Taking Action to Prevent Chronic Disease

Recommendations for a Healthier Ontario

Technical Appendix

Chronic diseases are the leading cause of death in Ontario. These largely preventable diseases diminish our quality of life, economy and communities.

Cancer Care Ontario
Action Cancer Ontario
Public Health Ontario
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This report is a supplementary document to *Taking Action to Prevent Chronic Disease: Recommendations for a Healthier Ontario*. Both publications are available online at *www.cancercare.on.ca/takingaction or www.oahpp.ca/takingaction*.

Public Health Ontario (Ontario Agency for Health Protection and Promotion) is a Crown corporation dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. As a hub organization, Public Health Ontario links public health practitioners, front-line health workers and researchers to the best scientific intelligence and knowledge from around the world.

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Special thanks go to the expert panels on tobacco, alcohol, physical activity, healthy eating and capacity for change. Please see Appendix 2 of the main report for membership.

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Cancer Care Ontario—an Ontario government agency—drives quality and continuous improvement in disease prevention and screening, the delivery of care and the patient experience, for cancer, chronic kidney disease and access to care for key health services.

Known for its innovation and results driven approaches, Cancer Care Ontario leads multi-year system planning, contracts for services with hospitals and providers, develops and deploys information systems, establishes guidelines and standards and tracks performance targets to ensure system-wide improvements in cancer, chronic kidney disease and access to care.

Cancer Care Ontario

Action Cancer Ontario

Contents

1. Introduction

The rise in prevalence of chronic diseases throughout the world is a growing cause for concern in the public health sector. The increasing burden of chronic diseases has negatively impacted quality of life, and contributed to poverty and adverse economic effects.

Chronic diseases are the leading causes of death and disability.[1–3] In 2005, they took the lives of over 35 million people worldwide. This is double the number of people that died from infectious diseases (including HIV/AIDS, malaria and tuberculosis).[4] In 2007, chronic diseases were responsible for 79% of all deaths in Ontario. Worldwide, in 2008, chronic diseases accounted for more deaths than all other causes combined: 63% of the 57 million global deaths.[5]

The burden of chronic disease is a major concern, and prevention of chronic disease is becoming a focus for governments at all levels. Some examples include:

- UN Summit on Non-communicable Disease (NCD) Prevention and Control September 2011[6]
- WHO 2008–2013 Action Plan for the Global Strategy for the Prevention and Control of NCDs[7]
- Lancet NCD Action Group and NCD Alliance[8]
- Chronic Disease Prevention Alliance of Canada: Framework for the Primary Prevention of Chronic Disease[9]
- Preventing and Managing Chronic Disease: Ontario's Framework[10]
- Commission on the Reform of Ontario's Public Services (2012)[11]

To guide action on the primary prevention of chronic disease, Cancer Care Ontario and Public Health Ontario released a report to the Ontario government in March 2012. The report, titled *Taking Action to Prevent Chronic Disease: Recommendations for a Healthier Ontario*, (referred to as the "report"), proposed 22 recommendations for policies and other interventions to address four major risk factors associated with chronic disease: tobacco use, alcohol consumption, physical inactivity and unhealthy eating. In addition, the report provides recommendations for taking a cohesive approach to chronic disease prevention at the system level; reducing inequities in the burden of chronic disease among disadvantaged populations; and addressing barriers to the prevention of chronic disease among First Nations, Inuit and Métis (FNIM) communities.

All of the recommendations presented in the report are based on evidence (in the form of research findings and experiential and/or contextual information). Recommendations are action-oriented and aim to reduce the prevalence of risk factors for chronic disease in Ontario.

This Technical Appendix augments the main report by providing more detailed information concerning the:

- prevalence of the risk factors addressed in the report
- disease and economic burden associated with these risk factors
- relationship between each risk factor and chronic diseases
- approach to the identification and review of the evidence used to generate the report recommendations
- potential impact of the recommendations on inequities in the burden of chronic diseases

It is hoped that the Technical Appendix will serve as a helpful resource, both for understanding the underlying rationale for each of the report recommendations and to support action on the recommendations. If implemented as part of a comprehensive strategy that engages all levels of government and civil society, and also embraces health equity, the recommendations discussed in the Technical Appendix will help to reduce the prevalence of chronic disease, and associated social and economic burdens.

Ontario *can* meet the challenge of chronic disease prevention.

2. Methods

To generate informed recommendations for interventions to prevent or ameliorate the key modifiable risk factors for chronic diseases (and their related determinants), the authors of the report undertook an extensive review of supporting data and evidence. Chapter 2 of the Technical Appendix provides an overview of methodology, specifically the methods used to:

- quantify the disease burden attributable to chronic diseases in Ontario
- identify the prevalence of the key modifiable risk factors for chronic diseases in Ontario
- review the associations between the risk factors and chronic diseases
- identify the economic burden arising from the risk factors in Ontario
- review the body of evidence on policies and other interventions addressing the risk factors
- assess the extent to which the proposed recommendations could potentially impact (positively or negatively) health inequities, and identify potential mitigation strategies for these inequities

2.1 Disease Burden

Mortality estimates were calculated from the Ontario Mortality database using the International Classification of Disease tenth revision (ICD-10) codes recommended by the Association of Public Health Epidemiologists in Ontario (APHEO) and other organizations. Cancer incidence estimates were calculated from the Ontario Cancer Registry; diabetes estimates were drawn from recent publications based on Canadian and Ontario data.

ICD codes for chronic diseases mortality data extraction:

- Cardiovascular disease: ICD–10: I00–I99 (or ICD–9: 390–459) (i.e., all of the "I" block)
- Cancer: ICD–0: C00–D48
- Diabetes: ICD–10:E10–E14 (or ICD–9:250)
- Chronic (lower) respiratory diseases: ICD–10: J40-J47 (or ICD–9: 490–494, 496)

Note: effective with the ICD–10 revision, ICD–9 code 495 [extrinsic allergic alveolitis] is no longer included. This affects data for few, if any, deaths per year in Ontario.

