

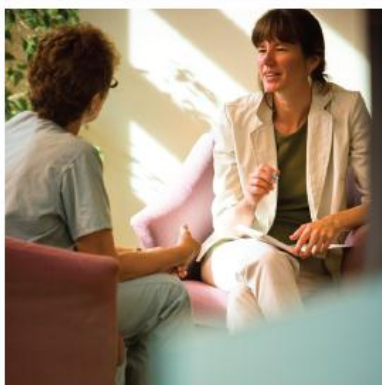
EVIDENCE  
BRIEF



PROMOTING HEALTHY WEIGHTS  
USING POPULATION-BASED  
INTERVENTIONS IN CANADA



17 SEPTEMBER 2012



EVIDENCE >> INSIGHT >> ACTION



**Evidence Brief:**  
**Promoting Healthy Weights Using Population-based Interventions in Canada**

17 September 2012

#### McMaster Health Forum

For concerned citizens and influential thinkers and doers, the McMaster Health Forum strives to be a leading hub for improving health outcomes through collective problem solving. Operating at the regional/provincial level and at national levels, the Forum harnesses information, convenes stakeholders, and prepares action-oriented leaders to meet pressing health issues creatively. The Forum acts as an agent of change by empowering stakeholders to set agendas, take well-considered actions, and communicate the rationale for actions effectively.

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#### Merit review

The evidence brief was reviewed by a small number of policymakers, stakeholders and/or researchers in order to ensure its scientific rigour and system relevance.

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## KEY MESSAGES

### What's the problem?

- Overweight and obesity is one the most significant public-health issues in Canada and is driven by a complex interplay of factors.
  - The prevalence of overweight and obesity in Canada, and in turn, its associated health and economic burden, is significant and growing. Obesity rates over the last three decades have roughly doubled, resulting in approximately one in four Canadian adults and 8.6% of children and youth being obese. This combined with the myriad co-morbidities associated with overweight and obesity place strain on already over-stretched health systems.
  - Promoting healthy weights at a population level is challenging due to the need to address a broad array of inter-related biological, behavioural, community and societal and environmental factors that contribute to overweight and obesity.
  - Current approaches to promoting healthy weights are not integrated and don't focus on the underlying determinants of overweight and obesity.

### What do we know (from systematic reviews) about three viable options to address the problem?

- Option 1 – Information and skills building
  - One high-quality review found that promising education-related strategies include the use of a school curriculum that includes healthy eating, physical activity and body image, teaching fundamental movement skills, and education for teachers and staff to implement health-promotion strategies. Medium-quality reviews highlighted: that information and education campaigns are effective at increasing knowledge and consumption of healthy food; the importance of tailoring information provided through education interventions; the potential benefits of including computer-based interventions as a supplement to standard weight-loss interventions; and that the use of nutrition labels is consistently linked to healthier diets.
- Option 2 – Programs to support healthy settings
  - Several systematic reviews found benefits related to this option. High-quality reviews found evidence to support positive effects for school-based programs, obesity prevention programs targeted to children aged six to 12, and tailored walking-promotion interventions. Several reviews (including one high-quality review) found evidence to indicate some benefit to workplace interventions (particularly those that were multi-component and target both exercise and dietary habits). Also, medium- and low-quality reviews found that intensive multi-component screening programs were most effective and that a well-designed built environment has a beneficial association with levels of physical activity and obesity rates.
- Option 3 – Guidelines and policies to enable healthy food and physical activity environments
  - Several high- and medium-quality reviews found benefits for financial incentives and price measures that affect demand for high-energy foods and beverages, and healthy foods, as well as indirect evidence of benefits for interventions aimed at restricting and reducing food and beverage marketing targeted at children. High-quality reviews found that: financial incentives have a positive effect on both food purchasing and weight loss; television influences food and beverage preferences, purchase requests, short-term consumption as well as adiposity; and food promotion influences children's food purchasing. Medium-quality reviews found that prices, taxes and subsidies were significantly associated with the demand for food and beverages.

### What implementation considerations need to be kept in mind?

- Potential barriers to promoting healthy weights using population-based interventions in Canada can be identified at the level of individuals (e.g., low health literacy levels), providers (e.g., lack of coordination and collaboration between providers within and between sectors), organizations (e.g., lack of consistency of educational material between schools and other settings), and system level (e.g., lack of coordinated policies between municipal, provincial and federal governments).





## REPORT

The obesity epidemic has led to calls for policies to address the rise in the prevalence of diseases associated with obesity. To spur additional efforts to address the obesity epidemic, the Canadian Federal, Provincial and Territorial (FPT) Ministers of Health and Health Promotion/Healthy Living committed in September 2010 to continue with efforts focused specifically on reducing the number of children and youth that are overweight or obese.<sup>(1)</sup> This commitment identified several key strategies which include, but are not limited to:

- making social and physical environments where children live, learn and play more supportive of physical activity and healthy eating;
- identifying the risk of overweight and obesity in children and addressing it early;
- increasing the availability and accessibility of nutritious foods; and
- decreasing the marketing of foods and beverages high in fat, sugar and/or sodium to children.<sup>(1)</sup>

As a follow-up to the 2010 meeting of Canadian FPT Ministers of Health and Health Promotion/Healthy Living, an action plan for curbing childhood obesity was created that is comprised of three integrated strategies:

- making childhood overweight and obesity a collective priority for action for FPT Ministers of Health and Health Promotion/Healthy Living, who will champion this issue and encourage shared leadership and joint and/or complementary action from government departments and other sectors of Canadian society;
- coordinating efforts on three key population-based policy priorities:
  - supportive environments: making social and physical environments where children live, learn and play more supportive of physical activity and healthy eating;
  - early action: identifying the risk of overweight and obesity in children and addressing it early (e.g. mental well-being); and
  - nutritious foods: looking at ways to increase the availability and accessibility of nutritious foods and decrease the marketing of foods and beverages high in fat, sugar and/or sodium to children;
- measuring and reporting on collective progress in promoting healthy living and reducing childhood overweight and obesity, learning from successful initiatives, and modifying approaches as appropriate.<sup>(2)</sup>

### Box 1: Background to the evidence brief

This evidence brief mobilizes both global and local research evidence about a problem, three options for addressing the problem, and key implementation considerations. Whenever possible, the evidence brief 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 evidence brief does not contain recommendations.

The preparation of the evidence brief involved five steps:

- 1) convening a Steering Committee comprised of representatives from Alberta Health and Wellness, Department of Health and Community Services (Government of Newfoundland and Labrador), Heart and Stroke Foundation of Canada, Quebec Coalition on Weight-Related Problems, Public Health Agency of Canada, and the McMaster Health Forum;
- 2) developing and refining the terms of reference for an evidence brief, particularly the framing of the problem and three viable options for addressing it, in consultation with the Steering Committee and a number of key informants, and with the aid of several conceptual frameworks that organize thinking about ways to approach the issue;
- 3) identifying, selecting, appraising and synthesizing relevant research evidence about the problem, options and implementation considerations;
- 4) drafting the evidence brief in such a way as to present concisely and in accessible language the global and local research evidence; and
- 5) finalizing the evidence brief based on the input of several merit reviewers.

The three options for addressing the problem were not designed to be mutually exclusive. They could be pursued simultaneously or in a sequenced way, and each option could be given greater or lesser attention relative to the others.

The evidence brief was prepared to inform a stakeholder dialogue at which research evidence is one of many considerations. Participants' views and experiences and the tacit knowledge they bring to the issues at hand are also important inputs to the dialogue. One goal of the stakeholder dialogue is to spark insights – insights that can only come about when all of those who will be involved in or affected by future decisions about the issue can work through it together. A second goal of the stakeholder dialogue is to generate action by those who participate in the dialogue and by those who review the dialogue summary and the video interviews with dialogue participants.

Although these are promising steps forward, there is currently no similar national strategy aimed at the obesity epidemic among adults, and much is left to be done in terms of identifying which specific population-based interventions included within the policy priorities outlined above could be considered. The purpose of this evidence brief, and the stakeholder dialogue it was prepared to inform, is to inform those involved with addressing the obesity epidemic through efforts to promote healthy weights in Canada. In doing so, the scope of the brief is focused on population-based interventions that may contribute to promoting healthy weights. Building on the definition of population health developed by the Federal, Provincial and Territorial Advisory Committee on Population Health in 1997,(3) we use the term population-based to refer to interventions targeted either at the entire population or at specific populations (e.g., adolescents), which includes health-system and/or public-health interventions. We do not include within this scope interventions focused on the treatment of obesity (e.g., surgery, medications, or clinical or secondary prevention). Within this scope, we review the research evidence about: 1) key features of the problem (specifically the issues underlying the obesity epidemic), 2) three options for addressing the problems, and 3) key implementation considerations for moving any of the options forward.

In this evidence brief several definitions are used to describe healthy and unhealthy weights and the health risks associated with the latter, which include body mass index (BMI, kg/m<sup>2</sup>), waist circumference and clinical-staging systems that evaluate co-morbidities and functional limitations (instead of anthropometric measures). For BMI, Health Canada recommends the use of the following categories to identify levels of health risk (relative to ‘normal weight’ category) among adults:(4)

- <18.5: underweight (increased risk);
- 18.5 - 24.9: normal weight (least risk);
- 25.0 - 29.9: overweight (increased risk);
- 30+: obese
  - 30.0 - 34.9: obese class I (high risk);
  - 35.0 - 39.9: obese class II (very high risk); and
  - ≥40.0: obese class III (extremely high risk).

The definitions used to study childhood obesity vary and, among those using BMI, the terminology used to define different levels of BMI also vary.(5) For the purposes of this evidence brief we have adopted the World Health Organization (WHO) definitions of childhood overweight and obesity, which are as follows (5-7):

## Box 2: Equity considerations

A problem may disproportionately affect some groups in society. The benefits, harms and costs of options to address the problem may vary across groups. Implementation considerations may also vary across groups.

One way to identify groups warranting particular attention is to use “PROGRESS,” which is an acronym formed by the first letters of the following eight ways that can be used to describe groups:†

- place of residence (e.g., rural and remote populations);
- race/ethnicity/culture (e.g., First Nations and Inuit populations, immigrant populations and linguistic minority populations);
- occupation or labour-market experiences more generally (e.g., those in “precarious work” arrangements);
- gender;
- religion;
- educational level (e.g., health literacy);
- socio-economic status (e.g., economically disadvantaged populations); and
- social capital/social exclusion.

The evidence brief strives to address all Canadians, but (where possible) it also gives particular attention to two factors:

- socioeconomic status; and
- age (children, adolescents, young adults and adults 55 years of age and over).

Many other groups warrant serious consideration as well, and a similar approach could be adopted for any of them.

† The PROGRESS framework was developed by Tim Evans and Hilary Brown (Evans T, Brown H. Road traffic crashes: operationalizing equity in the context of health sector reform. *Injury Control and Safety Promotion* 2003;10(1-2): 11–12). It is being tested by the Cochrane Collaboration Health Equity Field as a means of evaluating the impact of interventions on health equity.

- WHO – birth to age 5
  - overweight: BMI > 2 standard deviations above the WHO growth standard median
  - obese: BMI > 3 standard deviations above the WHO growth standard median
- WHO – ages 5 to 19
  - overweight: BMI > 1 standard deviation above the WHO growth standard median
  - obese: BMI > 2 standard deviations above the WHO growth standard median

It should be noted that the appropriateness of these cut-offs for use in non-white populations has been questioned.(8;9) Ethnic-specific measures have been investigated with recommendations made by a WHO panel for potential Asian-specific BMI cut-offs (i.e., underweight <18.5 kg/m<sup>2</sup>, increasing but acceptable risk 18.5 to 23 kg/m<sup>2</sup>, increased risk 23 to 27.5 kg/m<sup>2</sup>, and high risk ≥27.5 kg/m<sup>2</sup>), but due to lack of data the ranges outlined above were retained.(10)

In addition to BMI, measures of unhealthy weight are often supplemented with sex-specific cut-off points for waist circumference (WC), which are as follows (11):

- for men: WC ≥ 102 cm (40 inches); and
- for women: WC ≥ 88 cm (35 inches).

The limitation of anthropometric measures is that they provide little information about the extent and severity of co-morbidities and functional limitations attributed to overweight and obesity, which are important for understanding their impact. For example, the Edmonton Obesity Staging System includes the following classifications:(12)

- stage 0: patient has no apparent obesity-related risk factors (e.g., blood pressure, serum lipids, fasting glucose, etc. within the normal range), no physical symptoms, no psychopathology, no functional limitations and/or impairment of well-being;
- stage 1: patient has obesity-related subclinical risk factor(s) (e.g., borderline hypertension, impaired fasting glucose, elevated liver enzymes, etc.), mild physical symptoms (e.g., dyspnea on moderate exertion, occasional aches and pains, fatigue, etc.), mild psychopathology, mild functional limitations and/or mild impairment of well-being;
- stage 2: patient has established obesity-related chronic disease(s) (e.g., hypertension, Type 2 diabetes, sleep apnea, osteoarthritis, reflux disease, polycystic ovary syndrome, anxiety disorder, etc.) and moderate limitations in activities of daily living and/or well-being;
- stage 3: patient has established end-organ damage such as myocardial infarction, heart failure, diabetic complications, incapacitating osteoarthritis, significant psychopathology, significant functional limitation(s) and/or impairment of well-being; and
- stage 4: patient has severe (potentially end-stage) disability/ies from obesity-related chronic diseases, severe disabling psychopathology, severe functional limitation(s) and/or severe impairment of well-being.

The following key features of the health policy, population health and system context in Canada were also taken into account in the preparation of this evidence brief:

- Responsibility for public health in Canada is shared between federal and provincial/territorial governments. Activities at the federal level are coordinated through a central agency (Public Health Agency of Canada), and are focused on promoting health, preventing and controlling chronic diseases, injury and infectious diseases, preparing responses to public health emergencies, and supporting intergovernmental collaboration. The delivery and coordination of public health programs and services is done in collaboration with other parts of the federal health portfolio, provincial, territorial and municipal governments, as well as non-governmental and civil society organizations.
- Regulation of food products and product labelling are the responsibility of the federal government.
- Financial interventions such as taxes, financial incentives and subsidies are the responsibility of either provincial and territorial governments or the federal government, depending on the type of intervention being used and the sector in which it is being applied.

## **THE PROBLEM**

Overweight and obesity is a complex challenge in Canada given three sets of inter-related issues: 1) the health and economic burden of overweight and obesity is considerable and growing; 2) interventions to promote healthy weights need to address a broad array of inter-related biological, behavioural, community, societal and environmental factors; and 3) current system-level approaches to promoting healthy weights are not integrated and don't focus on the underlying determinants of overweight and obesity.

### **The health and economic burden of overweight and obesity is considerable and growing**

The prevalence of overweight and obesity in Canada, and in turn, its associated health burden, is significant and growing. Height and weight data from 2007-2009 indicate that approximately one in four Canadian adults were considered obese at that time (estimates range from 24.3-25.3%) and 8.6% of children and youth aged 6 to 17 were obese.(13) Another 29.5% of women and 44.1% of men were overweight.(13) Between 1981 and 2007/09, obesity rates roughly doubled among both men and women in most age groups.(14) Also, as obesity rates increased, overweight rates marginally increased: between 1981 and 2007/09, overweight rates in adult men and women (20-69 years) increased from 42.4% to 44.1%, and 24.8% to 28.9% respectively.(15) Over this period, the severity of obesity has increased, while fitness levels have declined.(14) Obesity rates vary widely within Canada and between countries. In Canada, adult obesity rates vary from 5.3% in Richmond, British Columbia, to 35.9% in the Mamawetan/Keewatin/Athabasca region of Saskatchewan.(14) Similarly, among OECD countries, overweight and obesity prevalence varies widely.(16) For example, in 2009, obesity prevalence ranged from 3.8% in Korea to 33.8% in the United States.(17)

An array of health-related problems have been demonstrated to be associated with overweight and obesity in adults. A recent systematic review of 89 prospective epidemiological studies concludes that both overweight and obesity are associated with the incidence of multiple co-morbidities including Type 2 diabetes, cancer and cardiovascular diseases.(18) With respect to cancer, there is strong evidence that obesity increases the risk of cancer of the colorectum, breast (in postmenopausal women), endometrium, esophagus, pancreas and kidney.(19) There is also substantial and consistent evidence that supports an association between maternal obesity and gestational diabetes mellitus, hypertensive disorders, caesarean delivery, neural tube defects and stillbirths.(20;21) Epidemiological studies suggest that overweight and obese women are less likely to breastfeed than normal weight women.(22)

Recent systematic reviews conclude that overweight and obesity in childhood and adolescence have important long-term health impacts. For example, overweight and obesity in childhood and adolescence have been found to be associated with increased risk of severe obesity in adulthood,(23) as well as increased risk of both premature mortality and adult morbidity, particularly cardiometabolic morbidity.(24;25) Research evidence suggests childhood obesity is not only likely a major cause of ill health in adulthood, but it contributes substantially to illness in childhood. More specifically, childhood obesity has been linked to a

### **Box 3: Mobilizing research evidence about the problem**

The available research evidence about the problem was sought from a range of published and “grey” research literature sources. Published literature that provided a comparative dimension to an understanding of the problem was sought using three health services research “hedges” in MedLine, namely those for appropriateness, processes, and outcomes of care (which increase the chances of us identifying administrative database studies and community surveys). Published literature that provided insights into alternative ways of framing the problem was sought using a fourth hedge in MedLine, namely the one for qualitative research. Grey literature was sought by reviewing the websites of a number of Canadian and international organizations, such as the Public Health Agency of Canada, Canadian Obesity Network, Canadian Institute for Health Information, Health Council of Canada, European Observatory on Health Systems and Policies, Health Evidence Network, Health Policy Monitor, and Organisation for Economic Co-operation and Development.

Priority was given to research evidence that was published more recently, that was locally applicable (in the sense of having been conducted in Canada), and that took equity considerations into account.

number of health, emotional and social issues, including hypertension, high blood pressure or heart disease in adulthood, Type 2 diabetes, sleep apnea and other breathing problems, abnormal or missed menstrual cycles, bone and joint problems and reduced balance, emotional health (low self-esteem, negative body image, and depression), and social health (feeling judged, and being teased or bullied).(24;26)

In addition to physical health, obesity has important implications for mental health. The most widely studied psychosocial manifestations of obesity are self-esteem and self-image. For children and adolescents, additional mental health issues include depression, being subjected to teasing, social isolation and discrimination, behavioural problems, and reduced quality of life.(27) The focus on weight may also lead to body dissatisfaction, which can reinforce or result in destructive patterns of behaviour (e.g., eating disorders or sub-optimal approaches to weight loss).(27-29) Obesity is also more prevalent in those with schizophrenia and depression (30;31), but there is only weak causal evidence to support the hypothesis that obesity increases the incidence of depression.(31;32)

The increasing burden of obesity combined with the myriad associated co-morbidities (19) place strain on already over stretched health systems in Canada. Estimates of the burden of obesity in terms of direct costs to provincial and territorial health systems in Canada and indirect costs to productivity range from \$4.6 billion (based on a study evaluating eight chronic diseases associated with obesity) to \$7.1 billion.(14;33)

### **Interventions to promote healthy weights need to address a broad array of inter-related biological, behavioural, community, societal and environmental factors**

An array of behavioural and socio-environmental factors have been associated with overweight and obesity. A systematic review of longitudinal observational studies examined the early-life and childhood predictors of adult obesity, and identified a number of important risk factors including genes, parental adiposity, maternal diabetes, maternal smoking, rapid infant growth, no or short breastfeeding, social factors (e.g., socioeconomic status in childhood and social mobility), birth weight, timing or rate of maturation (although obesity may also impact the rate of maturation), physical inactivity, dietary factors (e.g., consumption of sugar-sweetened beverages) and behavioural or psychological factors (e.g., temperament and self-esteem).(34-38)

Recent systematic reviews have also examined psychosocial determinants and environmental correlates of obesity-related dietary behaviours and physical activity in youth and adults.(39-44) For example, consistent associations were found between parental dietary intake and children's fat, fruit or vegetable intakes, between parental and sibling intake and adolescents' energy and fat intakes, and between parental education and adolescents' fruit or vegetable intake.(43) Factors related to the built environment (e.g., availability of sidewalks, parks, trails, recreational facilities, proximity to transit and residential density) have also been identified as important contributors to increasing levels of physical activity and reducing rates of overweight and obesity (45;46), while urban sprawl has been found to be associated with increased risk of being overweight and obese.(47-49)

Canadian studies reiterate the important links between physical activity, fitness, sedentary behaviours and nutrition and obesity in school-aged children and youth.(13;50-54) For example, the association between physical activity and fitness with overweight and obesity in children and adolescents, as well as improving the health of those who are overweight and obese, is well documented, yet most Canadians get less than the daily recommended amount of physical activity for their age group. Recent data indicate that nearly 90% of children and teens did not meet the recommended amount of physical activity per day.(50;51)

Another important factor contributing to overweight and obesity is socioeconomic status (SES) with research suggesting an inverse association between SES and the prevalence of overweight and obesity (55) and between SES and adiposity in children (i.e., lower SES groups tend to have higher rates of obesity).(56) These associations are observed whether SES is measured by income, education or occupation-based social class.(16) The relationship between SES and obesity is further discussed at the end of this section.

Despite the rich research evidence outlined above, it is important to note the challenges in establishing a causal association between possible determinants and obesity, and the relative importance of each determinant.(35) It is also challenging to establish a causal association between possible determinants of obesity and their respective determinants (i.e., the determinants of the determinants). Moreover, it is daunting to elucidate the cause-and-effect relationship when many factors appear to be both causes and effects.(32;57;58) As a result, for efforts towards promoting healthy weights at a population level to make an impact, they must carefully consider and address this complex interplay of factors.

**Current system level approaches to promoting healthy weights are not integrated and don't focus on the underlying determinants of overweight and obesity**

In seeking solutions to tackle the obesity epidemic, it is important to recognize the complex nature of the problem. Such complexity requires a shift from a focus on individual responsibility to an integrated approach to delivering population-based interventions that consider the underlying determinants that contribute to obesogenic environments.(59) As illustrated by the causal web of factors influencing weight-related problems developed by the International Obesity Taskforce,(60) individual factors remain important, but tackling the obesity epidemic necessitates an ecological approach,(61) with integrated interventions at the community, provincial, national and international levels. Furthermore, interventions to address the problem at a population level also necessitate including the food industry, media, marketing, transportation, urban planning, health care, education and public health.(60)

Integration involves all government sectors collaborating in a coherent effort guided by a multi-sectoral strategy.(62) The goal of such integrated approaches are to coordinate efforts to address the underlying determinants of health.(62) Such approaches can facilitate or trigger integration that is both vertical (i.e., across levels) and horizontal (i.e., across sectors), but it can also include actors that are not traditionally associated with the government in order to achieve a common purpose.(63;64)

Although system-level and integrated approaches to promote healthy public policies have gained interest in Canada,(65) a variety of features of existing delivery, financial and governance arrangements appear to limit the ability to efficiently support such approaches to promoting healthy weights. For example, a review and synthesis of the literature on integrated approaches to promote healthy weights and prevent obesity found that although there is plenty of evidence in support of inter-sectoral collaboration, working outside of one's mandate is discouraged, and efforts to reverse this tendency are necessary (64), especially when many population-based interventions span several sectors with competing mandates.

*Delivery arrangements*

In its 2009 report, the Senate Subcommittee on Population Health recommended that: "The Government of Canada work with other levels of government and the non-governmental sector to support the integration or coordination of community-level services within a determinants of health framework."(66) While acknowledging the need for greater integration, the Canadian Council on Integrated Healthcare (CCIH) admitted in a recent report that: "Unfortunately, our health system remains resistant to this kind of thinking".(62) The report went on to note that greater integration would require a paradigm shift from a focus solely on the individual to one that considers the relationship between individuals and their environments.(62)

Indeed, current delivery arrangements lack sustained integrated efforts among multiple stakeholders including government policymakers, municipal planners, community leaders, healthcare professionals, researchers, educational leaders, and employers working together to implement solutions at the individual, community, workplace, school and government-wide levels.(62) The need for multiple approaches that are integrated across sectors appears to be underscored by the complex web of factors that contribute to overweight and obesity, which results in a situation where one intervention may be adequate for some but not for others.(67)



Another important gap in existing delivery arrangements is the lack of emphasis across settings and sectors on the prevention of obesity. Key contributing factors include:

- lack of well-defined packages of interventions or approaches that identify/screen and manage/treat people who are at-risk for obesity or who are obese;
- lack of coordinated sets of preventive, population-level interventions or approaches aimed at addressing factors at the individual, household and community levels (e.g. provision of healthy food options in restaurants, workplace cafeterias, and daycares; availability of low cost healthy foods through community gardening, harvesting, etc.);
- lack of integration and coordination across providers (nurses, doctors, nutritionists, etc.), settings (e.g., healthcare, public health, school, work, community and society) and sectors (e.g., built environments, health impact assessments of agriculture or transportation policy) that sometimes have competing sets of priorities and mandates;
- lack of outreach (e.g., targeted educational initiatives) in key settings such as schools and the workplace, or at least, limited effectiveness or inadequate coordination; and
- lack of supports for self-management to sustain behaviour change.

#### *Financial arrangements*

Financial arrangements may also contribute to a lack of integrated approaches to delivering population-based interventions that promote healthy weights. First, there is a lack of coordinated packages of financial incentives (e.g., subsidies) and disincentives (e.g., taxes) to support active lifestyles and healthy eating behaviours (e.g., purchasing healthy food and participating in physical activity) that can contribute to preventing obesity among those at-risk and reduce the existing burden of obesity.(62)

Second, there is a lack of financial capacity to sustain integrated initiatives. A recent study that examined the integration of primary care and public health activities in the United States revealed that competition between partner organizations for limited funding streams can impede collaboration and progress, and that it remains challenging to sustain integrated initiatives beyond the grant period because of lack of reimbursement for public health activities.(68) Although the systems in each country differ, the latter finding resonates in Canada, which has been dubbed as the “country of perpetual pilot projects” where effective projects are rarely transformed into stable, funded programs.(69)

#### *Governance arrangements*

Governments cannot effectively tackle complex problems like obesity if they rely exclusively on a ‘command and control’ strategy. The “new” governance, as dubbed by Salamon, necessitates “cooperative actions orchestrated through complex networks” (70) of stakeholders across policy sectors and levels of governance. According to Bégin and colleagues, without integrated and coordinated structures, collaboration and progress across the country is impeded, which contributes to inconsistent approaches across provinces: “The second tragedy [the first being the lack of sustainable funding] is that our provincial and territorial health silos have no horizontal collaborative mechanisms to share lessons learned from pilot projects across jurisdictions. If a project does become integrated into a provincial health budget, that initiative usually stalls at the border, no matter how strong the evidence of its success.”(69)

Nonetheless, three Canadian initiatives that support, or supported, integration and coordination across policy sectors and governance levels are worth mentioning. The first initiative is the adoption in 2002 of the Quebec Public Health Act's section 54 stipulating that government bodies proposing new policies must first go through a health impact assessment process. Thus, section 54 explicitly states the minister of health's role and responsibility in advising the government and colleagues about the potential impact of government policies on the health of the population. It also creates the obligation on the part of other government bodies to consult the minister of health when developing policies that could have a significant impact on the health and

welfare of the population. Thus, section 54 constitutes a promising policy instrument that can facilitate or trigger inter-ministerial actions supporting healthy public policies.(65)

The second initiative is ActNow BC, launched in 2006 by the Premier of British Columbia. The objective was to use the 2010 Olympic Games in Vancouver as a catalyst for launching a whole-of-government platform to support healthy lifestyle choices and reduce the burden of disease in the province. This initiative also supported schools, employers, local governments and communities to develop and promote programs that achieve its aim of leading North America in healthy living and physical fitness.(65)

The third initiative is led by the Pan-Canadian Public Health Network (PHN), a network created in 2005 and whose mandate is to support linkages across many sectors and levels of government in Canada. The PHN is governed by a council composed of Federal/Provincial/Territorial (F/P/T) government officials, including the Chief Public Health Officer of Canada and senior government officials from all jurisdictions that are responsible for public health. During its first year, the Conference of F/P/T Deputy Ministers of Health referred the Integrated Pan-Canadian Healthy Living Strategy to the PHN for action and to monitor progress. The strategy provides a conceptual framework for sustained population-based actions to promote healthy living. More specifically, it seeks to obtain a 20% increase in the number of Canadians who are physically active, eat healthy and are at healthy body weights.(71) To support the healthy living strategy, the PHN developed the Declaration on Prevention and Promotion (72) and the F/P/T Framework for Action to Promote Healthy Weights,(1) which were endorsed by F/P/T Ministers of Health in 2010. The objectives of this initiative were to facilitate coordinated action by governments to promote healthy weights in children, but also to give a national profile to this problem and mobilize stakeholders from various sectors to address it.(73)

### **Additional equity-related observations about the problem**

As discussed earlier, socioeconomic status (SES) research suggests an inverse association between SES and the prevalence of overweight and obesity (55) and adiposity in children.(56) Even when there are no socioeconomic differences in obesity in childhood, inequalities in childhood circumstances are associated with inequalities in adulthood obesity.(55) In Canada, both individual- and area-level SES have been shown to be associated with overweight and obesity.(14) For example, in the mid-2000s, in most Census Metropolitan Areas obesity rates were higher in the most socioeconomically deprived areas than in the least deprived.(14)

A number of systematic reviews have examined the links between SES and obesity. For example, recent systematic reviews have found: 1) that childhood SES is associated with Type 2 diabetes and obesity in later life;(74) 2) an increased risk of overweight and obese youth becoming overweight adults, suggesting that the likelihood of persistence of overweight into adulthood is moderate for overweight and obese youth;(75) and 3) that over the period 1990-2005, associations between SES and adiposity in children were predominately inverse, while positive associations had all but disappeared.(56) Finally, a recent systematic review indicates that dietary behaviours may contribute to SES inequalities in overweight and obesity in Europe.(76) For example, there is an inverse and consistent association between SES and fruit and vegetable consumption, whether it is measured as intakes, frequency of consumption or meeting recommendations, and this association is consistent for both sexes and across regions.(76)

Canadian data suggest a similar strong inverse association between SES and the prevalence of overweight and obesity.(14) An additional concern in Canada is the prevalence of overweight and obesity in Aboriginal populations. In Canada, Aboriginal populations exhibit higher prevalence of overweight and obesity compared with non-Aboriginal populations.(77) These differences exist among Aboriginal populations living both on and off reserve. Data gathered from 2008 and 2010 showed that less than one-quarter (24.2%) of all First Nations adults had a normal body mass index (BMI), while 34.2% were overweight, 34.8% were obese, and 5.4% were morbidly obese.(77) Canadian research has also found that the prevalence of obesity tends to be lower in urban areas and city centres such as Montréal, Toronto and Vancouver.(78;79) Finally, Canadian



research has also found that food insecurity in preschool years increases the likelihood of being overweight or obese.(80;81)

The prevalence of obesity also differs across the age spectrum. Analyses from the 2007-2008 Canadian Community Health Survey (CCHS) show that the prevalence of obesity increases with each successive age group up to age 65. After this age, obesity rates decrease.(14) A similar U-shaped relationship between BMI and age is found globally.(16) Body adiposity increases with age; as metabolic rate and energy expenditure decrease with age, older persons do not require as many calories to maintain their body weight.(34) In a recent Manitoba study, of all the factors associated with obesity that were examined, age had the biggest influence, with an individual's probability of being obese rising sharply from age 18 until about age 60.(82) None of the research evidence we reviewed focused specifically on adults aged 55 and over.

### **THREE OPTIONS FOR ADDRESSING THE PROBLEM**

Many options could be selected as a starting point for deliberations about improving obesity outcomes using population-based interventions in Canada. To promote discussion about the pros and cons of potentially viable options, we have selected three options, which could collectively contribute to a more comprehensive approach to improving obesity outcomes. The options are designed to address three core groupings of interventions:

- 1) information and skills building;
- 2) programs to support healthy settings; and
- 3) guidelines and policies that enable healthy food and physical activity environments.

The options could be pursued simultaneously or sequentially, or components could be drawn from each element to create a new (fourth) option. They are presented separately to foster deliberations about their respective components, the relative importance or priority of each, their interconnectedness and potential of or need for sequencing, and their feasibility.

The principal focus in this section is on what is known about these options based on findings from systematic reviews. We present the findings from systematic reviews along with an appraisal of whether their methodological quality (using the AMSTAR tool)(83) is high (scores of 8 or higher out of a possible 11), medium (scores of 4-7) or low (scores less than 4) (see the appendix for more details about the quality appraisal process). We also highlight whether they were conducted recently, which we define as the search being conducted within the last five years. In the next section the focus turns to the barriers to adopting and implementing these options and to possible implementation strategies to address the barriers.

#### **Option 1 – Information and skills building**

The focus of this option is on equipping people with information and skills that increase awareness of the risks of being overweight or obese, support healthy behaviours and for making informed decisions.