2.2 Risk Factor Prevalence

Overall Risk Factor Prevalence

Indicators for risk factor prevalence: data sources

- *Current smoking (adult), obesity, physical inactivity, inadequate vegetable and fruit consumption:* Statistics Canada, Canadian Community Health Survey (CCHS), 2009–2010 share file (excludes non-response). Retrieved September 21, 2011 from Public Health Agency of Canada's Chronic Disease Infobase web site http://66.240.150.17/cubes/intro-e.html (Note: estimate for current smoking age 20+ calculated separately by PHAC staff as a special request.)
- *Youth smoking:* Youth Smoking Survey (YSS), 2008–09, Supplementary Tables to the Youth Smoking Survey, 2008-09. Retrieved September 15, 2011 from the Youth Smoking Survey web site: http://www.yss.uwaterloo.ca/index.cfm?section=5&page=288.
- *Alcohol consumption:* The CAMH Monitor, 2009. Centre for Addiction and Mental Health, CAMH Monitor eReport: Addiction and Mental Health Indicators among Ontario Adults, 1977–2009 (CAMH Research Document Series No. 31).

Indicators for risk factor prevalence: definitions

- *Current smoking:* the proportion of the population aged 20 years and over who reported being a current smoker (i.e., daily or occasional smokers). CCHS 2009–2010 share file, question SMK_Q202, excludes non-response.

- *Alcohol consumption:* the proportion of the population aged 18 years and over who exceeded the low-risk drinking guidelines recommended by the Centre for Addiction and Mental Health (CAMH) in its 2009 report (i.e., no more than 14 standard drinks per week for men and no more than 9 standard drinks for women OR no more than 2 drinks on any one day).
  - **Note:** These guidelines have now been superseded by Canada's low-risk alcohol drinking guidelines, but were the basis for the CAMH Monitor 2009 prevalence estimate used in this report.
- *Obesity:* the proportion of the population aged 18 years and over with a body mass index (BMI) of 30.0 kg/m^2 or higher, based on self-reported height and weight. CCHS 2009–2010 share file, derived variable HWTDISW, excludes non-response.
- *Physical inactivity:* the proportion of the population aged 12 years and over who are inactive (energy expenditure <1.5 kcal/kg/day) during their leisure time, based on an index of average daily physical activity (measured through energy expenditure) over the past 3 months. CCHS 2009–2010 share file, variable PACDPAI, excludes non-response.
- *Inadequate vegetable and fruit consumption:* the proportion of the population aged 12 years and over who reported eating vegetables and fruits fewer than 5 times per day. CCHS 2009–2010 share file, derived variable FVCGTOT, excludes non-response.

Risk factor equity

Indicator for risk factor prevalence by socio-demographic factors: data sources

- Statistics Canada, Canadian Community Health Survey (CCHS), 2007–2008 master file.

Indicators for risk factor prevalence by socio-demographic factors: definitions

- *Current smoking:* the proportion of the population aged 30 years and over who reported being a current smoker (i.e., daily or occasional smokers).
- *Alcohol consumption:* the proportion of respondents aged 30 years and over who drank more than 30 g (approximately 2 drinks) of alcohol on any day of the week prior to the interview
  - **Note:** pregnant or lactating females, females who did not answer the pregnancy or lactating questions (but not those who said they do not know if they are pregnant), and respondents who did not answer one or more of the required alcohol consumption questions were excluded.
- *Obesity:* the proportion of the population aged 30 years and over with a body mass index (BMI) of 30.0 kg/m^2 or higher, based on self-reported height and weight .
  - **Note:** pregnant or lactating females; females who did not answer the pregnancy or lactating questions (but not those who said they do not know if they are pregnant), respondents less than 3 feet tall or over 7 feet tall, and those with unknown values for height or weight were excluded.
- *Physical inactivity:* the proportion of respondents aged 30 years and over who were inactive (EE≤1.5 kcal/kg/day) in their leisure-time and active transportation in the past 3 months, based on daily estimated energy expenditure (EE) measured in kcal/kg/day. Active transportation is defined as walking or biking to and from work or school.
- *Neighbourhood income quintile:* this indicator divides dissemination areas (DAs) into quintiles according to income per single-person equivalent (IPPE). IPPE is a household size-adjusted measure of income adequacy based on census summary data at the DA level and using person-equivalents implied by the low income cut-offs (LICOs). IPPE was calculated by dividing the total income of the DA (average household income multiplied by the number of households) by the total number of single-person equivalents. Quintiles of the population by neighbourhood IPPE were constructed within each census metropolitan area (CMA),

census agglomeration (CA), or residual area not in any CMA or CA, and then pooled across areas. Income quintiles constructed in this manner take into account differences in housing costs across Canada within each province, including Ontario.

- *Urban/rural residence:* respondents living within any Census Metropolitan Area (CMA) or Census Agglomeration (CA) were considered "urban residents"—and those living outside of any CMA or CA were classified as "rural residents". Thus, the rural population included those who lived in towns and rural municipalities outside the commuting zone of larger urban centres (those with population of 10,000 or more in the commuting zone). All other areas were considered urban.
- *Education:* reflects the highest level of education attained by the respondent. Three categories were used: less than secondary school graduation; secondary school graduation and some post-secondary education; and post-secondary graduation.
- *Immigration:* distinguishes immigrants from the Canadian-born population. Three categories of immigration status were used: Canadian-born; immigrant fewer than 10 years in Canada; and immigrant 10 years or more in Canada.
- *Aboriginal identity:* distinguishes respondents who self-identify as Aboriginal (North American Indian, Métis, or Inuit) from those who do not consider themselves to be Aboriginal, based on the derived variable SDCDABT.

Additional notes on indicators for risk factor prevalence by socio-demographic factors

- The age group for these analyses is 30 years and over, which differs from the age groups used to report risk factor prevalence overall. This is meant to restrict the sample to those who have likely completed their education and reached adult socio-demographic status.
- The alcohol consumption indicator used in the equity analyses differs from the indicator used to report on alcohol consumption in Ontario as a whole. Prevalence estimates of alcohol drinking will differ slightly between the two indicators but can be considered comparable.
- The physical inactivity indicator used in the equity analyses differs from the indicator used to report physical inactivity for Ontario as a whole. The indicator used in the socio-demographic analyses considers physical activity from both leisure time and active transportation rather than leisure time activity only.