- Elements of this option might include:
  - mass media campaigns;
  - targeted educational initiatives about the risks of being overweight or obese and that teach and promote healthy behaviours (e.g., healthy eating, physical activity and food selection and

#### **Box 4: Mobilizing research evidence about options for addressing the problem**

The available research evidence about options for addressing the problem was sought primarily from three sources. First, we searched for systematic reviews in Health Systems Evidence ([www.healthsystemsevidence.org](http://www.healthsystemsevidence.org)), which is a continuously updated database containing more than 1,800 systematic reviews of delivery, financial and governance arrangements within health systems. The reviews were identified by searching the database for reviews containing obes\* in the title and/or abstract. Additional reviews were identified by searching the database for reviews addressing features of the options that were not identified using the keyword search. Second we assessed all of the reviews in the obesity/overweight, healthy weight, physical inactivity or sedentary activity categories in Health-Evidence.ca. Third we searched for evidence about costs and/or cost-effectiveness in the NHS Economic Evaluation Database (available through the Cochrane Library) using a similar keyword-based approach.

The authors' conclusions were extracted from the reviews whenever possible. Some reviews contained no studies despite an exhaustive search (i.e., they were "empty" reviews), while others concluded that there was substantial uncertainty about the option based on the identified studies. Where relevant, caveats were introduced about these authors' conclusions based on assessments of the reviews' quality, the local applicability of the reviews' findings, equity considerations, and relevance to the issue. (See the appendices for a complete description of these assessments.)

Being aware of what is not known can be as important as being aware of what is known. When faced with an empty review, substantial uncertainty, or concerns about quality and local applicability or lack of attention to equity considerations, primary research could be commissioned, or an option could be pursued and a monitoring and evaluation plan designed, as part of its implementation. When faced with a review that was published many years ago, an updating of the review could be commissioned if time allows.

No additional research evidence was sought beyond what was included in the systematic review. Those interested in pursuing a particular option may want to search for a more detailed description of the option or for additional research evidence about the option.

- preparation);
- building capacity and providing the opportunities and supports consumers need to obtain and use health information effectively; and
- food labelling.

A summary of the key findings from the synthesized research evidence is provided in Table 1. For those who want to know more about the systematic reviews contained in Table 1 (or obtain citations for the reviews), a fuller description of the systematic reviews is provided in Appendix 1.

We found 20 systematic reviews addressing one or more of the elements comprising this option. One medium-quality review found evidence to suggest that information and education campaigns are effective at increasing knowledge and consumption of healthy food, but a low-quality review found only marginal increases in consumption of fruits and vegetables after public campaigns to promote their intake.(84) Several reviews evaluated educational initiatives, and one high-quality review found that promising education-related strategies include the use of a school curriculum that includes healthy eating, physical activity and body image, teaching fundamental movement skills, and education for teachers and staff to implement health promotion strategies.(85) Medium-quality reviews highlighted the importance of tailoring information in education interventions (86) and including computer-based interventions as a supplement to standard weight loss interventions.(87) For the capacity-building element, one low-quality review found that interventions to improve nutritional literacy resulted in improved nutrition knowledge.(88) Lastly, one recent medium-quality review found evidence that consistently linked the use of nutrition labels to healthier diets.(89) The same review also found that when compared with labels that use ‘traditional’ quantitative labels, those using graphics, symbols, adjective labels and those with minimal numerical content were more effective.(89)

Table 1: Summary of key findings from systematic reviews relevant to Option 1 – Information and skills building

Category of finding	Summary of key findings
Benefits	<ul style="list-style-type: none"> <li>• <b>Mass media campaigns</b> <ul style="list-style-type: none"> <li>○ A recent medium-quality review found evidence suggesting that information and educational campaigns that are focused nationally and targeted to specific communities or in schools, are effective at increasing knowledge and consumption of healthy food. There was also some evidence suggesting reductions in adiposity, cardiovascular risk factors and physical activity.(90) However, a recent but low-quality review found only marginal increases in consumption of fruits and vegetables in a large body of literature evaluating the efficacy of public campaigns to promote their intake. The review also noted that campaigns never achieve an increase of one portion of fruits and vegetables per person per day regardless of the evaluation procedure.(84)</li> </ul> </li> <li>• <b>Targeted educational initiatives about the risks of being overweight or obese and that teach and promote healthy behaviours (e.g., healthy eating, physical activity and food selection and preparation)</b> <ul style="list-style-type: none"> <li>○ A recent high-quality review of interventions for preventing obesity in children found that although it was difficult to distinguish which components contributed the most beneficial effects, the most promising findings for education-related strategies include the use of a school curriculum that includes healthy eating, physical activity and body image, teaching fundamental movement skills, and education (e.g., professional development) for teachers and staff to implement health promotion strategies.(85) In addition, an older medium-quality review found that for any educational material to be persuasive it must communicate strong and convincing arguments from a source that is perceived as credible and trustworthy.(91)</li> <li>○ A recent medium-quality review found tailoring information in educational interventions reduces the disadvantages associated with general health information (especially from information obtained from the internet) and produces more</li> </ul> </li> </ul>

	<p>positive outcomes.(86)</p> <ul style="list-style-type: none"> <li>○ A recent medium-quality review of weight gain-prevention interventions for children under two years of age found evidence that supports the potential long-term viability of delivering educational sessions to parents and their children as infrequently as twice per year. The review also notes the benefits of educating parents on healthy eating as important parts of the intervention.(92) Another review targeted to children under five years of age found that high-intensity programs that supply targeted messages in repetition through different modes (e.g., tailored feedback from a primary care provider, group education, pamphlets and posters), and that aim to also improve parent knowledge, skills and competency, have some impact.(93)</li> <li>○ Several reviews evaluated web-based interventions or the use of computers as educational or health promotion tools. A recent medium-quality review found that including computer-based interventions as a supplement to standard weight loss interventions increases weight loss, but the use of computer-based technology alone decreased weight loss.(87) Another recent medium-quality review found that consistent use of website features may be associated with weight loss, but the evidence is still too limited to determine which features contribute to the improvements.(94)</li> </ul> <ul style="list-style-type: none"> <li>● <b>Building capacity and providing the opportunities and supports consumers need to obtain and use health information effectively</b> <ul style="list-style-type: none"> <li>○ A recent but low-quality review found consistent evidence across studies that low-literacy nutrition interventions resulted in improved nutrition knowledge.(88)</li> </ul> </li> <li>● <b>Food labelling</b> <ul style="list-style-type: none"> <li>○ A recent medium-quality review found evidence consistently linking the use of nutrition labels to healthier diets, but the findings varied considerably depending on the subgroup studied, with lower use among children, adolescents and obese older adults.(89) The same review also found that when compared with labels that used 'traditional' quantitative labels, those using graphics, symbols, adjective labels and those with minimal numerical content were more effective.</li> </ul> </li> </ul>
Potential harms	<ul style="list-style-type: none"> <li>● No reviews identified potential harms</li> </ul>
Costs and/or cost-effectiveness in relation to the status quo	<ul style="list-style-type: none"> <li>● No studies evaluated costs and/or cost-effectiveness in relation to the status quo</li> </ul>
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	<ul style="list-style-type: none"> <li>● Uncertainty because no systematic reviews were identified <ul style="list-style-type: none"> <li>○ Not applicable (reviews were found for each option element)</li> </ul> </li> <li>● Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review <ul style="list-style-type: none"> <li>○ Not applicable (no 'empty' reviews were found)</li> </ul> </li> <li>● No clear message from studies included in a systematic review <ul style="list-style-type: none"> <li>○ <b>Mass media campaigns</b> <ul style="list-style-type: none"> <li>■ A recent but low-quality review found that increases in knowledge and awareness are reported after information campaigns, but there is a lack of evidence to determine whether campaigns are effective in changing nutritional intake or health outcomes such as body mass, blood cholesterol or blood pressure.(84)</li> </ul> </li> <li>○ <b>Building capacity and providing the opportunities and supports consumers need to obtain and use health information effectively</b> <ul style="list-style-type: none"> <li>■ A recent but low-quality review found inconsistent evidence about the effects of low-literacy nutrition interventions on self-reported eating behaviours, and found no evidence to be able to determine whether they have an impact on anthropometric or biologic outcomes.(88)</li> </ul> </li> <li>○ <b>Food labelling</b> <ul style="list-style-type: none"> <li>■ A recent medium-quality review found that worksite food and beverage labelling alone is not sufficient for changing diets.(90) Also, an older medium-quality review concluded that there was virtually no insight from the available evidence into how labelling information could be used in a real-world</li> </ul> </li> </ul> </li> </ul>

	shopping situation, and whether and how it may affect consumers' dietary patterns.(95) Similarly, a recent low-quality review of experimental research conducted in the laboratory and in the field found too little evidence on providing nutritional information (along with taxation or subsidies) to make conclusions.(96)
Key elements of the policy option if it was tried elsewhere	<ul style="list-style-type: none"> <li>• <b>Mass media campaigns</b> <ul style="list-style-type: none"> <li>○ A recent medium-quality review found some studies suggesting that the most effective campaigns are those that focus on specific food, are sustained over many years and adopt multiple modes for communication and education. Benefits of short-term campaigns were increased by using direct communication methods to or involvement of the public.(90)</li> </ul> </li> <li>• <b>Targeted educational initiatives about the risks of being overweight or obese and that teach and promote healthy behaviours (e.g., healthy eating, physical activity and food selection and preparation)</b> <ul style="list-style-type: none"> <li>○ A medium-quality but older review about the effectiveness of interventions to increase fruit and vegetable consumption highlighted that education should be focused on specific behavioural changes (rather than on information acquisition).(97)</li> <li>○ A recent medium-quality review of interactive electronic media interventions found that computer-based interventions which were multi-component and that integrated parents were more effective. However, it was unclear whether the benefits of the programs were attributable to their computerized or interactive components.(98)</li> <li>○ A recent but low-quality review highlighted that education-based programs should use trained educators (99) and another recent and low-quality review highlighted the importance of having a parent component in any childhood intervention, as well as ensuring the intervention takes into account cultural norms.(100;101)</li> </ul> </li> <li>• <b>Building capacity and providing the opportunities and supports consumers need to obtain and use health information effectively</b> <ul style="list-style-type: none"> <li>○ A recent but low-quality review identified three qualitative studies that suggest that the unique learning needs of individuals with limited literacy skills be considered during the process of developing nutrition materials and education techniques.(88)</li> </ul> </li> </ul>
Stakeholders' views and experience	<ul style="list-style-type: none"> <li>• <b>Targeted educational initiatives about the risks of being overweight or obese and that teach and promote healthy behaviours (e.g., healthy eating, food preparation and physical activity)</b> <ul style="list-style-type: none"> <li>○ An older medium-quality review of eHealth interventions focused on healthy living found that participants in the programs were generally more open to the use of these interventions as part of a program that also includes face-to-face contact, and are less receptive to those with in-person contact.(102)</li> </ul> </li> </ul>

## Option 2 – Programs to support healthy settings

This option is focused on providing programs that support healthy settings. This includes programs that identify risk factors and plans for early action as well as those that support healthy behaviours and mental health.

Elements of this option might include:

- integrated approaches (i.e., across providers, settings and sectors) for identifying risk factors and early action;
- healthy eating and physical activity programs targeted to where children and adolescents live, learn and play (i.e., both in-school and after-school environments);
- community or workplace programs to support healthy eating, physical activity and breastfeeding;
- psychosocial supports (particularly for children and adolescents); and
- infrastructure programs to support active transportation and recreation.

A summary of the key findings from the synthesized research evidence is provided in Table 2. For those who want to know more about the systematic reviews contained in Table 2 (or obtain citations for the reviews), a fuller description of the systematic reviews is provided in Appendix 2.

We found 48 systematic reviews addressing one or more of the elements comprising this option, most of which address healthy eating and physical activity programs targeted to where children and adolescents live, learn and play. Two reviews – one of medium-quality and one low-quality – addressing integrated approaches found that more intense screening programs and those that are multi-component were most effective.(103;104) From the 34 reviews addressing healthy eating and physical activity programs targeted to children, three high-quality reviews found evidence to support positive effects for school-based programs (105), obesity-prevention programs targeted to children aged six to 12 (85), and interventions promoting walking that are tailored to the needs of individuals and targeted to the most sedentary and/or those most motivated to change.(106) Four systematic reviews evaluating workplace interventions found some evidence for benefits, with the most promising interventions being multi-component and targeting both exercise and dietary habits.(90;107-109) A recent high-quality systematic review addressing the psychosocial supports element found that motivational interviewing can help improve adherence to programs.(110) Lastly, almost all of the 169 studies included in a recent medium-quality review found a beneficial association between the built environment and levels of physical activity or obesity.(45) Also, three reviews – two medium-quality and one low-quality – found that providing infrastructure for safe physical activity environments or facilities and for transport (e.g., sidewalks, controlled intersections and public transport) help facilitate increases in activity levels.(90;101;111) Note that some reviews did not yield clear messages and are not summarized in this paragraph.

Table 2: Summary of key findings from systematic reviews relevant to Option 2 – Programs to support healthy settings

Category of finding	Summary of key findings
Benefits	<ul style="list-style-type: none"> <li>• <b>Integrated approaches (i.e., across providers, settings and sectors) for identifying risk factors and early action</b> <ul style="list-style-type: none"> <li>○ One older medium-quality review evaluating screening and early treatment for reducing morbidity and mortality from overweight and obesity found that more intense counselling programs (in terms of frequency and how structured the health promotion program is) resulted in beneficial outcomes as compared to less intense programs.(104) These programs were also found to be more effective when they incorporated a behavioural component. However, the review found no difference in the effectiveness of interventions delivered in individual- and group-based environments.</li> <li>○ A recent low-quality review evaluating obesity management in adults, found that multi-component interventions were more effective than those consisting of one or</li> </ul> </li> </ul>

	<p>two interventions.(103) The most effective multi-component programs incorporated individual sessions, support family involvement and provide problem-solving strategies with a collective focus on supporting lifestyle change.</p> <ul style="list-style-type: none"> <li>• <b>Healthy eating and physical activity programs targeted to where children and adolescents live, learn and play (i.e., both in-school and after-school environments)*</b> <ul style="list-style-type: none"> <li>○ A recent high-quality review found evidence indicating that school-based physical activity interventions have positive effects on the duration of physical activity, television viewing, VO2 max, and blood cholesterol, but no effect on leisure time physical activity rates, systolic and diastolic blood pressure, body mass index, or pulse rate.(105) The same review also found that a combination of printed educational materials and changes to the school curriculum that promote physical activity resulted in positive effects.</li> <li>○ Another recent high-quality review found strong evidence of beneficial effects of child obesity prevention programs on BMI, particularly for programs targeted to children aged six to 12 years. The review outlines that the included studies evaluated a broad range of program components, making it difficult to determine which contributed most to the benefits observed. However, several promising components that contributed to the benefits found included (with the list extracted directly from the review): <ul style="list-style-type: none"> <li>▪ ensuring school curriculum includes healthy eating, physical activity and body image;</li> <li>▪ increased sessions for physical activity and teaching fundamental movement skills throughout the school week;</li> <li>▪ improving nutritional quality of the food supply in schools;</li> <li>▪ environmental and cultural practices that support children eating healthier foods and being active throughout each day;</li> <li>▪ support for teachers and other staff to implement health promotion strategies and activities (e.g. professional development, capacity building activities); and</li> <li>▪ parent support and home activities that encourage children to be more active, eat more nutritious foods and spend less time in screen-based activities.</li> </ul> </li> <li>○ A recent high-quality review of interventions to promote walking at the individual- and population-level found clear evidence supporting interventions that are tailored to the needs of individuals, targeted to the most sedentary and/or those most motivated to change, and delivered to individuals, households or in groups. The most successful interventions achieved increases in walking of up to 30-60 minutes per week.(106)</li> <li>○ A recent medium-quality review of parent-focused interventions for addressing childhood overweight and obesity found interventions that go beyond providing information and include behavioural strategies (e.g., goal setting, barrier identification and self-monitoring) showed some benefits.(112)</li> <li>○ Another recent medium-quality review found that computer/web-based physical activity interventions can be effective in increasing physical activity among preadolescents and adolescents.(113)</li> </ul> </li> <li>• <b>Community or workplace programs that support healthy eating, physical activity and breastfeeding</b> <ul style="list-style-type: none"> <li>○ A recent medium-quality review of community-based primary care interventions found that interventions combining both diet or healthy eating and exercise should be encouraged, especially in combination with food provision.(114)</li> <li>○ A recent high-quality review found that behavioral counselling appears to be the most effective means to improve maternal health and weight, while intensive exercise programs and combined diet and exercise programs can also have benefits.(115)</li> <li>○ Four systematic reviews evaluated workplace interventions. The only high-quality and recent review found evidence to suggest that workplace-based programs have somewhat efficacious in reducing weight, BMI and body fat percentage.(109) A recent medium-quality review found some evidence to suggest that workplace interventions increase physical activity.(90) An older medium-quality review found that the most promising workplace programs for encouraging weight loss are multi-component and target both exercise and dietary habits.(108) Another older and medium-quality review</li> </ul> </li> </ul>
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	<p>similarly found evidence that worksite health promotion programs focused on improving nutrition and physical activity levels create modest reductions in employee weight and BMI.(107)</p> <ul style="list-style-type: none"> <li>• <b>Psychosocial supports (particularly for children and adolescents)</b> <ul style="list-style-type: none"> <li>○ A recent high-quality review found that motivational interviewing can help improve adherence to programs designed to address weight loss and that adherence can be a strong predictor of weight loss outcomes.(116)</li> <li>○ An older medium-quality review found that dietary counselling often produced short-term reductions in BMI, but long-term outcomes were inconsistent.(117)</li> </ul> </li> <li>• <b>Infrastructure programs to support active transportation and recreation</b> <ul style="list-style-type: none"> <li>○ A recent medium-quality review found almost all of the 162 included studies identified a beneficial association between the built environment and levels of physical activity or obesity. However, studies that used objective measures of physical activity such as pedometers were 18% less likely to find a positive outcome.(45) Another recent medium-quality review found that increasing access to recreation and exercise facilities is linked to increased physical activity and metabolic risk factors such as adiposity.(90)</li> <li>○ An older medium-quality review found positive associations between public provision of recreational infrastructure as well as infrastructure for transport (e.g., sidewalks, controlled intersections and public transport) on physical activity. Also, the review found that the number of roads, traffic density and speed, crime and area deprivation were negatively associated with children participating in physical activity.(111)</li> <li>○ One recent but low-quality review found that providing access to safe physical activity environments and sports equipment can help facilitate increases in the activity levels of students.(101)</li> </ul> </li> </ul>
Potential harms	<ul style="list-style-type: none"> <li>• <b>Healthy eating and physical activity programs targeted to where children and adolescents live, learn and play (i.e., both in-school and after-school environments)*</b> <ul style="list-style-type: none"> <li>○ A recent high-quality review suggested that while physical activity interventions directed at entire school populations may be beneficial in terms of ensuring that students are exposed to the program, there is also the potential for stigmatization. For example, requiring unfit students to engage in rigorous physical activity in front of their peers may result in them being subjected to ridicule.(105) The review also suggested that physical activity requirements may result in some doing the exact opposite. Both situations could result in an overall reduction of physical activity rather than an increase. Another harm identified is that making physical activity a requirement and implementing reward systems (e.g., assigning grades) may make physical activity seem more like work (rather than as something intrinsically valued), or require increasingly larger rewards.</li> <li>○ A recent high-quality review of interventions for preventing obesity in children found only eight studies that reported on adverse effects, and none found evidence of adverse outcomes such as unhealthy dieting practices, increased prevalence of underweight or body image sensitivities.(85)</li> </ul> </li> </ul>
Costs and/or cost-effectiveness in relation to the status quo	<ul style="list-style-type: none"> <li>• <b>Healthy eating and physical activity programs targeted to where children and adolescents live, learn and play (i.e., both in-school and after-school environments)*</b> <ul style="list-style-type: none"> <li>○ A recent medium-quality review evaluating physical-activity interventions found that the most cost-effective interventions were those involving point-of-decision prompts such as signs to promote taking the stairs, but these also had the least overall impact on increasing physical activity levels. School-based interventions were also found to be cost-effective and increased physical activity by an average of 16% (as compared to 0.2% for point-of-decision prompts). Individually adapted behaviour change and social support interventions were least cost-effective, but also achieved the greatest effect with physical activity increases of 35-43%.(118)</li> <li>○ A recent medium-quality review searched for cost-effectiveness studies for weight management programs for children under five years of age, but none were identified.(119)</li> </ul> </li> <li>• <b>Community or workplace programs that support healthy eating, physical activity</b></li> </ul>



	<p><b>and breastfeeding</b></p> <ul style="list-style-type: none"> <li>○ An older medium-quality review reported that there are limited studies to suggest that worksite-based weight loss programs result in lower health care costs, increased productivity, or reduced absenteeism.(108)</li> </ul>
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	<ul style="list-style-type: none"> <li>• Uncertainty because no systematic reviews were identified <ul style="list-style-type: none"> <li>○ Not applicable (reviews were found for each option element)</li> </ul> </li> <li>• Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review <ul style="list-style-type: none"> <li>○ Not applicable (no ‘empty’ reviews were found)</li> </ul> </li> <li>• No clear message from studies included in a systematic review <ul style="list-style-type: none"> <li>○ <b>Community or workplace programs that support healthy eating, physical activity and breastfeeding</b> <ul style="list-style-type: none"> <li>▪ A recent and high-quality review found limited evidence to suggest that multi-component community-wide interventions effectively increase population levels of physical activity.(120)</li> </ul> </li> <li>○ <b>Psychosocial supports (particularly for children and adolescents)</b> <ul style="list-style-type: none"> <li>▪ A recent high-quality review suggested that motivational interviewing can be an important component of weight-loss strategies, but its utility independent of other intervention components is not well investigated.(116)</li> </ul> </li> </ul> </li> </ul>
Key elements of the policy option if it was tried elsewhere	<ul style="list-style-type: none"> <li>• <b>Healthy eating and physical activity programs targeted to where children and adolescents live, learn and play (i.e., both in-school and after-school environments)*</b> <ul style="list-style-type: none"> <li>○ A recent high-quality review noted that implementing school-based programs likely requires significant changes to the curriculum to be able to ensure that sufficient time is consistently devoted to the programs.</li> <li>○ A recent medium-quality review found that in addition to using a multidisciplinary approach and incorporating both nutrition education and physical activity promotion, school-based interventions should include mandated activity programs that are supported with teacher training and age-appropriate activities in the curriculum.(121)</li> <li>○ A recent medium-quality review of weight management programs for children under five years of age identified several important characteristics for programs targeting this age group, which include: easy and safe access to the program, implementation in a pre-school that children were already attending, parental involvement, and making programs applicable to all levels of literacy.(119)</li> <li>○ A recent medium-quality review of physical activity interventions for girls noted that programs that include parents and friends in health promotion efforts can be more effective at ensuring commitment.(122)</li> <li>○ A recent medium-quality review of community nutrition interventions for teens found that to maximize effectiveness, school-based interventions should adopt a multidisciplinary approach and incorporate both nutrition education and physical activity promotion.(121)</li> </ul> </li> <li>• <b>Community or workplace programs that support healthy eating, physical activity and breastfeeding</b> <ul style="list-style-type: none"> <li>○ A recent high-quality review of workplace health promotion interventions found that interventions targeting physical activity and dietary behaviour in combination with an environmental component are more effective in reducing body weight than efforts without an environmental component.(109)</li> <li>○ An older medium-quality review of workplace health promotion interventions notes that results are most applicable to a white-collar work-force where both overweight and other chronic disease risk conditions exist.(107)</li> </ul> </li> </ul>
Stakeholders’ views and experience	<ul style="list-style-type: none"> <li>• No reviews identified stakeholders’ views and experiences</li> </ul>

\*Due to the large number of systematic reviews identified as addressing this element, we focused on high-quality reviews and supplemented the findings with other reviews where necessary.

### **Option 3 – Guidelines and policies to enable healthy food and physical activity environments**

The focus of this option is on influencing demand for specific products or activities at the individual, household or community level. This could include strategies to increase demand for healthy foods and physical activity by requiring specific nutritional content on foods, restricting the marketing or sale of specific products, financial interventions or other policies that support the development of healthy environments.

Elements of this option might include:

- improving the provision of nutritional content information at point-of-purchase;
- restricting and reducing food and beverage marketing targeted at children;
- restricting the sale of unhealthy food and beverages where children live, learn and play;
- implementing zoning bylaws and policies that support the development of healthy communities;
- financial incentives (e.g., tax credits or targeted income transfer programs) that focus on increasing healthy food consumption, physical activity and active transport;
- price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport; and
- agricultural subsidies that determine the relative prices of certain commodities used to produce high-energy foods.

A summary of the key findings from the synthesized research evidence is provided in Table 3. For those who want to know more about the systematic reviews contained in Table 3 (or obtain citations for the reviews), a fuller description of the systematic reviews is provided in Appendix 3.

We found 20 systematic reviews addressing one or more of the elements comprising this option. Review findings suggest that there are benefits for four of the option elements: 1) restricting and reducing food and beverage marketing targeted at children; 2) implementing zoning bylaws and policies to support the development of healthy communities; 3) financial incentives; and 4) price measures that affect demand. While no systematic reviews were identified that explicitly examine the effect of food and beverage marketing restrictions, we identified several that examined the impact of marketing more generally on behavioural outcomes. Specifically, one high-quality review (123) found strong evidence that television influences food and beverage preferences, purchase requests, short-term consumption, as well as adiposity, and another high-quality review (124) found strong evidence that food promotion influences children's food purchase-related behaviour. For zoning bylaws, almost all of the 169 studies included in a recent medium-quality review found a beneficial association between the built environment and levels of physical activity or obesity.(45) However, a medium-quality review found similar associations, but highlighted that even where consistent associations are observed between environmental variables and health behaviours, causality is difficult to determine due to the limitations in the available research evidence.(125) Another high-quality review found some evidence to suggest that financial incentives have a positive effect on both food purchasing and weight loss.(126) Three medium-quality reviews that assessed pricing measures found that price increases were significantly associated with lower demand for food and beverages,(127) with the size of the effect being proportional to the change in price,(90) and another similarly concluded that taxes and subsidies influence consumption, with larger taxes eliciting more significant changes in body weight and disease incidence.(128) Note that we found reviews related to the other three elements (improving the provision of nutritional content information at point-of-purchase, restricting the sale of unhealthy food and beverages where children live, learn and play, and agricultural subsidies that determine the relative prices of certain commodities used to produce high-energy foods), but they did not yield clear messages and are not summarized in this paragraph.

Table 3: Summary of key findings from systematic reviews relevant to Option 3 – Guidelines and policies to enable healthy food and physical activity environments

Category of finding	Summary of key findings
Benefits	<ul style="list-style-type: none"> <li> <b>Restricting and reducing food and beverage marketing targeted at children</b> <ul style="list-style-type: none"> <li>No systematic reviews were identified that explicitly examine the effect of food and beverage marketing restrictions. A number of reviews, however, were identified that examine the impact of marketing more generally on several behavioural outcomes, as described below.</li> <li>A high-quality review examined the effect of food and beverage television advertising on the diets and health of children and youth. The review found: 1) strong evidence that television advertising influences the food and beverage preferences, purchase requests, and the short-term consumption of children aged 2 to 11 years, and that exposure to television advertising is associated with adiposity in children aged 2–11 and teens aged 12–18; 2) moderate evidence that television advertising influences the usual dietary intake of children aged 2–5 years and beliefs of children aged 2–11; 3) weak evidence that television advertising influences the usual dietary intake of children aged 6–11 years, and that it does not influence the usual dietary intake of teens aged 12–18; and, 4) insufficient evidence that television advertising influences the food and beverage preferences, purchase requests, short-term consumption, and beliefs of teens aged 12–18.(123)</li> <li>An older high-quality review examined the influence of food promotion on children and found: 1) strong evidence that food promotion influences children's food purchase-related behaviour; 2) reasonably strong evidence that food promotion has an effect on children's food preferences; 3) modest evidence that food promotion has an effect on children's nutritional knowledge; 4) modest evidence that food promotion has an effect on consumption behaviour; and 5) some evidence that food promotion significantly influences children's food behaviour and diet independently of other factors known to influence children's food behaviour and diet.(124)</li> <li>A medium-quality review examined the effect of food promotion on children's food knowledge, preferences and behaviour. The review found strong evidence that exposure to food promotion can influence children's food preferences and children's food purchasing and purchased-related behaviour, and modest evidence that exposure to food promotion can influence nutritional knowledge and food consumption behaviour.(129)</li> <li>A recent low quality review examined the influence of in-store food marketing on food-purchasing behaviours and found that most promotions of child-targeted foods are for sugary foods.(130)</li> </ul> </li> <li> <b>Implementing zoning bylaws and policies that support the development of healthy communities</b> <ul style="list-style-type: none"> <li>A recent medium-quality review found that almost all of the 162 included studies identified a beneficial association between the built environment and levels of physical activity or obesity. However, studies that used objective measures of physical activity such as pedometers were 18% less likely to find a positive outcome.(45) Similarly, an older low-quality review found that policies for community- and street-scale urban design and land use policies promoted physical activity.(131)</li> </ul> </li> <li> <b>Financial incentives (e.g., tax credits or targeted income transfer programs) that focus on increasing healthy food consumption, physical activity and active transport</b> <ul style="list-style-type: none"> <li>A high-quality but older review examined the impact of monetary incentives on the modification of dietary behaviour and found limited evidence suggesting that incentives have a positive effect on both food purchasing patterns and weight loss.(126)</li> </ul> </li> <li> <b>Price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport</b> <ul style="list-style-type: none"> <li>A recent medium-quality review examined the impact of prices on the demand for food and beverages. The review of 160 studies found that higher prices were</li> </ul> </li> </ul>

	<p>significantly associated with lower demand for food and beverages. Price elasticities (i.e., the percentage change in quantity demanded in response to a 1% change in price) for foods and non-alcoholic beverages ranged from -0.3 to -0.8, with food away from home, soft drinks, juice and meats being most responsive to price changes. The studies reviewed, however, did not assess the effects of price changes on substitutions from unhealthy to healthy food choices for many of the key categories (e.g., whole grains).(127)</p> <ul style="list-style-type: none"> <li>○ A recent medium-quality review concludes that taxes and subsidies influence consumption, with larger taxes being associated with more significant changes in consumption, body weight and disease incidence.(128)</li> <li>○ Another recent medium-quality review found that changes in food prices resulted in changes in dietary behaviours and that the size of the effect was proportional to the change in price.(90)</li> <li>○ A recent low-quality review of experimental research conducted in the laboratory and in the field found that price changes (in the form of changes in price, taxes or subsidies) modify purchases of targeted foods, but research on the overall nutritional quality of purchases is mixed because of substitution effects.(96)</li> <li>○ Two recent low-quality reviews found consistent evidence that weight outcomes are responsive to food, restaurant and beverage prices. The effects, however, were generally small in magnitude.(132;133) The reviews also found that there is evidence on the effect of prices of fruits and vegetables on weight outcomes and that the effect is greater in low-SES populations and for those at risk for overweight or obesity.(132;133)</li> <li>○ Another recent low-quality review found some evidence that school-based pricing incentives are effective for altering the consumption of various food items, like increasing fruit and vegetable consumption, in school cafeterias or vending machines in the short and long run.(134)</li> <li>○ An older low-quality review found strong and consistent evidence that manipulating food prices systematically influenced food purchases. Specifically, reducing the prices of healthier food options, including low-fat snack food and fruits and vegetables, was found to consistently increase the purchase of those items in a dose-dependent manner.(135)</li> <li>○ An older low-quality review found no direct evidence of a causal relationship between policy-related economic instruments such as taxes and subsidies and food consumption, including foods high in saturated fats. Indirect evidence, however, suggested that price differences had an effect on food consumption or weight in large-scale community settings.(136)</li> </ul>
Potential harms	<ul style="list-style-type: none"> <li>● <b>Price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport</b> <ul style="list-style-type: none"> <li>○ Although low SES individuals appear to be more responsive to price changes, tax increases may be regressive.</li> <li>○ The taxation of high-energy foods and beverage will reduce weight only if individuals do not substitute to other high-energy foods and high-calorie beverages. However, as pointed out by Andreyeva et al, 2011, reliable estimates of the cross-price elasticities necessary to quantify the extent of possible substitution and the net impact on caloric intake are not available.(137) Additionally, as taxes increase price, which in turn reduce purchasing power, a tax increase that results in diminished purchasing power can affect diet choices in a way that can diminish the effectiveness of tax policies in controlling weight.(132) Consequently, in theory at least, a poorly designed tax measure could lead to increased weight. Careful attention needs to be devoted to defining the scope of foods and beverages to be taxed or subsidized.</li> </ul> </li> </ul>
Costs and/or cost-effectiveness in relation to the status quo	<ul style="list-style-type: none"> <li>● <b>Price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport</b> <ul style="list-style-type: none"> <li>○ Given that the demand for foods and beverages is price-inelastic and that current taxes on foods and beverages constitute only a fraction of total price, nearly all practicable tax increases would generate increased government revenues.</li> </ul> </li> </ul>
Uncertainty regarding benefits and potential	<ul style="list-style-type: none"> <li>● Uncertainty because no systematic reviews were identified <ul style="list-style-type: none"> <li>○ Not applicable (reviews were found for each option element)</li> </ul> </li> </ul>