2.3 Risk Factor and Disease Associations

A literature review of associations between the selected risk factors and chronic diseases began with known expert panel reviews or monographs (e.g., International Agency for Research on Cancer monographs, United States Surgeon General Reports). Medical subject heading (MeSH) terms were then used to search the PubMed database for systematic reviews published subsequent to the expert reviews. Evidence from large systematic reviews and meta-analyses, high-impact journals and well-known research groups was prioritized for inclusion.

Classifications of the strength of evidence and the language used to describe this were taken directly from the expert panel reviews and vary depending on the reviewing body and/or report. In general, well-established causal relationships are referred to as "sufficient" or "convincing"; possible/probable relationships are referred to as "probable," "limited" or "suggestive"; and so on. For a full description of the rating system applied by each expert panel, please see the reports cited in the references.

2.4 Economic Burden

Estimates of the economic burden of the four risk factors of interest (tobacco use, alcohol consumption, physical inactivity and unhealthy eating) in Ontario were collected through these steps:

1. A systematic search of the published literature from 2006–2011 was conducted by a library information scientist using the following databases: MEDLINE, EMBASE, CINAHL, and EconLit (see Table 1 for search strategies—searches were performed by combining economic and risk factor search terms).

2. Studies were sorted by title and abstract by one reviewer; they were included in the review if they:
   - were an original research paper or systematic review
   - contained estimates of the economic burden for one (or multiple) of the risk factors that was not restricted to a specific disease or outcome (e.g., diabetes)
   - examined an entire population (as opposed to sub-populations such as children, seniors or military veterans)
   - contained estimates for industrialized, Western countries/regions such as Canada, United States, Europe, Australia and New Zealand (estimates for other countries/regions were not included)
3. Estimates were extracted for each risk factor for direct health care costs and indirect costs related to lost productivity.
   - Several studies also included other costs (i.e., law enforcement, research) but these were not included.
   - All studies were prevalence based (as opposed to incidence based).
4. Estimates, which were usually presented as total direct and indirect costs, were converted to cost per capita using population estimates in the year of costing.
   - Direct medical costs varied (sometimes substantially), by study but typically included at least costs incurred from in- and out-patient services and pharmaceuticals.
   - Indirect costs varied slightly but typically included the monetary value associated with lost productivity.
5. Estimates of cost per capita were converted to Canadian dollars in the year of costing using the average currency exchange for that year from Bank of Canada.[12]
6. Estimates of cost per capita in Canadian dollars in the year of costing were inflated to 2011 Canadian dollars using the Bank of Canada inflation calculator, which uses the Statistics Canada Consumer Price Index.[13]
7. Estimates of cost per capita in 2011 Canadian dollars were multiplied by the population of Ontario in 2011 (n= 13,372,996)[14] to obtain an estimated burden for Ontario.

Table 1: Search strategies used for assessing the economic burden of selected chronic disease risk factors by database

Concept/risk factor	MeSH terms	EMTREE terms	CINAHL headings	Econlit
Economic	Economics Costs and Cost Analysis Cost of Illness exp Health Care Costs exp Health Expenditures Economics, Hospital Economics, Medical Economics, Nursing	economic aspect "cost" economics health economics economic evaluation "health care cost" "cost of illness"	(MH "Economics") (MH "Economic Aspects of Illness") (MH "Health Care Costs+") (MH "Costs and Cost Analysis")	N/A
Tobacco use	Smoking exp Tobacco exp Tobacco Use Cessation Tobacco Use Disorder Tobacco Smoke Pollution	exp Smoking Tobacco Smokeless Tobacco Tobacco Dependence/ Smoking Cessation Cigarette Smoke Tobacco Smoke "Smoking and Smoking Related Phenomena"	(MH "Smoking+") (MH "Passive Smoking") (MH "Smoking Cessation") (MH "Tobacco+")	Subject ("Tobacco") Subject ("Smoking")

Table 1: Search strategies used for assessing the economic burden of selected chronic disease risk factors by database (continued)

Concept/risk factor	MeSH terms	EMTREE terms	CINAHL headings	Econlit
Alcohol consumption	Alcohol Drinking exp Alcohol-Related Disorders exp Alcohol-Induced Disorders Alcoholic Intoxication Alcoholism exp Alcoholic Beverages	Drinking Behavior Alcohol Consumption Alcohol Abuse Alcohol Abstinence Alcoholism Alcoholic Intoxication Alcoholic Beverage	(MH "Alcohol Drinking") (MH "Alcohol-Related Disorders+") (MH "Alcoholics") (MH "Alcoholic Beverages")	
Physical inactivity	exp Exercise Physical Exertion Motor Activity Overweight Obesity Body Mass Index Life Style Sedentary Lifestyle Exercise Therapy Weight Loss Physical Fitness	exp Exercise Fitness Physical Activity Motor Activity Obesity Lifestyle Lifestyle Modification Sedentary Lifestyle Body Mass Weight Reduction	(MH "Physical Activity") (MH "Exercise+") (MH "Motor Activity") (MH "Body Weight+") (MH "Physical Fitness+") (MH "Exertion") (MH "Body Mass Index") (MH "Life Style+")	
Unhealthy eating	exp Diet Food Habits Energy Intake Caloric Restriction exp Diet Therapy Nutrition Therapy Nutritional Status Nutritional Physiological Phenomena exp Food Diet Therapy.fs. Overnutrition Eating	exp Diet exp Feeding Behavior exp Dietary Intake Food Intake Energy Consumption exp Food Intake Caloric Restriction exp Diet Therapy exp Nutrition exp Food Overnutrition Eating	(MH "Diet+") (MH "Food Habits") (MH "Food+") (MH "Energy Intake") (MH "Food Intake+") (MH "Nutrition") (MH "Nutritional Status") (MH "Hyperphagia") (MH "Eating")	

2.5 Approach to the Evidence

The evidence clearly demonstrates that the four key risk factors (tobacco use, alcohol consumption, physical inactivity and unhealthy eating) are strongly related to chronic disease and its prevention. More challenging is the central question: What interventions are needed to prevent or ameliorate these risk factors and their determinants?