<p>harms (so monitoring and evaluation could be warranted if the option were pursued)</p>	<ul style="list-style-type: none"> <li>• Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review <ul style="list-style-type: none"> <li>○ Not applicable (no ‘empty’ reviews were found)</li> </ul> </li> <li>• No clear message from studies included in a systematic review <ul style="list-style-type: none"> <li>○ <b>Improving the provision of nutritional content information at point-of-purchase</b> <ul style="list-style-type: none"> <li>▪ Three recent reviews identified evidence related to this element. The first, a medium-quality review, found limited evidence to suggest that labelling and other approaches to providing information (e.g., nutrient fact labels, front-of-pack labels or listing calories or specific nutrients at point-of-purchase) are effective in changing dietary behaviours.(90) Similarly, a low-quality review of experimental research conducted in the laboratory and in the field found too little evidence on whether providing nutritional information along with taxation or subsidies changed dietary habits to make recommendations.(96)</li> <li>▪ Another older low-quality review found that while the reported use of nutrition labels is high, objective measures suggest that actual use during food purchase may be much lower.(138)</li> </ul> </li> <li>○ <b>Restricting the sale of unhealthy food and beverages where children live, learn and play</b> <ul style="list-style-type: none"> <li>▪ A low-quality review examined the effects of restricting access to food and identified only a single cross-country observational study from which reliable conclusions could not be drawn.(135)</li> <li>▪ A recent medium-quality review examined links between obesity and the community food environment (not including restrictions) and found limited and mixed evidence.(139)</li> </ul> </li> <li>○ <b>Implementing zoning bylaws and policies that support the development of healthy communities</b> <ul style="list-style-type: none"> <li>▪ An older medium-quality review examined links between physical environments and physical activity, nutrition and obesity. The review found that there are several urban form characteristics (natural and built environment) that tend to be associated with physical activity, and possibly nutrition-related obesity behaviours. These include: mixed land use and density; footpaths and cycle ways and facilities for physical activity; street connectivity and design; and transport infrastructure and systems linking residential, commercial and business areas. The review highlights that a key limitation in interpreting the available research is that even where there are reasonably consistent associations between environmental variables and health behaviours, the evidence cannot be interpreted as definitively ‘causal’.(125)</li> <li>▪ A high-quality review examined the effectiveness of interventions that aim to promote walking and cycling as an alternative to using cars and found that targeted behaviour change programs can alter the behaviour of motivated subgroups. However, the balance of best available evidence about publicity campaigns, engineering measures and other interventions suggests that they have not been effective.(140)</li> <li>▪ In addition, an older low-quality review concluded there was insufficient evidence to determine whether transportation policy promotes physical activity.(131)</li> </ul> </li> <li>○ <b>Financial incentives (e.g., tax credits or targeted income transfer programs) that focus on increasing healthy food consumption, physical activity and active transport</b> <ul style="list-style-type: none"> <li>▪ A recent low-quality review found no evidence for the use of financial incentives to promote increased physical activity.(132)</li> <li>▪ A high-quality but older review examined the impact of monetary incentives on the modification of dietary behaviour and found that the limited available evidence suggests that incentives have a positive effect on both food purchasing patterns and weight loss. The review, however, concludes that the small number of relevant studies precludes conclusions regarding the optimal characteristics level or form of an incentive to achieve effect (only two of four studies included in the review examined financial incentives).(126)</li> </ul> </li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>▪ A recent medium-quality review found no evidence to be able to evaluate the effectiveness of tax incentives or subsidies on levels of physical activity.(90)</li> <li>○ <b>Price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport</b> <ul style="list-style-type: none"> <li>▪ A recent medium-quality review found evidence to suggest that changes in gasoline prices may contribute to increasing levels of physical activity.(90)</li> <li>▪ A recent low-quality review found mixed evidence on the impact of tax or price changes on foods.(84)</li> </ul> </li> <li>○ <b>Agricultural subsidies that determine the relative prices of certain commodities used to produce high-energy foods</b> <ul style="list-style-type: none"> <li>▪ A recent medium-quality review found, based on evidence from the United States, that agricultural subsidies have limited impact on food prices and population diet. The review did suggest that policies facilitating the product and transportation of healthy foods are more likely to have longer-term effectiveness.(90)</li> </ul> </li> </ul>
Key elements of the policy option if it was tried elsewhere	<ul style="list-style-type: none"> <li>• <b>Improving the provision of nutritional content information at point-of-purchase</b> <ul style="list-style-type: none"> <li>○ An older low-quality review suggested that adding interpretational aids such as verbal descriptors or reference values helps consumers to compare products and put them into a total diet context.(138) The review also suggests that consumers who do look at nutrition labels can understand some terms used, but are confused by certain types of information, especially as the complexity of the task increases.</li> </ul> </li> </ul>
Stakeholders' views and experience	<ul style="list-style-type: none"> <li>• <b>Agricultural subsidies that determine the relative prices of certain commodities used to produce high-energy foods</b> <ul style="list-style-type: none"> <li>○ A recent low-quality systematic review reported results from a Delphi survey, which found that changing agricultural subsidies was rated as having the highest potential impact on obesity, but also the lowest potential in terms of feasibility.(132)</li> </ul> </li> <li>• <b>Price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport</b> <ul style="list-style-type: none"> <li>○ A recent low-quality systematic review reporting results from a Delphi survey found that three-quarters of the panel recommended moving forward with a tax on caloric sweetened beverages. The panel viewed the evidential base for food taxes to be more compelling than the evidence to support a beverage tax, but panel members did not recommend proposing such taxes at this time despite the empirical evidence. Panel members felt there were a number of difficulties with the design and implementation of food taxes that required further research before specific recommendations could be made. In contrast to concerns about food taxes, panel members were uniformly in favour of fruit and vegetable subsidies and felt subsidies should primarily target children and low-income households.(132)</li> </ul> </li> </ul>

### **Additional equity-related observations about the three options**

Many of the reviews about programs and education (options 1 and 2) were focused on children and youth. These reviews often emphasized the importance of ensuring programs and educational materials are developed in ways that are appropriate for specific age groups. In addition, many reviews emphasized the importance of involving parents in interventions for children and youth to not only build their knowledge and skills, but also to ensure consistency between what's being learned at home and at school. Several reviews addressing options 1 and 2 also noted the importance of ensuring programs, services and educational initiatives are culturally appropriate.(100;101;141-144) None of the reviews focused specifically on adults aged 55 and over.

A recent high-quality review of interventions for preventing obesity in children that addressed elements of options 1 and 2 conducted an equity analysis using the PROGRESS acronym (see box 2) and found that very few of the included studies reported outcomes related to any of these variables.(85) Most of the studies that included equity considerations focused on SES and race. The review found evidence to support significant positive outcomes for the more disadvantaged, and there was no evidence to indicate widening of health inequalities as a result of any of the interventions.

We also observed several equity considerations related to the third option. Consumption taxes, by design, are nearly always regressive, meaning that they place a disproportionately heavy financial burden on individuals with low incomes (i.e., low SES). Food and beverage taxes are no exception. This regressivity can be further increased if taxed foods and beverages are disproportionately consumed by low-income individuals. Changes in taxes, however, need not be regressive if individuals with low incomes are more responsive to price changes. To attenuate or even offset the effect of increased taxes on individuals with low income, a portion of food or beverage taxes can be dedicated to, for example, targeted fruits and vegetable subsidies for low-income individuals. A medium-quality review about the built environment also noted observations related to equity. The review highlighted that there is less access to recreational facilities in low-income neighborhoods and minority communities, and those that are available are often of poorer quality.(45) In addition, the results indicated that studies with a focus on children recruited from the community were less likely to find a beneficial relationship between the built environment and levels of physical activity. However, the review also found a beneficial relationship between these variables when studies were focused on children recruited from school settings, indicating that setting and not age group might be the more important variable affecting the relationship. Lastly, another review noted that the composition of local food environments (e.g., the number of fast food restaurants) may be related to neighborhood SES status (but the need for additional research about this was also noted).(90)

## IMPLEMENTATION CONSIDERATIONS

Potential barriers to promoting healthy weights using population-based interventions in Canada can be identified at the level of individuals (e.g., health literacy levels), providers (e.g., lack of coordination and collaboration between providers within and between sectors), organizations (e.g., coordination of consistent educational material between schools and other settings), and system level (e.g., coordinating policies between municipal, provincial and federal governments). A detailed list of potential barriers to implementing the three options is provided in Table 4. We found few empirical studies that helped to identify or establish the importance of these barriers, so we have listed those that were identified in a range of sources (not just empirical studies) and we have not rank ordered them in any way.

Table 4: Potential barriers to implementing the options

Levels	Option 1 – Information and skills building	Option 2 – Programs to support healthy settings	Option 3 – Guidelines and policies to enable healthy food and physical activity environments
<b>Individual</b>	<ul style="list-style-type: none"> <li>• Lack of health literacy that may prevent some individuals from engaging in education and skill-building opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term commitment to programs to sustain behaviour change</li> </ul>	<ul style="list-style-type: none"> <li>• Consumers may substitute more expensive high-energy foods and beverages for others that may not be affected by pricing measures</li> </ul>
<b>Professional/provider</b>	<ul style="list-style-type: none"> <li>• Coordinating the delivery of consistent educational content across providers</li> <li>• Professional cognitions and outcome expectancies</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of collaboration and coordination between providers within and between sectors</li> <li>• Professional cognitions and outcome expectancies</li> </ul>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<b>Organization</b>	<ul style="list-style-type: none"> <li>• Challenges in coordinating consistent educational content between schools and other settings</li> <li>• Lack of a champion or leadership changes in partner organizations</li> <li>• Inability to sustain projects due to short term funding</li> </ul>	<ul style="list-style-type: none"> <li>• Difficulty with integrating programs across organizations in different sectors</li> <li>• Lack of a champion or leadership changes in partner organizations</li> <li>• Inability to sustain projects due to short term funding</li> </ul>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<b>System</b>	<ul style="list-style-type: none"> <li>• Difficulty with ensuring education and skills building activities reach all those who could benefit, including hard-to-reach populations.</li> <li>• Lack of a champion or leadership changes at the macro-level</li> </ul>	<ul style="list-style-type: none"> <li>• Full implementation requires cross-sectoral collaboration (e.g., between education and health sectors)</li> <li>• Lack of a champion or leadership changes at the macro-level</li> </ul>	<ul style="list-style-type: none"> <li>• Challenges in coordinating policies between municipal, provincial and federal governments</li> <li>• Lack of a champion or leadership changes at the macro-level</li> <li>• Resistance from industries that could face reduced revenue as a result of pricing measures on certain products</li> <li>• Ability to enforce new regulations (e.g., food labelling)</li> <li>• Difficulty with restricting advertising and marketing between jurisdictions and in online media</li> <li>• Competing priorities in sectors required to implement some interventions</li> </ul>



The barriers to implementing options can increase in number and magnitude depending on the complexity of the interventions. Integrated population-based approaches to addressing overweight and obesity are inherently complex, and achieving sustained and significant changes likely requires that multiple interventions and strategies be used in combination. The associated difficulties with implementing and sustaining such interventions are affected by the implementation barriers listed above as well as by the number of partners involved, the cost of the intervention, the strength of the relationship among partners, the strategic importance of the intervention to each partner organization, and the level and point of integration of the various partner activities related to overweight and obesity. As outlined in the table above, all three options require sustained leadership support and overall coordination and consensus building among providers and organizations and across sectors. Successful implementation of integrated approaches to addressing overweight and obesity will require that a number of these barriers be addressed. There are some existing initiatives that can serve as models for overcoming many of the likely barriers to a multi-sectoral population-based strategy to promote healthy weights.

For example, Ensemble Prévenons l'Obésité Des Enfants (EPODE) was first launched in 2004 in 10 French pilot communities and has since expanded to more than 500 communities worldwide. It is a large-scale, coordinated, capacity-building approach for communities to implement effective and sustainable strategies to prevent childhood obesity.<sup>(145)</sup> The EPODE model promotes the involvement of multiple stakeholders at a central level (including ministries, health groups, non-government organizations (NGOs) and private partners) and at a local level (political leaders, health professionals, families, teachers, local NGOs and the local business community). EPODE incorporates social marketing, training within communities, changing built environments, and ongoing monitoring and evaluation. Outcome measures, together with process and output indicators at the central, local and individual levels, are also collected.

EPODE has had success in changing physical environments, such as the installation of multisport courts in neighbourhoods, the development of baby exercise facilities, and improvements to the 'walkability' of towns, benefiting all citizens. The initiative has also had success in establishing public-private partnerships to encourage healthy lifestyle choices with up to 84% of resources being private-sector based.<sup>(146)</sup> Qualitative research has revealed that maintaining close communication between national coordination, local coordination, local stakeholders and the population is key for successful planning and development, and that strong governance is important if public-private partnerships are to work. Outcome measures (BMI) have revealed significant reductions in childhood obesity in most participating communities in just two years (2005 to 2007).<sup>(145)</sup>

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## APPENDICES

The following tables provide detailed information about the systematic reviews identified for each option. Each row in a table corresponds to a particular systematic review and the reviews are organized by option element (first column). The focus of the review is described in the second column. Key findings from the review that relate to the option are listed in the third column, while the fourth column records the last year the literature was searched as part of the review.

The fifth column presents a rating of the overall quality of the 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 or to population-level interventions. 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.

The last three columns convey information about the utility of the review in terms of local applicability, applicability concerning prioritized groups, and issue applicability. The third-from-last column notes the proportion of studies that were conducted in Canada, while the second-from-last column comments on the proportion of studies included in the review that deal explicitly with one of the prioritized groups. The last column indicates the review’s issue applicability in terms of the proportion of studies focused on overweight and obesity.

All of the information provided in the appendix tables was taken into account by the evidence brief’s authors in compiling Tables 1-3 in the main text of the brief.

**Appendix 1: Systematic reviews relevant to Option 1 – Information and skills building**

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
Mass media campaigns	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p><b>**</b>This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>Focused national, community, and school-based media and educational campaigns are all effective in increasing knowledge and consumption of healthy foods, with some evidence of reductions in adiposity and other cardiovascular risk factors as well as physical activity.</p> <p>Some studies suggest that campaigns are most effective when they are focused on specific foods, implemented for many years, use multiple modes for communication and education, and, if shorter-term, incorporate other means of more direct communication to or involvement by the public.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
	The effectiveness of specific policies and programs promoting healthy eating in Europe (84)	<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.</p> <p>Nutritional labelling and symbols on</p>	Not reported	3/9	0	Not reported	Not reported

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>packaging both improves consumer awareness and encourages companies to produce healthier products.</p> <p>Low-level taxation of unhealthy foods has little impact on consumer behaviour. but can generate revenue to fund other health initiatives.</p> <p>Product reformulation, through regulation of food standards or voluntary industry measures, is potentially effective for reducing intakes of unhealthy ingredients. (Capacci, 2012)</p>					
	Behavioural interventions for preventing and treating obesity in adults (99)	<p>Programs based on behavioural theories have shown some effectiveness, however their true effectiveness is difficult to discern as their effects are hard to isolate and as there is need for researchers to develop improved psychometrically robust instruments that measure the changes in constructs of the theories that are being used in the interventions.</p> <p>Education-based programs should use trained educators to be maximally effective as well as be complemented by policy and environmental changes.</p> <p>Media is a useful adjunct to any weight loss intervention and must be utilized where ever financially feasible.</p> <p>The setting of delivery for obesity prevention programs for adults has little impact on the effectiveness of the program and there is need for more</p>	2007	2/9	0	0	0

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>programs to be developed in community and worksite settings where obesity can be detected and addressed in a timelier manner than through primary care.</p> <p>Programs should aim to be medium-long term, being implemented for at least 6 months. (Sharma, 2007)</p>					
Targeted educational initiatives about the risks of being overweight or obese and that teach and promote healthy behaviours (e.g., healthy eating, food preparation and physical activity)	The effectiveness of community-based interventions to increase fruit and vegetable consumption (97)	<p>Evidence derived from this review makes a few recommendation for health promotion programs:</p> <ul style="list-style-type: none"> <li>- multi-component programs with multiple contact points with participants are most successful</li> <li>- education should be focused on behavioral change as opposed to information acquisition</li> <li>- education should target specific behaviour changes like increasing intake of fruits and vegetables as opposed to supplying general health information.</li> </ul> <p>Programs based on behavioural change theories are also generally more successful in promoting healthy lifestyle choices. (Ciliska, 2000)</p>	Not reported	7/9	0	9	0
	The effectiveness of web-based interventions for weight loss and maintenance (94)	<p>A critical component of web-based weight-loss programs is their ability to personalize approaches to weight loss through tailored feedback and health information.</p> <p>Higher or more consistent usage of website features may be more associated with weight loss, but evidence is too limited to determine yet what features improve this effect and reduce attrition.</p>	2008	7/11	0	0	18

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		(Neve, 2010)					
	The effectiveness of weight gain prevention interventions for children under 2 years (92)	<p>Evidence presented in this paper supports the potential viability of long-term educational programs which incorporate educational sessions delivered as infrequently as twice per year, as well as child-health monitoring in preventing development of childhood obesity.</p> <p>Educating parents on healthy eating and being active and particularly the importance of reducing time children spend watching television, can also significantly impact children's habits and overall health. (Ciampa, 2010)</p>	2009	6/10	Not reported	12	12
	The effectiveness of computers to deliver education and support strategies for weight loss (87)	<p>This review shows that including computer-based interventions as a supplement to standard weight loss interventions increases weight loss, while the use of computer-based technology alone decreases weight loss.</p> <p>Factors associated with successful weight management include long-term behaviour change and dedicated self-monitoring of weight which can be facilitated by computer based interventions because they incorporate potential advantages such as persistence, anonymity and scalability among others, including the potential to utilize large social networks for support.</p> <p>The potential for computer-based interventions for weight loss is continually improving as technology does, and may offer particular benefit as aspects like</p>	2010	9/11	Not reported	0	11



Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		portability and complexity of ICT interventions is improved. (Reed, 2012)					
	Interactive electronic media interventions for the prevention or treatment of obesity in children and adolescents (98)	<p>Evidence supports the use of interactive internet sites or CD-ROM-based components, whether as adjunct to a program or a programs itself, in reducing BMI. Based on this review, however, it cannot be determined whether the benefits of these programs were due to the computerized aspects of the programs or the interactive approach.</p> <p>Computer-based programs which were multi-component and which integrate parents are more effective than those which do not, however what components have the greatest impact on obesity was not determined. (Nguyen, 2011)</p>	2010	7/10	0	24	24
	The effectiveness of computer-tailored physical activity and nutrition education (91)	<p>Both tailored and non-tailored interventions should be based on a detailed planning process including epidemiological analysis of the most important and best changeable determinants of the target behaviours.</p> <p>In order for educational material to be persuasive, it must communicate sufficiently strong and convincing arguments from a source that is perceived as credible and trustworthy.</p> <p>Computer-tailored physical activity and nutrition education for primary prevention, while not supported as effective by current literature, may be more effective if it is incorporated into other preventive community services, or</p>	2004	6/10	0	1	1

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		can be delivered in an interactive manner such as a web-based application. (Kroeze, 2006)					
	eHealth intervention studies focused on healthy living (102)	<p>Support for “second generation” eHealth intervention efficacy in improving obesity outcomes over and above other intervention components cannot be definitively discerned from the papers included in this review.</p> <p>How to get participants to use the interactive technologies at a high enough frequency over a specified duration to receive an optimal dose of the intervention is an issue in need of attention when developing these types of interventions, and studies show incorporating peer support is an effective way to improve utilization.</p> <p>Participants in programs are generally more open to the use of eHealth intervention as an aspect of a program with face-to-face contact, and are less receptive to those completely missing an in-person component. There is potential to use ICT to facilitate this in-person communication, however, and more research is needed in this area. (Norman, 2007)</p>	2005	5/10	1	11	14
	The effectiveness of tailored health communication (86)	<p>Nutritional interventions yield more positive outcomes than physical activity interventions, even when programs are tailored to individuals.</p> <p>Tailoring focuses on content that is most relevant to an individual and therefore it</p>	2009	4/10	0	2	4

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		can reduce the disadvantages associated with general health information on the internet, including incorrect information or incorrect understanding of information. (Enwald, 2010)					
	General parenting practices for preventing or treating childhood obesity (147)	<p>As general parenting is a more broad concept which has implications in many aspects of parenting, a positive change in general parenting practices can impact on a broad range of specific parenting practices, in turn influencing multiple child-based outcomes.</p> <p>Findings of this study promote an authoritative parenting approach which encourages instrumental competence in children by helping them balance rule-following with autonomous active thinking. This approach is most effective when combined with lifestyle education on healthy behaviours.</p> <p>The effects of general parenting interventions may be limited by the age of the children they are targeted towards and are more likely to be effective for younger children when parents' habits are more easily modified, children are more impressionable and children are more dependent on their parents. (Gerards, 2011)</p>	2010	4/10	1	9	9
	Behavioural interventions for preventing and treating obesity in adults (99)	Programs based on behavioural theories have shown some effectiveness, however their true effectiveness is difficult to discern as their effects are hard to isolate, and there is need for researchers to develop improved psychometrically	2007	2/9	0	0	0

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>robust instruments that measure the changes in constructs of the theories that are being used in the interventions.</p> <p>Education-based programs should use trained educators to be maximally effective as well as be complemented by policy and environmental changes.</p> <p>Media is a useful adjunct to any weight loss intervention and must be utilized where ever financially y feasible.</p> <p>The setting of delivery for obesity prevention programs for adults has little impact on the effectiveness of the program, and there is need for more programs to be developed in community and worksite settings where obesity can be detected and addressed in a timelier manner than through primary care.</p> <p>Programs should aim to be medium-long term, being implemented for at least 6 months. (Sharma, 2007)</p>					
	The effectiveness of weight gain prevention programs for children under 5 years (93)	High-intensity programs which supply repetition of targeted messages through different modes (tailored individual feedback from primary-care giver, group education settings, use of pamphlets and posters in community facilities) and aim to improve parent knowledge, skills and competency, have some impact on the health of children under 5 compared to lower intensity programs. (Campbell, 2007)	2006	3/9	0	9	1
	The effectiveness of nurse-delivered	In the U.K., policy has been crucial in	2005	2/9	0	0	6

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	obesity management in primary care in the U.K. (148)	<p>initiating and supporting health promotion activity and has been the setting for primary care nurses' involvement in obesity management in public health.</p> <p>Nursing practices to address obesity have developed from more general and less effective information sharing to more intensive one-on-one sessions aimed at educating and motivating patients on how to weight manage.</p> <p>Whether interventions should focus on promoting weight loss with caloric restriction or promote a more holistic approach promoting overall health is undetermined, as well as to what degree interventions should be multidisciplinary and what role nurses play in that. Based on these variables there is need for more research in this area before further recommendations can be made for policy and public health. (Brown, 2008)</p>					
	The effectiveness of health education and promotion interventions for preventing weight gain in Hispanic children (100)	<p>Results of this review are in agreement with many other reviews of health promotion programs in suggesting that having a parent component in any childhood intervention is ideal, as children often cannot make decisions regarding their lifestyle and health.</p> <p>Programs which target older age groups are often more successful in influencing health behaviour as these individuals more often understand complex health information and also play a greater role in</p>	2010	2/9	0	9	9

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>shaping their own habits and making decisions about their diet and lifestyle.</p> <p>Cultural norms present one challenge in addressing the obesity epidemic, and many cultures view overweight as a sign of health, wealth and strength, so programs must aim to remain culturally sensitive while addressing this issue. (Branscum, 2011)</p>					
	Interventions to reduce obesity in middle school-age children of ethnic minority (101)	<p>Goal setting is an effective means to improve students' self-efficacy and autonomy in being able to take control over their own health and the decisions they make, and those students who targeted specific goals were found to be more likely to achieve behavior change.</p> <p>Evidence found in this review indicates that programs tailored to target high-risk children or a specific demographic/gender may be more effective in changing health behaviours.</p> <p>Access to safe physical activity environments and sports equipment can help facilitate students in increasing their activity levels.</p> <p>Parents are able to provide more effective support to their children in improving their health when parents and children receive the same educational programs and interventions, therefore school programs may benefit from including a take-home component for parents. (Stevens, 2010)</p>	2008	2/9	0	8	8

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	The effectiveness of web-based interventions in helping achieve and/or maintain a healthy weight (149)	<p>There is evidence to support that frequent engagement with weight loss resources may increase magnitude of weight loss, however these results were not consistent across studies.</p> <p>Studies were inconclusive in determining whether internet-based interventions are more effective in the long term than in-person interventions or self-directed weight-loss goals.</p> <p>Attrition rates present a significant barrier to the effectiveness of internet-based interventions, and strategies to better retain participants should be developed for future programs and studies. (Arem, 2011)</p>	2009	1/10	Not reported	0	9
Building capacity and providing the opportunities and supports consumers need to obtain and use health information effectively	To summarize the literature on nutrition and health literacy to enhance dietetics practitioners' awareness of the importance of health literacy in practice and research (88)	<p>Strong health literacy skills correlate with many nutrition-specific skills such as estimation of portion sizes, understanding of nutrition labels, and seeking of and trust in nutrition information sources.</p> <p>The reading level of most publicly available nutrition information is too difficult for a large portion of the public to understand, and therefore there is a need to better educate dietetics practitioners on the use of readability assessments to enhance the understandability of education materials and the quality of care provided. (Carbone, 2012)</p>	2011	2/9	Not reported	0	0
Food labelling	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce	**This review addressed many of the elements for all three options and only the key findings related to this row are	2011	7/10	21/497	69/497 (mostly children, a	14/497

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	tobacco use.(90)	provided (with key findings about other relevant elements presented separately in each of the three appendix tables)  There is limited evidence to suggest that certain workplace-based interventions can increase physical activity, while worksite food or beverage labelling alone is not effective in changing diets.				few low income)	
	How consumers perceive, understand, like and use nutrition information on food labels (95)	The review found widespread consumer interest in nutrition information on food packages, although this interest varies across situations and products.  The review concluded there was virtually no insight into how labelling information is, or will be, used in a real-world shopping situation, and how it affects, or will affect consumers' dietary patterns.	2006	4/10	0/58	Not reported	0/58
	Consumer use and understanding of nutrition labels, as well as the impact of labelling on dietary habits (89)	Nutrition labels on pre-packaged foods are among the most prominent sources of nutrition information, perceived as a highly credible source of information, and are used by many consumers to guide their selection of food products.  There is a consistent link between the use of nutrition labels and healthier diets, but their use varies considerably across subgroups, with lower use among children, adolescents and older adults who are obese.  There are also challenges in terms of consumer understanding and appropriate use of labelling information.	Not reported (published in 2011)	4/10	9/120	28/120	Not reported
	The effectiveness of specific policies and	Public policies and campaigns to promote	Not reported	3/9	0	Not reported	Not reported



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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	programs promoting healthy eating in Europe (84)	<p>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.</p> <p>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 has little impact on consumer behaviour, but can generate revenue to fund other health initiatives.</p> <p>Product reformulation, through regulation of food standards or voluntary industry measures, is potentially for reducing intakes of unhealthy ingredients. (Capacci, 2012)</p>					

**Appendix 2: Systematic reviews relevant to Option 2 - Programs to support healthy settings**

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
Integrated approaches (i.e., across providers, settings and sectors) for identifying risk factors and early action	Screening and early treatment for reducing morbidity and mortality from overweight and obesity (104)	<p>Counselling-based interventions targeting improvement of diet and exercise were consistently more effective when they incorporated a behavioural component</p> <p>Interventions delivered in individual and group-based environments did not differ significantly in their effectiveness, however the intensity of the program (how often counselling occurs and how structured the health promotion program being delivered is) does impact program outcomes in favour of more intense interventions.</p> <p>Counselling program can be effective on their own and also in combination with pharmacological therapies.</p>	2001	6/9	Not reported	0	128
	Obesity management in adults (103)	<p>Effective weight reduction programs should focus primarily on weight reduction (as opposed to addressing cardiovascular or other factors associated with overweight) and should focus on improving behavior using multi-component interventions lasting at least 6 months</p> <p>Tailored nutrition education may be a promising strategy for improving the diets of adults in both high-risk and normal-risk groups over the long term</p> <p>Multi-component interventions are more effective than single or double component interventions and the most effective</p>	2010	3/10	1	Not reported	Not reported

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		programs incorporate individual sessions, family involvement and problem-solving strategies into multi-component programs that focus on lifestyle changes. (Kirk, 2012)					
Healthy eating and physical activity programs targeted to where children and adolescents live, learn and play (i.e., both in-school and after school environments)	The effectiveness of interventions for preventing obesity in children (85)	<p>All health promotion programs evaluated in this review were in the direction of benefit, and it is therefore safe to conclude that these types of intervention aimed at these age groups are beneficial, even though the amount of benefit is uncertain.</p> <p>This review indicates the need for more quality research in the area of obesity prevention for children and youth, particularly focused on the role of behavioural theories as well as those reporting on the impacts of the environment and setting, and the sustainability of the impacts measured. (Waters, 2011)</p>	2010	11/11	2	55	55
	The effectiveness of school-based interventions in promoting physical activity and fitness in children and adolescents (105)	<p>Evidence Suggests that school-based physical activity interventions may have positive impact on the duration of children's physical activity and the time they spend watching television, as well as being effective in improving overall fitness levels and mean blood cholesterol, but not blood pressure, body mass index (BMI), or pulse rate.</p> <p>As school-based interventions were found to be ineffective at improving childrens' leisure physical activity, but there were no harmful effects identified and there were some benefits, continuation of school-</p>	2007	9/10	0	18	12

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>based physical activity promotion is recommended.</p> <p>A potential limitation of school-based health promotion programs is if they are too focused on the school setting children may not translate what they learn to their home or community, and therefore programs should aim to facilitate families in incorporating more leisure time physical activity into their home lives. (Dobbins, 2009)</p>					
	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p>**This review addressed many of the elements for all three elements, and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in this table and in Appendices 2 and 3)</p> <p>Comprehensive school-based interventions are effective for both diet and physical activity changes.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
	Cost-effectiveness of physical activity interventions (118)	<p>The most cost-effective strategies were for point-of-decision prompts (e.g., signs to prompt stair use), which had tiny effects, adding only 0.2% of minimum recommended physical activity levels.</p> <p>School-based physical-activity interventions targeting children and adolescents ranked well with a median of \$0.42/METhour/day/person, generating an average of 16% of recommended physical activity.</p> <p>There were few interventions in the categories of “creation of enhanced access</p>	2008	4/10	2/91	15/91 (youth) 11/91 (older adults)	1/91

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>to places for physical activity” and “community campaigns,” but several were cost-effective.</p> <p>The least cost-effective categories were the high-intensity “individually adapted behavior change” and “social support” programs, with median cost- effectiveness ratios of \$0.84 and \$1.16 per MET-hour/day/person. However, they also had the largest effect sizes, adding 35%–43% of recommended physical activity, respectively.</p>					
	The effects of interventions to promote walking in individuals and populations (106)	<p>The most successful interventions could increase walking among targeted participants by up to 30-60 minutes a week on average, at least in the short-term.</p> <p>Clear evidence that people can be encouraged to walk more by interventions tailored to their needs, targeted at the most sedentary or at those most motivated to change, and delivered either at the level of the individual or household, or through group-based approaches.</p>	Not reported (published in 2007)	9/11	1/48	Not reported	Not reported
	Identification of effective elements of community nutrition interventions to prevent and/or reduce overweight and obesity in teens (121)	<p>To be maximally effective school-based obesity prevention programs should use a multidisciplinary approach, incorporating both nutrition education and physical activity promotion.</p> <p>Successful programs require mandated activity programs supported with teacher training as well as the development of age-appropriate activities to be incorporated into class curriculums.</p>	2009	4/11	Not reported	63	63

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		In reversing obesity and its complications, programs should incorporate an initial intensive treatment phase, combined with interventions to create supportive environments and focus on inciting both physical activity and nutrition behaviour change through multifaceted approaches. (Ayliffe, 2010)					
	The effectiveness of interventions for preventing of childhood obesity (150)	The most effective health promotion programs are long term and multi-component, incorporating both nutritional and physical activity interventions.  Supportive home and school environments can also have significant impact on the effectiveness of obesity prevention programs. (Bautista-Castano, 2004)	2003	2/9	Not reported	14	14
	The effectiveness and cost-effectiveness of weight management programs for children under 5 years (119)	The results of this review identified a number of characteristics important for programs aiming to prevent obesity in this age group, including: easy and safe access to the program, implementation in a pre-school children were already attending, parental involvement and support at home, the relationship between those delivering the intervention and participants, addressing cognitive and addressing environmental barriers to exercise and dietary change, including making programs applicable to all levels of literacy. (Bond, 2011)	2009	5/9	0	16	16
	The effectiveness of physical activity interventions for young and adolescent girls (122)	Making physical education programs more enjoyable for more girls by increasing choice and offering a variety of	2010	6/10	0	21	0

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>competitive, non-competitive and innovative activities is a high priority in interventions hoping to increase physical activity and improve health.</p> <p>Programs which include parents and, even more importantly, friends in health promotion efforts can be more effective in inciting commitment from individuals and producing positive changes. (Camacho-Minano, 2011)</p>					
	The effectiveness of community-based interventions to increase fruit and vegetable consumption (97)	<p>Evidence derived from this review makes a few recommendation for health promotion programs:</p> <ul style="list-style-type: none"> <li>- multi-component programs with multiple contact points with participants are most successful</li> <li>-education should be focused on behavioural change as opposed to information acquisition</li> <li>- education should target specific behaviour changes like increasing intake of fruits and vegetables as opposed to supplying general health information.</li> </ul> <p>Programs based on behavioural change theories are also generally more successful in promoting healthy lifestyle choices. (Ciliska, 2000)</p>	Not reported	7/9	0	9	0
	The effectiveness of aspects of school-based obesity prevention and treatment interventions (151)	<p>Universally applicable programs are shown to be more effective than those targeted to at-risk groups, but these results may be due to a trend where children already at-risk or overweight respond more slowly or less well to prevention interventions than do children in lower risk populations.</p>	2008	3/11	Not reported	40	40