Criteria to select priority interventions

In the past, prevention efforts primarily attempted to change individual knowledge, attitudes, beliefs and behaviour through such strategies as health education and counselling. More recently, advances in comprehensive tobacco control have emphasized the importance of the broader determinants of health behaviours and the importance of policy-oriented intervention approaches. Building on these perspectives, current preventive approaches increasingly focus on how social, physical and economic environmental factors directly or indirectly influence risk-related decisions.[15]

Policy-level approaches such as those recommended in this report address these environmental influences on health-related behaviours. For example, access to healthy foods and opportunities to participate in physical activity are highly influenced by government policies and legislation.[16] Similarly, children's exposure to second-hand smoke was reduced by legislation prohibiting smoking in motor vehicles in their presence.

The Prevention Working Group (PWG), a joint CCO-PHO committee assembled to oversee the development of the report, reviewed the criteria used by the Lancet NCD Action Group and the NCD Alliance. These groups stated that interventions must meet "rigorous, evidence-based criteria; a substantial effect on health; strong evidence for cost-effectiveness; low cost of implementation; and political and financial feasibility for scale up."[8] The PWG considered the interventions identified by these groups in the Ontario context, and prioritized these and other interventions on the following criteria:

- within Ontario government scope of control (though we recognize that some policy interventions may require collaboration with other levels of government for successful implementation)
- supported by strength of evidence
- reflect level of development of policy interventions in the risk factor domain (for some policy interventions the evidence may be emerging/promising)
- identified in previous reports and expert consensus statements
- limited to four recommendations for each key risk factor domain plus cross-cutting recommendations

The PWG evaluated the impact of the proposed recommendations on health equity with the Health Equity Impact Assessment tool (HEIA)[17] Members of First Nations communities were consulted in the development of the recommendations, and the report provides some suggestions for expanding the engagement process further.

Reviewing the evidence

As was noted previously, the report was developed to provide evidence-informed recommendations to the provincial government for policy-level, population/public health interventions in Ontario. As discussed by Sweet and Moynihan (2007), public health approaches that place evidence within the broader constellation of social, cultural and political factors are optimal guides for effective public and population health policy and programs.[18,19]

Evidence-informed and evidence-based public health makes decisions "on the basis of the best available scientific evidence, using data and information systems systematically, applying program-planning frameworks, engaging the community in decision-making, conducting sound evaluation, and disseminating what is learned."[20]

The PWG recognized the importance of these broader factors and activities, and strove to identify the strongest available evidence in support of the recommended interventions. It adhered, in principle, to established typologies of evidence. It addressed this issue by adopting the CDC Guide to the Continuum of Evidence of Effectiveness, which recognizes three types of evidence: research evidence, contextual evidence, and experiential evidence.[21]

Evidence from systematic reviews, including those conducted by the Cochrane Collaboration, the Task Force on Community Preventive Services (Community Guide), and health-evidence.ca was considered to be highly credible. Other sources of evidence included drawing on other literature reviews,

peer-reviewed literature describing single studies, and grey literature (government or other reports). Thus, the PWG relied largely on existing systematic reviews and other available literature, since the broad scope of the project and limitations on time and resources did not allow the PWG to conduct its own systematic reviews of evidence.

In addition, expert panel members provided informed sources of information and opinion (experiential evidence), which greatly augmented other sources of evidence and contributed to the refinement of recommendations. Finally, initial jurisdictional scans provided important sources of information (contextual evidence). These scans were useful in two ways:

1) providing recommendations related to the report (e.g., the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases)
2) indicating other locations that have implemented similar policy recommendations (e.g., US state laws regarding mandatory physical education in schools)

While the approach drew on the strongest evidence to support recommendations, the PWG also acknowledged that the evidence needed to be relevant to its focus on provincial policy-level interventions to improve population health in Ontario. Research designs traditionally considered to be the strongest for clinical studies, such as randomized control trials, may not always be relevant for studies of public health (or education) policies.[20,22,23]

A greater range of designs and approaches is needed for studies of this type, such as community trials, quasi-experimental designs, and observational studies.[22] In recognition of this perspective on the importance of relevance, a more inclusive approach was adopted concerning evidence and study design to support the recommendations.

For additional information, please refer to the Centers for Disease Control and Prevention (CDC) chart *Continuum of Evidence of Effectiveness* used as a guide to assessing best available research evidence of effectiveness.[21]

2.6 Equity Analysis

To examine how recommendations in this report might unequally impact Ontario sub-populations, PWG undertook an analysis using the Ministry of Health and Long-Term Care (MOHLTC) Health Equity Impact Assessment (HEIA) tool.[17] The HEIA is described by the MOHLTC as "a flexible and practical assessment tool that can be used to identify unintended potential health impacts (positive or negative) of a plan, policy or program on vulnerable or marginalized groups within the general population."[24] Ideally, a HEIA is conducted by those developing policy recommendations; it should be used by decision-makers prior to implementation.

The information needed to apply the HEIA was acquired through semi-structured qualitative interviews based on the HEIA tool with one or two risk factor leads for each of tobacco use, alcohol consumption, physical inactivity and unhealthy eating, and one lead for the overarching recommendations (five interviews total). The purpose of these interviews was to determine:

- which Ontario sub-populations might be impacted unequally (either positively or negatively) by the hypothetical implementation of each recommendation
- how potential negative impacts (i.e., impacts resulting in increased inequities) may be mitigated
- where these impacts and mitigation strategies have been documented in the published literature

Extensive literature searches were also performed in PubMed, Google Scholar and Google to compile published and grey literature that assessed the unequal impact of similar policy recommendations and potential mitigation strategies. Results were summarized by theme and entered into a modified HEIA table under the headings "underlying premises" (results from the key informant interviews) and "evidence" (results from the literature).

3. Risk Factor and Disease Prevalence

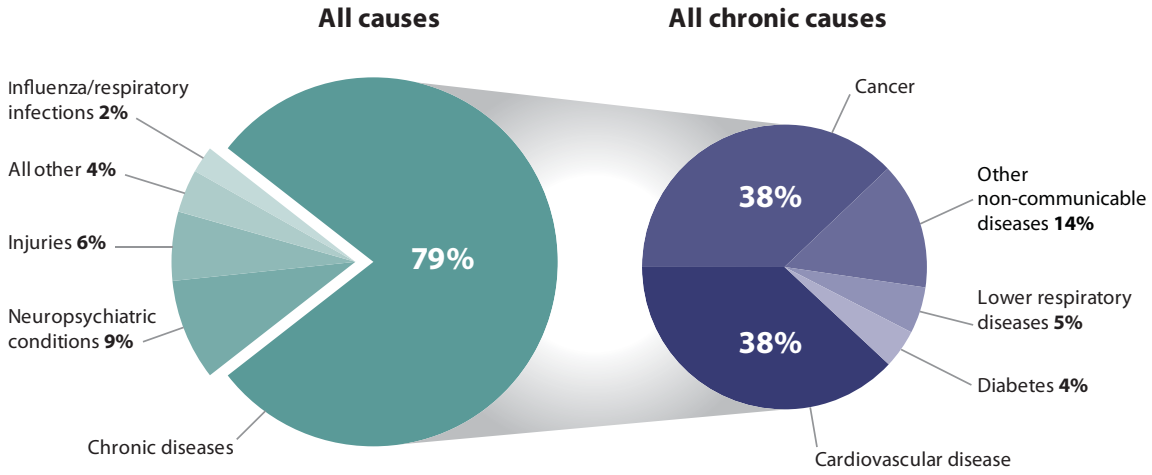
The rising burden of chronic diseases in Ontario presents a formidable societal challenge. To illustrate the magnitude of this challenge, which provided the impetus for the generation of the report recommendations, Chapter 3 provides an overview of the human burden of chronic diseases in Ontario. This section also summarizes data on the prevalence of the key modifiable risk factors addressed in the report and describes the inequitable distribution of these risk factors within the Ontario population.

3.1 Burden of Disease

According to the World Health Organization, 63% of the 57 million global deaths in 2008 were due to chronic diseases, mainly cardiovascular disease, cancer, chronic respiratory disease and diabetes.[5] Chronic diseases are also an important cause of illness and death in Ontario. The number of Ontarians dying from these diseases grew 19% from 49,529 in 1984 to an estimated 58,800 in 2012.[25] In 2007, cancer and cardiovascular disease alone accounted for 76% of all chronic disease deaths (Figure 1).

Chronic diseases will continue to be responsible for a large proportion of deaths in Ontario in the years to come. Figure 2 demonstrates that the number of deaths due to chronic diseases remains high following a period of increase, largely due to population aging and growth. Ontario's population is projected to continue aging and growing, reaching 16.9 million in 2031, when there will be nearly 25% aged 65 and over.[26]

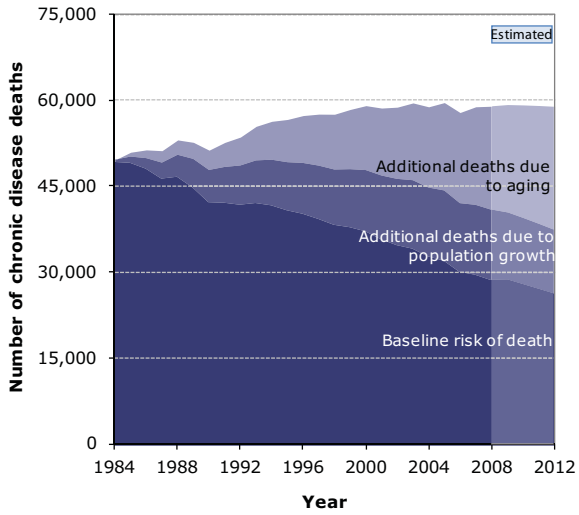
Figure 1: Cause of death, Ontario residents, 2007



Data source: Death, Ontario Ministry of Health and Long-Term Care, IntelliHealth ONTARIO Date data last refreshed Oct, 2011.

Note: ICD10 categories adopted from: Word Health Organization. Global burden of disease in 2002: data sources, methods and results (revised February 2004) [Internet]. Geneva: World Health Organization; 2004 [cited 2011 Sep 12]. Available from: http://www.who.int/healthinfo/paper54.pdf

Figure 2: Growth in chronic disease deaths in Ontario, 1984–2012



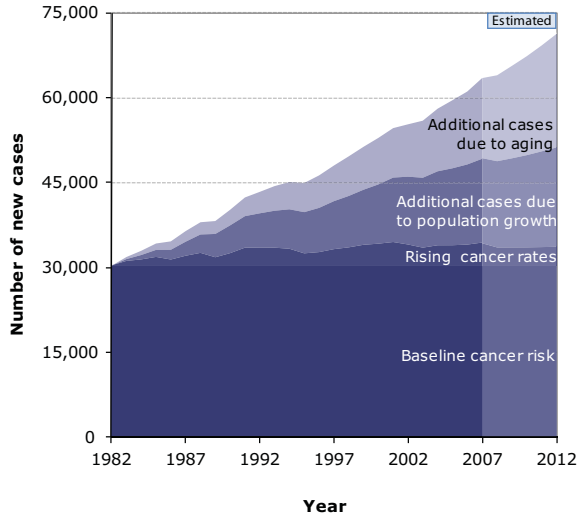
Data source: Cancer Care Ontario (Ontario Cancer Registry, 2011)

Note: Disease groups defined according to International Classification of Diseases, Tenth Revision (ICD-10), codes I00-I99 (cardiovascular), C00-D48 (cancer), J40-J47 (chronic lower respiratory), and E10-E14 (diabetes).

Through a number of efforts, the baseline risk of dying from chronic diseases has decreased overall (Figure 2). However, the impact of chronic diseases on the health of Ontarians continues to increase; this is particularly apparent when examining the number of new (incident) and existing (prevalent) cases. A large rise in new cases of cancer has been observed since the early 1980s, with the slight increase in risk dwarfed by the number of new cases attributable to population growth and aging (Figure 3). Diabetes prevalence in Ontario rose 69% from 1995 to 2005,[27] and it has been estimated that an additional 777,000 cases will be diagnosed by 2017.[28] It is more difficult to estimate the burden of cardiovascular and chronic respiratory diseases in Ontario because incidence and prevalence data are not collected in a dedicated registry or database such as the Ontario Cancer Registry or Ontario Diabetes Database.