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>Long-term interventions are more efficacious than short-term ones as they allow for repeated practice as well as adoption of learning intervention curriculum and skills as habits.</p> <p>Interventions which focus on reducing sedentary behaviour were found to be effective while those that incorporate physical activity were less effective in terms of changing BMI, however their benefit may not be effectively communicated using this outcome measure as BMI does not count for fat loss or muscle gain. (Cook-Cottone, 2009)</p>					
	Interventions to reduce adiposity in healthy weighted children (152)	<p>Nutritional education, nutritional skills training and physical education do not significant impact childhood adiposity, but can be beneficial in general health promotion.</p> <p>Mandatory aerobic fitness can reduce childhood adiposity as well as programs that are tailored to best suit each gender. (Connelly, 2007)</p>	2006	6/9	Not reported	28	28
	The effects of interventions for decreasing sedentary behaviours on behaviour change and weight control in children and adolescents (153)	<p>Interventions focused on decreasing sedentary behaviour consistently result in positive health behaviour change such as reduced time watching TV/video, and are associated with modest improvement of weight parameters like BMI.</p> <p>School-based programs aimed at reducing sedentary behaviour appear to produce positive results while worksite and primary care based interventions have not</p>	2004	7/11	Not reported	12	12



Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		shown to produce consistent improvements in participants' health. (De Mattia, 2007)					
	The effectiveness of population-based childhood overweight and obesity prevention interventions (154)	Study outcomes largely differed when analyzed by gender which supports the need for gender-tailored obesity prevention programs. (Doak, 2006)	2005	5/9	Not reported	25	25
	The effectiveness of interventions to prevent obesity in children and adolescents (155)	Evidence supports the use of limited, school-based programs which combine the promotion of healthy dietary habits and physical activity for preventing obesity in children and adolescents.  There is limited analysis of interventions tailored to high-risk groups, and therefore whether such interventions are more beneficial cannot be confirmed and recommendations cannot be made. (Flodmark, 2006)	2004	6/10	0	24	24
	The effectiveness of interventions to prevent obesity and chronic disease in children and adolescents (156)	There is a need for interventions which target children in the 0-5 years age group, including breastfeeding promotion programs, as there is a clear lack of programs for this age group despite it being a critical point of growth where upward crossing of weight centiles is recognized as a risk for obesity.  There is a need for more home-based programs as this is a key area where environmental and socioeconomic factors which play into obesity can be addressed, including the extent of family support and involvement a child receives, as well as their day-to-day habits.  There is need for gender-specific	2003	6/9	Not reported	147	147

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>programs as these groups have different needs, abilities and preferences in terms of diet and physical activity, as well as programs targeted to immigrant groups which may need culture-sensitive programs.</p> <p>Programs which yield positive nutrition outcomes in community settings should combine family, behaviour modification and physical activity interventions with diet and nutrition recommendations.</p> <p>In designing obesity intervention/prevention programs, stakeholders should have involvement in program development, and programs should be developed to allow continual incorporation of new elements associated with greater program effectiveness. (Flynn, 2006)</p>					
	The effectiveness of parent-focused interventions for addressing childhood overweight and obesity (112)	<p>Use of behavioural change techniques in interventions addressing overweight and obesity can enhance both the initial effectiveness and long-term sustainability of behavioural lifestyle interventions.</p> <p>The findings of this review supports use of intervention content which extends beyond information to include cognitive and behavioural strategies like goal setting, barrier identification, and self-monitoring, and especially identified environmental restructuring as a beneficial program component. (Golley, 2011)</p>	2008	7/10	1	17	3
	The effectiveness of school-based programs in the prevention and	The results of this review provide sound evidence to support schools as favourable	2007	4/11	Not reported	19	19

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	management of childhood obesity (157)	settings for obesity prevention in children  Interventions which use both physical activities and classroom curriculum were more effective in reducing childhood obesity, however diet-based interventions of any type must be careful not to promote inappropriate eating patterns. (Gonzalez-Suarez, 2009)					
	The effectiveness of computer- or web-based interventions to increase preadolescent and adolescent physical activity (113)	Computer/web-based physical activity interventions can be effective in increasing physical activity among preadolescents and adolescents, especially if they add parental support, are theory- or model-driven, and/or are individually tailored.  Interventions based in the school, as compared to other venues (e.g. home), have resulted in increased physical activity.  Use of behavioural theory models as a framework should be utilized in the planning/development stages of interventions.  Individual tailoring and interpersonal support, such as from parents, can enhance intervention effectiveness. (Hamel, 2011)	2010	5/10	Not reported	9	0
	Parent engagement to improve childhood dietary habits (158)	School interventions can be effective in improving childhood obesity, however because parents act as nutrition “gatekeepers,” providing their children with ability and opportunity to make healthy food choices, home-based	2008	7/10	0	24	9

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>interventions may be more effective at targeting day-to-day habits.</p> <p>There is a need to better develop a theoretical basis for defining and characterizing “effective food parenting”. (Hingle, 2010)</p>					
	Childhood obesity prevention interventions targeting African-American children (141)	<p>Gender-specific and culturally tailored interventions can lead to behavioural changes, as it allows the material to be tailored to beliefs and associated risk factors</p> <p>Inclusion of parents and family in interventions is important to their efficacy, as parents play a significant role in children’s decisions and behaviour, as well as act as role models who children are likely to model their own behaviour after.</p> <p>Schools are an important venue for delivery of obesity interventions, as a majority of a nation’s youth can be reached, and all children are included regardless of demographics. Therefore environmental and educational programs are likely to be effective if delivered in this environment.</p> <p>Theory-based programs are favourable as they allow for development of measurable program outcomes, help in the design of interventions, provide a framework for effective programming strategies and increase the likelihood of successful replication (Ickes, 2011)</p>	2010	2/9	0	18	18

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	The effectiveness of school-based strategies for obesity prevention and control (159)	<p>Schools present a setting and resource with significant potential in addressing the obesity epidemic.</p> <p>The most efficacious programs were combination interventions (nutrition and PA) with a parent or family component. Therefore programs should be both multi-component and cover multiple settings (home, school etc.).</p> <p>School policies and programs going forward should be informed, but not limited, by the evidence available to date as it is limited, and many emerging patterns are in need of greater investigation before recommendations can be made. (Katz, 2009)</p>	2004	6/11	Not reported	12	0
	The effectiveness of school-based strategies for obesity prevention and control (142)	<p>Program components common in successful interventions include: parent involvement , classroom instruction on improving dietary intake or increasing participatory/hands-on, skill-building student activities, the provision of print materials, teacher training for program implementation, student competitions, improvements to the nutritional environment, implementation of PA programs in addition to routine PE, modifications to duration, frequency or intensity of existing PE, use of non-competitive PA, training in behavioural techniques or coping skills, and program tailoring for cultural relevance. (Katz, 2008)</p>	2004	6/11	Not reported	21	21
	The effectiveness of interventions designed to prevent overweight and	The effectiveness of interventions which aim to increase physical activity can be	2010	5/10	1	30	30

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Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	obesity in pre-adolescent girls (143)	<p>enhanced if they also directly focus efforts on reducing the amount of time spent doing sedentary activities.</p> <p>It is important to include a modification of school food provision component in school-based interventions alongside an education component.</p> <p>Programs should be tailored to be culturally sensitive and culturally relevant, and can also increase effectiveness by taking advantage of peer groups for support and encouragement. (Kesten, 2011)</p>					
	The effectiveness of school-based programs for reducing childhood overweight or obesity (160)	<p>Programs which focus on older age groups, around 10-14 years , may be more effective due to greater control over their own lifestyle and choices, and therefore there may be some merit in targeting these slightly older children as they begin to establish long-term health behaviour patterns.</p> <p>Targeting of a single issue (like soft drinks) can be an appropriate high profile component of acute management of childhood obesity, but may also distract public and financial attention away from other relevant health promotion efforts offering promise of lasting impact on health behaviours and outcomes. (Kropski, 2008)</p>	2005	6/10	1	14	14
	The effectiveness of interventions to promote healthy weight in the general population (161)	Interventions promoting a reduction in TV produced positive results possibly due to reduced inactivity or energy intake derived from eating while watching TV,	2008	6/11	Not reported	37	68

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		and reducing food advertisement exposure.  Life-style education interventions for adults as well as multi-component programs also appear promising , as both indicated positive effects on BMI. (Luckner, 2011)					
	The effectiveness of interventions to prevent obesity in 0-5 year olds (144)	Studies of interventions which focus on changing behaviour show them to be mostly ineffective due to the number of factors involved in behavioural change, of which only a few are targeted by a single intervention.  Evidence seems to support interventions which change potential upstream drivers of obesity (the physical, cultural, economic, social and legislative environments) in addressing the epidemic of childhood overweight and obesity. (Monasta, 2011)	2008	7/9	1	17	17
	The effectiveness and feasibility of interventions to prevent obesity in 0-5 year olds (162)	While the evidence for this review was extremely limited, the evidence did show support for the role of parents and caregivers, even those most at risk of rearing children who will become overweight or obese, in being receptive to intervention programs and in their need for support in making positive changes to their and their children's lifestyles (Hesketh, 2010)	2008	4/9	Not reported	23	23
	The effectiveness of school-based obesity and Type 2 diabetes prevention interventions (163)	Schools are typical sites for learning and therefore children may be more receptive to ideas presented at school and be more willing to participate in planned activities with their peers.	2004	2/9	1	12	21

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		To maximize effectiveness, changing the environment around an education program can facilitate health choices by improving accessibility, and parents should be incorporated to ensure the home environment supports what children are learning in schools. (Ng, 2005)					
	The effectiveness of physical activity interventions for children aged 4–12 years and adolescents aged 13–19 years (164)	<p>School-based environmental changes may be a promising approach as they are likely to be sustainable, require little training and are likely to promote less structured types of physical activity that can be performed any time with little equipment</p> <p>Incorporation of a family or parent component mildly improves program effectiveness as there are many family-related correlates of children's health behavior. (Salmon, 2007)</p>	2006	2/9	Not reported	90	0
	School-based interventions for obesity management (165)	<p>Physical activity has shown to have significant impact on health, however a barrier to physical activity-based and fitness education obesity interventions for students which must be addressed in order to improve their efficacy, is the availability of materials and facilities suitable for the persistence of physical activity in the long term</p> <p>Education-based programs can be dually effective with positive short-term results being the retention of curricula and also subsequent long-term behaviour modification.</p>	2007	1/9	Not reported	51	51



Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		Efficacy of school programs is limited if the school environment and foods available to students are not supportive of healthy choices, and therefore there is a need for policy and environmental changes as well as family inclusion to create a community and home environment which complements in-school programs. (Shaya, 2008)					
	The effectiveness of school-based interventions for preventing obesity in children.(166)	<p>Population-based interventions delivered in schools which aim to address childhood and adolescent obesity prevention should target both physical activity, including reducing sedentary behaviours like television watching, and nutrition behaviours.</p> <p>Programs based on behavioural theories can be more effective than non-theory based approaches, however there is a need to develop appropriate measurement tools to measure the behavioural changes these theories promote.</p> <p>Physical education classes present an optimal area for implementation of more focused obesity prevention programs, however there is need for these programs to be supplemented by changes in both policies and environments to create supportive communities encouraging children eating healthy foods and enjoying regular physical activity. (Sharma, 2007)</p>	2005	1/9	1	21	21
	The effectiveness of obesity prevention programs for children and adolescents (167)	Programs delivered to adolescent rather than other ages are generally more effective in preventing weight gain, as this age group is better able to grasp	2005	5/11	Not reported	64	64

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>intervention material and also yields more control over food and physical activity choices</p> <p>The addition of a parental component to programs was found to enhance program effectiveness as it can help to modify the home environment and facilitate healthy choices to be made outside of school</p> <p>Programs of short duration were found to be more effective than longer term programs, however these effects were likely due to program drop-out from long-term studies. (Stice, 2006)</p>					
	The effectiveness of obesity prevention programs for children and youth (168)	<p>Program effectiveness is difficult to evaluate, especially between interventions as programs often differ in program duration, frequency and intensity, targeted age of participants and level of involvement of students, the school as a community/institution, and parents.</p> <p>Program evaluations which have been completed are difficult to draw sound conclusions from based on methodological limitations like inadequate sample selection, lack of masking of outcome assessors, inappropriate data analysis, and lack of important sub-analyses, as well as issues surrounding how to determine "dosage" for programs.</p> <p>Drawing conclusions and making recommendations based on current program evaluations is difficult due to the question of statistical versus clinical</p>	2003	8/10	2	1	23

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		significance for health promotion programs. (Thomas, 2004)					
	Identification of effective elements of community nutrition interventions to prevent and/or reduce overweight and obesity in teens (121)	<p>To be maximally effective, school-based obesity prevention programs should use a multidisciplinary approach, incorporating both nutrition education and physical activity promotion.</p> <p>Successful programs require mandated activity programs supported with teacher training, as well as the development of age-appropriate activities to be incorporated into class curriculums.</p> <p>In reversing obesity and its complications, programs should incorporate an initial intensive treatment phase, combined with interventions to create supportive environments and focus on inciting both physical activity and nutrition behaviour change through multifaceted approaches. (Ayliffe, 2010)</p>	2009	4/11	Not reported	63	63
	The effectiveness of interventions for preventing childhood obesity (150)	<p>The most effective health promotion programs are long term and multi-component incorporating both nutritional and physical activity interventions.</p> <p>Supportive home and school environments can also have significant impact on the effectiveness of obesity prevention programs. (Bautista-Castano, 2004)</p>	2003	2/9	Not reported	14	14
Community or workplace programs to support healthy eating, physical	The effectiveness of community wide, multi-strategic interventions for increasing physical activity (120)	Multi-strategic, community-wide interventions are inconsistent in their efficacy for increasing community-wide physical activity.	2009	11/11	1	8	1

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
activity and breastfeeding		Community-based programs can be improved if they have a theoretical basis and take into account differences in population demographics such as gender.(Baker, 2011)					
	The effectiveness of community-based primary care interventions in reducing adult obesity in the general population (114)	Interventions combining both diet or healthy eating and exercise should be encouraged, especially in combination with food provision, however this element in not feasible for long-term implementation.  Individual level interventions have only proven to produce modest results and therefore population level interventions and broadly applicable health policy reform options for improvement should be identified and explored in addressing the obesity epidemic. (Thomas, 2008)	2007	7/9	6	360	22
	The effectiveness of interventions for preventing excessive weight gain during pregnancy (115)	Behavioural counselling appears to be the most effective means to improve maternal health and weight while intensive exercise programs and combined diet and exercise programs can also have benefits.  Maintaining a low glycemic index diet can have benefits over a high glycemic index diet for both mothers and newborns, especially when women adopt it alongside increased exercise or physical activity. (Muktabhant, 2012)	2011	10/11	1	0	28
	The effectiveness of internet-based weight loss programs (169)	Internet-based diet programs with e-counselling can have a significant positive effect on weight reduction, and may be an effective alternative to more time-consuming and financially demanding clinical weight-loss programs.	2005	2/9	Not reported	1	8

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		<p>Internet-based programs however are at risk of compromising patient-counsellor communication and are not always preferred by participants over in-person weight loss/maintenance programs.</p> <p>While it can be difficult to implement exercise programs electronically, there is evidence to support the integration of physical activity into online programs for maximizing the benefits of these programs. (Weinstein, 2006)</p>					
	The effectiveness of worksite-based health promotion interventions for controlling employee weight (107)	<p>This review found that there is evidence supporting the use of worksite health promotion programs focused on improving nutrition, physical activity, or for creating modest reductions in employee weight and BMI.</p> <p>The results of this review are most applicable to a white-collar work-force where both overweight and other chronic disease risk conditions exist.</p> <p>Workplace obesity prevention programs can improve employee self-confidence and the relationship between management and labour. As well, they also have the potential to increase a company's profitability through increasing employee productivity and reducing medical care and disability costs. (Anderson, 2009)</p>	2005	6/11	0	0	11
	The effect of workplace health promotion interventions on weight outcomes (109)	Evidence derived from this review suggests that workplace-based programs may have mild efficacy in reducing weight, BMI and body fat percentage.	2009	8/11	1	0	2