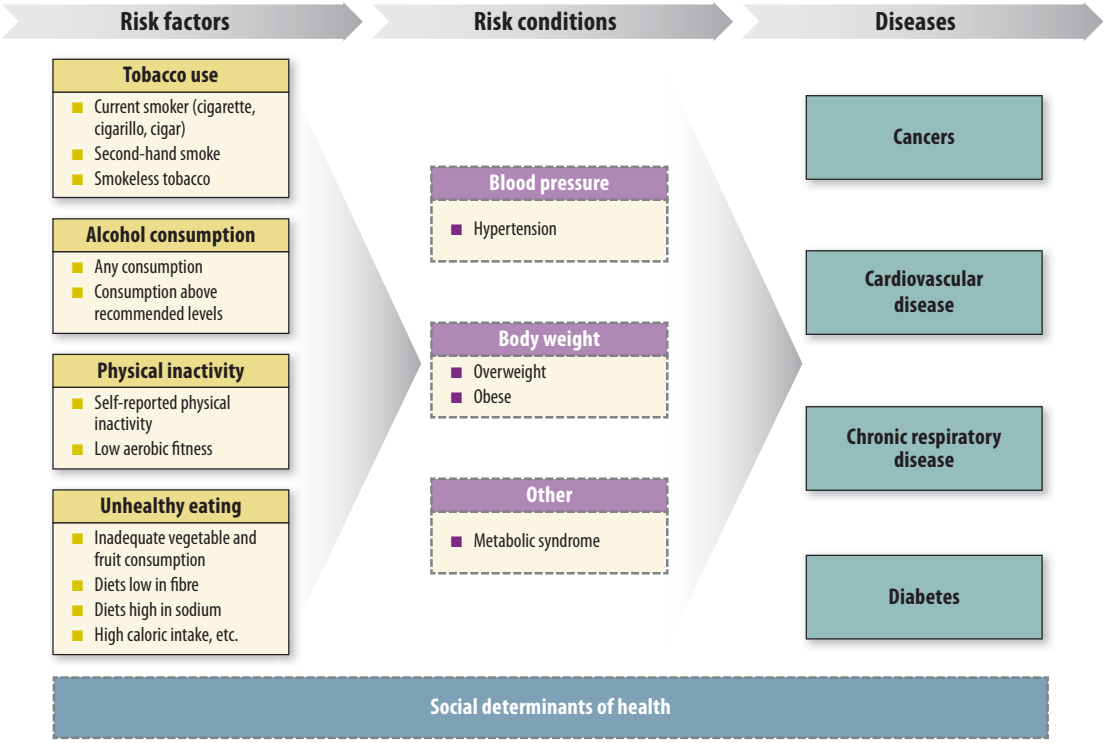
A substantial proportion of new cases and deaths from chronic diseases in Ontario could be prevented through primary prevention efforts aimed at reducing the prevalence of four key risk factors; namely, tobacco use, alcohol consumption, physical inactivity and unhealthy eating. Figure 4 summarizes the causal association between these risk factors and selected chronic diseases.

Figure 3: Growth in new cases of cancer in Ontario, 1982–2012



Data source: Cancer Care Ontario (Ontario Cancer Registry, 2010)

Figure 4: Causal links between selected risk factors and chronic diseases



Adapted from: Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. Lancet. 2010 Nov 20;376(9754):1775–84.

The 2012 report, *Seven more years: The impact of smoking, alcohol, diet, physical activity and stress on health and life expectancy in Ontario* examines the burden of these risk factors on overall and health adjusted life expectancy . It demonstrates that Ontarians can gain a significant number of years of life and life lived in good health if unhealthy behaviours are addressed.[29]

3.2 Prevalence of Risk Factors

Tobacco use, alcohol consumption, physical inactivity and unhealthy eating are causally associated with many chronic diseases, particularly cancer, cardiovascular disease, chronic respiratory disease and diabetes. (See Table 2 for the prevalence of selected modifiable risk factors in Ontario).

Tobacco use: Smoking rates in adults aged 12 or older declined significantly between 2003 and 2010 (Figure 5), continuing a decade long trend in smoking rates in Ontario.[30] However, one in five (20.3%) Ontario adults aged 20 or older continues to smoke, and over one in ten (11.9%) youth in grades 10 to 12 are current daily or occasional smokers (Table 2). Furthermore, 27.8% of high-school-age youth have low confidence in their ability to remain smoke-free in the future.[31] An additional 6% of non-smoking Ontarians aged 12 or older are exposed to second-hand smoke in their homes, and 8% of adult workers are exposed to second-hand smoke at work.[32]

Alcohol consumption: Approximately one in five (21.7%) Ontario adults aged 18 or older drinks more alcohol than recommended in the low-risk drinking guidelines (Table 2) (i.e., more than 2 standard drinks on a given day, or more than 14 drinks per week for men or 9 drinks per week for women).[30] This figure has remained essentially unchanged in recent years (Figure 5). The percentage of daily drinkers and the average number of drinks per day among those who drank alcohol in the past year, however, increased between 1996 and 2009.[30] Among Ontario youth (grades 7, 9, 10 and 12), 65.3% report ever drinking alcohol and 26.9% report consuming five or more drinks on a single occasion in the last month.[33]

Physical inactivity and unhealthy eating: Half (49.2%) of Ontarians aged 12 or older report being inactive during their leisure time (Table 2), and more than half have inadequate vegetable and fruit consumption. This has been the case for several years (Figure 5). The actual proportion of inactive individuals is probably much higher than suggested by these leisure-time self-reports, and may show a trend not represented by self-reported data.[34] Although eating at least five servings of vegetables and fruit a day is a good marker of overall diet quality,[35] less than half (42.6%) of Ontarians report eating vegetables and fruit at least five times a day (Table 2). These factors independently increase an individual's risk of chronic disease. They also contribute to the prevalence of obesity, a risk condition for chronic disease (See Figure 4).

Overweight and obesity: The proportion of obese adults has increased for at least two decades[36] and continues to rise (Figure 5). An estimated 18.2% of Ontarians aged 18 or older are obese, based on self-reported height and weight (Table 2). Actual proportions could be higher, as it has been shown that self-reported data underestimate the prevalence of obesity by about 8 percentage points. The impact on future chronic disease is compounded by the substantial incidence of overweight and obesity in children and youth.[37]

Table 2: Percentage of Ontarians with select modifiable risk factors

Risk factor	Year(s)	Age group	Percentage (95% CI)
Current smoking (adults)*	2009-2010	20+	20.3 (19.6–21.1)
Current smoking (youth)†	2008-2009	Grades 10–12	11.9 (10.9–12.9)
Alcohol consumption > low risk guidelines‡	2009	18+	21.7 (19.5–24.0)
Physical inactivity*	2009-2010	12+	49.2 (48.4–50.0)
Obesity*	2009-2010	18+	18.2 (17.5–18.9)
Inadequate vegetable and fruit consumption*	2009-2010	12+	57.4 (56.5–58.3)

Data sources

* Statistics Canada, Canadian Community Health Survey (CCHS), 2009-2010 share file

† Youth Smoking Survey (YSS), 2008-09

‡ Centre for Addiction and Mental Health (CAMH) Monitor, 2009

CI = confidence interval

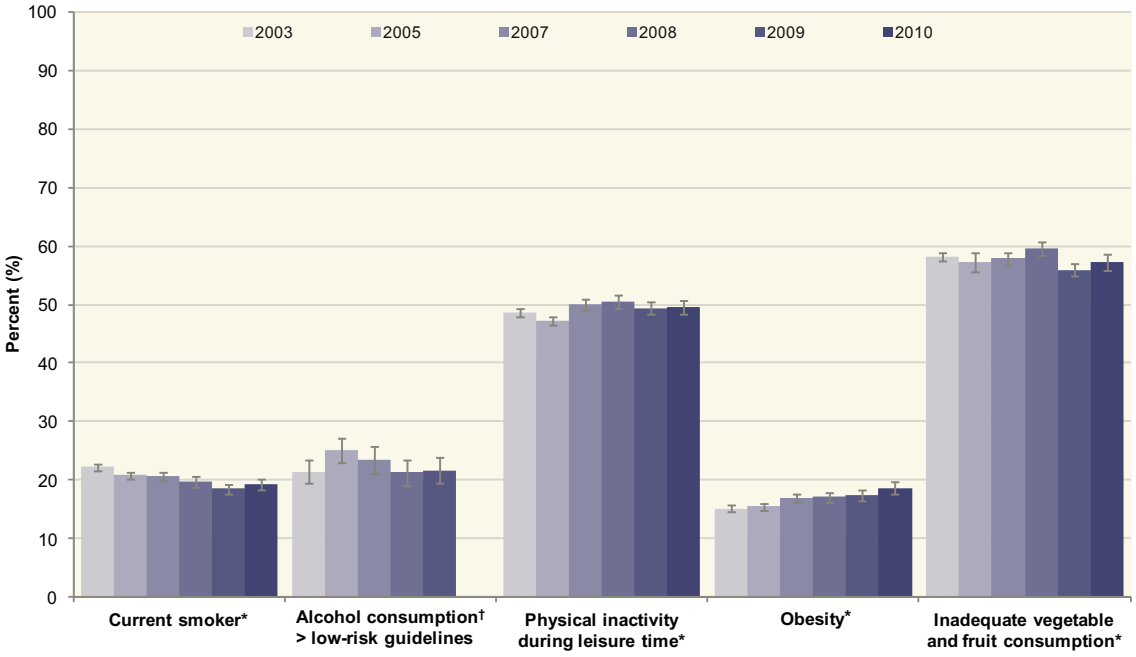
3.3 Risk Factor Equity

The prevalence of chronic disease risk factors is not distributed evenly in Ontario (Table 3). Several sub-populations experience particularly high rates of tobacco use, alcohol consumption in excess of recommended levels, physical inactivity and unhealthy eating (approximated by obesity in the absence of analyses on unhealthy eating). In Ontario adults aged 30 or older, alcohol intake above 2 drinks per day is more common among those who self-identify as off-reserve Aboriginal (31.7%) compared to the non-Aboriginal population (23.4%). It is also more common among those who are Canadian-born (26.6%) compared to immigrants (regardless of the time since immigration), living in rural areas (26.1%) compared to urban areas (23.3%), and post-secondary school graduates (23.8%) compared to those with less than a secondary school education (20.6%).

The proportion of individuals that report being inactive during leisure time or transportation is substantially higher among those who immigrated to Canada less than ten years ago (66.2%) compared to those who are Canadian born (49.2%). Inactivity is also higher among those with less than a secondary school education (66.3%) compared to those with some post-secondary (55.9%) or post-secondary education (48.5%). Those who self-identify as off-reserve Aboriginal report less inactivity (46.6%) than non-Aboriginal Ontarians (53.0%). Obesity is more common among individuals who identify as Aboriginal (30.6%), live in rural areas (24.0%), have less than secondary education (23.5%), live in the poorest neighbourhoods (21.3%) and are Canadian-born (20.9%).

The percentage of current smokers among those who self-identify as off-reserve Aboriginal (41.5%) is more than double the percentage among the non-Aboriginal population (19.5%). It is also significantly higher in the poorest neighbourhoods (25.4%) compared to the richest neighbourhoods (15.0%). A gradient in current smoking prevalence by the amount of time an individual has lived in Canada is apparent; Canadian-born adults have the highest percentage of current smokers (23.1%) compared to immigrants who have been in Canada for 10 years or more (15.2%) or fewer than 10 years (11.0%). Current smoking is also significantly higher among those with less than a secondary school education (23.6%) compared to post-secondary school graduates (17.3%), and those who live in rural areas (23.6%) compared to urban areas (19.5%).

Figure 5: Percentage of Ontarians with selected modifiable risk factors, recent trends, 2003–2010



Data sources

* Canadian Community Health Survey. Statistics Canada. Health trends. Statistics Canada Catalogue No. 82-213 XWE. Ottawa. Released October 25, 2011. See http://www12.statcan.gc.ca/health-sante/82-213/index.cfm?Lang=ENG. (Accessed December 22, 2011).

† Ialomiteanu, A.R., Adlaf, E.M., Mann, R.E. & Rehm, J. (2011). CAMH Monitor eReport: Addiction and Mental Health Indicators Among Ontario Adults, 1977–2009 (CAMH Research Document Series No. 31). Toronto: Centre for Addiction and Mental Health. Available from: http://www.camh.net/Research/camh_monitor.html.