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		Studies included in this review indicate that studies targeting physical activity and dietary behaviour, with an environmental component, are more effective in reducing body weight than studies without an environmental component. (Verweij, 2011)					
	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p>**This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables).</p> <p>There is limited evidence to suggest that certain workplace-based interventions can increase physical activity, while worksite food or beverage labelling alone is not affective in changing diets.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
	The effectiveness of worksite-based weight loss programs (108)	<p>An advantage of worksite programs is that they can reach large populations of adults who may not be receiving recommended preventive health services otherwise.</p> <p>The most promising programs for encouraging weight loss are multi-component, targeting both exercise and dietary habits, and may even incorporate environmental or financial interventions which studies suggest may be effective in workplace environments</p> <p>There are limited studies showing that worksite-based weight loss programs result in lower health care costs, increased productivity, or reduced absenteeism,</p>	2006	6/10	0	0	11

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		therefore whether workplace health promotion programs are worth the cost of their implementation has yet to be determined. (Benedict, 2008)					
Psychosocial supports (particularly for children and adolescents)	The effectiveness of motivational interviewing in helping promote weight loss (110)	<p>Motivational interviewing can be a beneficial aspect of weight-loss strategies, but its utility independent of other components is not well investigated.</p> <p>Study outcomes suggest that it may be more effective to focus programs on prioritizing the greatest patient need, whether it is achieving behaviour change or enhancing weight-loss, as attempting both can overburden individuals.</p> <p>Motivational interviewing can improve attendance and commitment to programs which can have positive effects on weight loss, as adherence to interventions can be a strong predictor of weight loss outcomes. (Armstrong, 2011)</p>	2009	10/11	Not reported	0	6
	The effectiveness of dietary counselling (117)	Dietary counselling most often produced a short-term reduction in BMI while participants were on the programs, however the weight reduction did not persist in the long-term. (Dansinger, 2007)	2006	5/11	Not reported	0	46
Infrastructure programs to support active transportation and recreation	Effect of the built environments (e.g., parks, trails, sidewalks) on physical activity or obesity rates.(45)	<p>The systematic review revealed that a high percentage of studies (89.2%) have identified a beneficial relationship between the built environment and physical activity or obesity. However, virtually all articles utilized simple observational study designs not suited for inferring causality.</p> <p>Studies utilizing objective physical activity measures (e.g., pedometer) were 18% less likely to identify a positive outcome.</p>	2011	8/11	Not reported	68/169 (children) 21/169 (elderly) 10/169 (minorities)	45/169

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
		Studies focusing on children in community settings (–14.2%), examining direct measures of obesity (–6.2%), or with an academic first author (–3.4%) were also less likely to find a positive outcome.					
	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p>**This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>Greater access to recreation and exercise spaces and facilities has been linked to greater physical activity and lower adiposity or other metabolic risk factors, but the evidence is mostly cross-sectional.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
	Influence of the physical environment on children's physical activity (111)	<p>Children's participation in physical activity is positively associated with publicly provided recreational infrastructure (access to recreational facilities and schools) and transport infrastructure (presence of sidewalks and controlled intersections, access to destinations and public transportation).</p> <p>Transport infrastructure (number of roads to cross and traffic density/speed) and local conditions (crime, area deprivation) are negatively associated with children's participation in physical activity.</p>	2006	5/10	1/33	33/33	Not reported
	Interventions to reduce obesity in middle school-age children of ethnic	Goal setting is an effective means to improve students' self-efficacy and	2008	2/9	0	8	8



Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
	minority (101)	<p>autonomy in being able to take control over their own health and the decisions they make, and those students who targeted specific goals were found to be more likely to achieve behaviour change.</p> <p>Evidence found in this review indicates that programs tailored to target high-risk children or a specific demographic/gender may be more effective in changing health behaviours.</p> <p>Access to safe physical activity environments and sports equipment can help facilitate students in increasing their activity levels.</p> <p>Parents are able to provide more effective support to their children in improving their health when parents and children receive the same educational programs and interventions, therefore school programs may benefit from including a take-home component for parents. (Stevens, 2010)</p>					

**Appendix 3: Systematic reviews relevant to Option 3 – Guidelines and policies to enable healthy food and physical activity environments**

Option element	Focus of systematic review	Key findings	Year of last search	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Proportion of studies that focused on overweight or obesity
Restricting food and beverage marketing targeted at children	The effect of food and beverage marketing on the diets and health of children and youth (123)	<p>There is strong evidence that television advertising influences the food and beverage preferences of children aged 2–11 years.</p> <p>There is insufficient evidence about its influence on the preferences of teens aged 12–18 years.</p> <p>There is strong evidence that television advertising influences the food and beverage purchase requests of children aged 2–11 years.</p> <p>There is insufficient evidence about its influence on the purchase requests of teens aged 12–18 years.</p> <p>There is moderate evidence that television advertising influences the food and beverage beliefs of children aged 2–11 years. There is insufficient evidence about its influence on the beliefs of teens aged 12–18 years.</p> <p>Review concluded that television advertising influences children to prefer and request high-calorie and low-nutrient foods and beverages.</p> <p>There is strong evidence that television advertising influences the short-term consumption of children aged 2–11 years.</p> <p>There is insufficient evidence about its</p>	2005	8/10	Not reported	65/65	65/65

		<p>influence on the short-term consumption of teens aged 12–18 years.</p> <p>There is moderate evidence that television advertising influences the usual dietary intake of younger children aged 2–5 years, and weak evidence that it influences the usual dietary intake of older children aged 6–11 years. There is also weak evidence that it does <i>not</i> influence the usual dietary intake of teens aged 12–18 years.</p> <p>Statistically, there is strong evidence that exposure to television advertising is associated with adiposity in children aged 2–11 years and teens aged 12–18 years.</p> <p>The association between adiposity and exposure to television advertising remains after taking alternative explanations into account, but the research does not convincingly rule out other possible explanations for the association.</p>					
	Influence of food promotion on children (124)	<p>There is strong evidence that food promotion influences children's food purchase-related behaviour.</p> <p>There is reasonably strong evidence that food promotion has an effect on children's food preferences.</p> <p>There is modest evidence that food promotion has an effect on children's nutritional knowledge.</p> <p>There is modest evidence that food promotion has an effect on consumption behaviour.</p> <p>There is some evidence that food promotion significantly influences children's food behaviour and diet independently of other factors known to influence children's food behaviour and diet.</p>	2003	8/10		101/101 (children)	

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	The effect of food promotion on children's food knowledge, preferences and behaviour (129)	<p>There is strong evidence that exposure to food promotion can influence children's food preferences, food purchasing and purchased-related behaviour.</p> <p>There is modest evidence that exposure to food promotion can influence nutritional knowledge and food consumption behaviour.</p>		6/10			
	The influence of in-store food marketing on food-purchasing behaviors (130)	Most promotions of child- targeted foods are for sugary foods.	2011	1/9	Not reported	Not reported	Not reported
Price measures (including taxes and subsidies) that affect the demand for high-energy foods and beverages, healthy foods, physical activity, and active transport	The effectiveness of monetary incentives in modifying dietary behaviour (126)	<p>Limited evidence suggests that incentives have a positive effect on both food purchasing patterns and weight loss.</p> <p>The evidence in support of sustained positive effects is, however, weaker. (Wall, 2006)</p>	2005	9/11	0	2	0
	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p><b>**</b>This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>Food pricing changes (both lowering the price of healthy food or raising the price of unhealthy food) are effective in changing dietary behaviour, while small taxes are ineffective in reducing consumption of unhealthy foods or other risk factors. (price measures)</p> <p>In some studies, vulnerable populations such as youth and people of lower socioeconomic status appeared to be most sensitive to price changes. (price measures)</p> <p>The effect size of pricing changes is proportional to the price differences. (price measures)</p> <p>Some evidence suggests that changes in</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497

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		gasoline prices could be effective in improving physical activity. (price measures)					
	The impact of prices on the demand for food and beverages (127)	<p>Prices were significantly associated with lower demand for food and beverages.</p> <p>Price elasticities for foods and nonalcoholic beverages ranged from -0.3 to -0.8, with food away from home, soft drinks, juice and meats being most responsive to price changes.</p> <p>The studies reviewed did not assess the effects of price changes on substitutions from unhealthy to healthy food choices for many of the key categories (e.g., whole grains).</p>	2007	4/10	0/160	Not reported	Not reported
	To assess the effect of food taxes and subsidies on diet, body weight and health through a systematic review of the literature (128)	<p>Taxes and subsidies influenced consumption in the desired direction, with larger taxes being associated with more significant changes in consumption, body weight and disease incidence.</p> <p>Studies that focused on a single target food or nutrient may have overestimated the impact of taxes by failing to take into account shifts in consumption to other foods.</p> <p>Food taxes and subsidies have the potential to contribute to healthy consumption patterns at the population level.</p>	Not reported	6/10	Not reported	Not reported	24/24
	The relation between food price changes and food-purchasing patterns (96)	Experimental research conducted in the laboratory and in the field finds that price changes (in the form of changes in price, taxes or subsidies) modify purchases of targeted foods, but research on the overall nutritional quality of purchases is mixed because of substitution effects.	2011	3/9	Not reported	4	0
	Economic policies targeting obesity and its causal behaviours (132)	Subsidizing fruit and vegetables may have a short term impact on children's nutritional consumption, but also may impact their long-term dietary habits,	2009	3/9	Not reported	Not reported	Not reported

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	<p>especially if subsidies are complemented with educational programs which teach families how to easily prepare healthier meals.</p> <p>Taxation of unhealthy food stuffs like sugar-sweetened drinks may impact consumers' food choices, but can also yield benefits through providing a funding source for alternate health promotion programs.</p> <p>Evidence is limited for the use of financial incentives for promoting increased physical activity.</p>					
The effects of food pricing policy on population food consumption patterns (133)	There is evidence on the effect of prices of fruits and vegetables on weight outcomes, and that the effect is greater in low-SES populations and for those at risk for overweight or obesity.	2008	3/9	Not reported	3	9
The effectiveness of specific policies and programs promoting healthy eating in Europe (84)	<p>There is mixed evidence about the effect of taxation of unhealthy foods on consumer behaviour.</p> <p>There is uncertainty about the distributional impacts of tax or price changes.</p>	Not reported	3/9	0	0	0
The effectiveness of economic incentives for improving nutritional behavior in schools (134)	There is evidence that school-based pricing incentives are effective for altering the consumption of various food items, like increasing fruit and vegetable consumption, in school cafeterias or vending machines in the short and long run.	Not reported	3/9	0	30	0
The effectiveness of environmental approaches to reducing population obesity (135)	<p>There is strong and consistent evidence that manipulating food prices systematically influenced food purchases.</p> <p>Reducing the prices of healthier food options, including low-fat snack food and fruits and vegetables, was found to consistently increase the purchase of</p>	2004	1/9	Not reported	2	1

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		those items in a dose-dependent manner.					
	Effectiveness of economic instruments to reduce consumption of foods high in saturated fats and other energy-dense foods for preventing and treating obesity (136)	<p>No direct scientific evidence of a causal relationship between policy-related economic instruments and food consumption, including foods high in saturated fats, was identified.</p> <p>Indirect evidence suggests effects of price differences on food consumption or weight in large-scale community settings, but there are important limitations to the generalizability of their findings.</p>	Not reported	3/10	Not reported	Not reported	Not reported
Agricultural subsidies that determine the relative prices of certain commodities used to produce high-energy foods	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p>**This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>U.S. evidence suggests that agricultural subsidies alone have limited effect on food prices or population diet, however, adopting policies that facilitate production and transportation of healthy foods will have greater long-term effectiveness.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
Implementing zoning bylaws and policies that support the development of healthy communities	<p>Links between physical environments and physical activity, nutrition and obesity (125)</p> <p>*Note this review also contains an overview of reviews.</p>	<p>There are several urban form characteristics (natural and built environment) that tend to be associated with physical activity, and possibly nutrition-related obesity behaviours. These include: mixed land use and density; footpaths and cycle ways and facilities for physical activity; street connectivity and design; transport infrastructure and systems, linking residential, commercial and business areas.</p> <p>A key limitation in interpreting the available research is that even where there are reasonably consistent associations between environmental variables and health behaviours, the evidence cannot be</p>	2005	4/10	Not reported	Not reported	15/15

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		<p>interpreted as definitively 'causal'.</p> <p>There is a lack of research on the types of interventions or built environmental change which will produce the most improvements in health-enhancing physical activity.</p>					
	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p>**This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>Local food environments (i.e. number of fast food restaurants) appear related to neighborhood socioeconomic status in a variety of populations, but effectiveness of interventions has not been studied.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
	The effectiveness of urban design, land use and transport policies and practice to increase physical activity (131)	<p>Community-scale and street-scale urban design and land use policies and practices were found to be effective in promoting physical activity.</p> <p>Evidence was deemed insufficient to assess transportation policy and practices to promote physical activity.</p>	Not reported	3/10	1/12	0/12	0/12
	To assess what interventions are effective in promoting a population shift from using cars towards walking and cycling and to assess the health effects of such interventions (140)	<p>Targeted behaviour change programs can change the behaviour of motivated subgroups, resulting (in the largest study) in a shift of around 5% of all trips at a population level.</p> <p>The balance of best available evidence about publicity campaigns, engineering measures, and other interventions suggests that they have not been effective.</p> <p>Trials of active commuting found short term improvements in certain measures of health and fitness, but there was no good evidence on effects on health of any effective intervention at population level.</p>	2002	9/11	0/22	0/22	0/22
Improving the provision of	The effectiveness of population approaches to improve dietary habits,	**This review addressed many of the elements for all three options and only the	2011	7/10	21/497	69/497 (mostly	14/497



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nutritional content information at point-of-purchase	increase physical activity, and reduce tobacco use.(90)	<p>key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>There is limited evidence that labelling and information approaches, including nutrient facts labels, front-of-pack product labels, or point-of purchase listing of calories or specific nutrients, are effective in changing the dietary behaviours of consumers. Nutritional panels by themselves are not effective.</p>				children, a few low income)	
	Extent to which consumers understand and use nutrition labelling when making point-of-purchase decisions on food selection (138)	<p>The review reveals that reported use of nutrition labels is high, but more objective measures suggest that actual use of nutrition labelling during food purchase may be much lower.</p> <p>Whether or not consumers can understand and use nutrition labelling appears to depend on the purpose of the task (e.g., identifying the amount of a specific nutrient a product contains, assessing what counts as a low or high amount of the nutrient, deciding the overall healthiness of a product, etc.).</p> <p>Evidence suggests that consumers who do look at nutrition labels can understand some terms used, but are confused by certain types of information, especially as the complexity of the task increases.</p> <p>Adding interpretational aids (e.g., verbal descriptors and recommended reference values) helps in product comparison and in putting products into a total diet context.</p>	2002	3/10	Not reported	3/103 (elderly) 1/103 (adolescents) 4/103 (people living on a low income)	Not reported
	The relation between food price changes and food-purchasing patterns (96)	Experimental research conducted in the laboratory and in the field finds too little evidence on whether providing nutritional information along with taxation or subsidies to change dietary habits to make recommendations.	2011	3/9	Not reported	4	0

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Restricting the sale of unhealthy food and beverages where children live, learn and play	The effectiveness of environmental approaches to reducing population obesity (135)	A low quality review examined the effects of restricting access to food and identified only a single cross-country observational study from which reliable conclusions could not be drawn.(42) (Faith, 2007)	2004	1/9	Not reported	2	1
	To examine the relationship between obesity and the community and/or consumer food environment (139)	Research examining obesity and the community or consumer food environment is limited and provides mixed evidence.	2006	4/11	Not yet available	Not yet available	Not yet available
Financial incentives (e.g., tax credits or targeted income transfer programs) that focus on increasing healthy food consumption, physical activity and active transport	Economic policies targeting obesity and its causal behaviours (132)	There is no evidence for the use of financial incentives for promoting increased physical activity.	2009	3/9	Not reported	Not reported	Not reported
	The effectiveness of population approaches to improve dietary habits, increase physical activity, and reduce tobacco use.(90)	<p><b>**</b>This review addressed many of the elements for all three options and only the key findings related to this row are provided (with key findings about other relevant elements presented separately in each of the three appendix tables)</p> <p>Minimal evidence exists to evaluate the effectiveness of tax incentives or subsidies to promote physical activity, though there is strong evidence that taxes on tobacco affect consumption, in particular among youth.</p> <p>Individual financial incentives appear to be effective in improving health behaviors, but gains are lost when the incentives are no longer offered.</p>	2011	7/10	21/497	69/497 (mostly children, a few low income)	14/497
	The effectiveness of monetary incentives in modifying dietary behaviour (126)	A high-quality but older review examined the impact of monetary incentives on the modification of dietary behaviour and found that the limited available evidence suggests that incentives have a positive effect on both food purchasing patterns and weight loss. The review, however, concludes that the small number of	2005	9/11	0	2	0

		relevant studies precludes conclusions regarding the optimal characteristics level or form of an incentive to achieve effect (only two of four studies included in the review examined financial incentives).					
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