Note: Ages 12+ (current smoker, physical inactivity, inadequate vegetable and fruit consumption) or 18+ (alcohol consumption, obesity).

Table 3: Percentage of Ontario adults (aged 30+ years) with selected modifiable risk factors, by socio-demographic factors, 2007–2008

Socio-demographic indicator	Category	Current smoker (%)	Alcohol > 2 drinks any day (%)	Inactive (%)	Obese (%)
Aboriginal identity (off-reserve)	Aboriginal identity	**41.5**	**31.7**	46.6	**30.6**
	Non-Aboriginal identity*	19.5	23.4	53.0	18.2
Immigration	<10 years in Canada	**11.0**	**15.1†**	**66.2**	**8.5†**
	>10 years in Canada	**15.2**	**15.9**	**59.3**	**15.3**
	Canadian born*	23.1	26.6	49.0	20.9
Neighbourhood income quintile	Poorest neighbourhood	**25.4**	22.7	**61.1**	**21.3**
	Richest neighbourhood*	15.0	25.5	47.5	16.4
Education	Less than secondary	**23.6**	**20.6**	**66.3**	**23.5**
	Some post-secondary	**25.2**	24.6	**55.9**	**20.1**
	Post-secondary graduate*	17.3	23.8	48.5	16.8
Urban/rural residence	Rural	**23.6**	**26.1**	50.8	**24.0**
	Urban*	19.5	23.3	53.4	17.9

Data source

Statistics Canada, Canadian Community Health Survey (CCHS), 2007-2008 master file

Bold text indicates estimate is significantly different from the reference (95% confidence intervals do not overlap).

* Reference category

† Interpret with caution due to high variance (coefficient of variation between 16.6 and 33.3).

Table 4: Causal links between selected modifiable risk factors and chronic diseases

Select specific diseases	Tobacco use			Alcohol	Physical inactivity		Unhealthy eating			
	Current smoker	Second-hand smoke	Smokeless	Alcohol consumption	Physical inactivity	Obesity	Inadequate vegetable and fruit	Diets low in fibre	High sodium	Trans fat
Cancer										
Breast	↑			⬆	↑	⬆				
Lung	⬆	⬆					↑			
Colon and rectum	⬆			⬆	⬆	⬆		⬆		
Leukemia	⬆									
Bladder	⬆									
Body of uterus	⬇				↑					
Kidney	⬆					⬆				
Oral cavity, pharynx	⬆	↑	⬆	⬆			↑			
Cardiovascular disease										
IHD	⬆	⬆	↑	⇧	⬆	⬆	⬆	↑	⬆	⬆
Stroke	⬆	↑	↑	⇧						
Chronic respiratory disease										
Asthma										
COPD	⬆	↑								
Diabetes										
Type 2 diabetes	↑			⇧	⬆	⬆		↑		

Notes: IHD = ischemic heart disease; COPD = chronic obstructive pulmonary disease; ⬆ = convincing increased risk; ↑ = probable increased risk; ⬇ = convincing decreased risk; ↓ = probable decreased risk; ⇧ = convincing J- or U shaped risk; ⇧ probable J- or U-shaped risk.

Table 4 was assembled using expert evaluations performed by the World Health Organization, International Agency for Research on Cancer, United States Surgeon General and World Cancer Research Fund. This table includes only a selection of risk factors and the most common diseases associated with these risk factors. Directional arrows were included if the strength of evidence for the causal association between the risk factor and disease was rated as 'probable' or stronger by the expert panel. Unhealthy eating indicators were evaluated by the World Health Organization for cardiovascular disease as a whole; a distinction was not made between IHD and stroke..

4. Risk Factor and Disease Associations

Tobacco use, alcohol consumption, physical inactivity and unhealthy eating are causally associated with several chronic diseases, particularly cancer, cardiovascular disease, chronic respiratory disease and diabetes. Chapter 4 summarizes the causal links between key risk factors and chronic diseases (Table 4, opposite page), and provides a detailed description of each disease-risk factor association. The latter was generated through a review of the evidence including expert panel assessments.

4.1 Tobacco Use

Tobacco use and cancer

Expert panel assessment

Active cigarette smoking

- Tobacco smoking is the largest cause of cancer worldwide. First demonstrated to be a convincing cause of lung cancer in the 1950s, tobacco smoke is now recognized as a multi-organ carcinogen. The International Agency for Research on Cancer's (IARC) most recent assessment of the carcinogenicity of tobacco smoke concluded that there is convincing evidence that tobacco smoke causes cancers of the oral cavity and pharynx, nasopharynx, nasal cavity and paranasal sinuses, esophagus, stomach, colon and rectum, liver, pancreas, larynx, lung, uterine cervix, ovary, kidney, urinary bladder and other urinary (incl. ureter), and bone marrow (myeloid leukemia). Tobacco smoking is inversely related to endometrial cancer risk.[38]
- Limited evidence also suggests a causal association between active tobacco smoking and female breast cancer. The IARC review as well as the 2004 US Surgeon General's report[39] concluded that there was limited or insufficient evidence to establish a causal association between tobacco smoking and breast cancer; however, two recent expert panel reviews, including one led by a Canadian expert panel, have concluded that there is sufficient evidence to establish causality between tobacco smoking and both pre- and post-menopausal breast cancer.[40,41]

Table 5: Summary of selected expert panel assessments of tobacco use and cancer

Specific indicator	Cancer site	Direction of association	Strength of evidence
Active smoking	Oral cavity and pharynx	↑	Convincing
	Nasopharynx, nasal cavity and paranasal sinuses	↑	Convincing
	Esophagus	↑	Convincing
	Stomach	↑	Convincing
	Colon and rectum	↑	Convincing
	Liver	↑	Convincing
	Pancreas	↑	Convincing
	Larynx	↑	Convincing
	Lung	↑	Convincing
	Uterine cervix[a]	↑	Convincing
	Ovary (mucinous)	↑	Convincing
	Kidney, bladder and other urinary[b]	↑	Convincing
	Bone marrow (myeloid leukemia	↑	Convincing
	Endometrium	↓	Convincing
	Female breast	↑	Probable
Second-hand smoke	Lung	↑	Convincing
	Larynx	↑	Probable
	Pharynx	↑	Probable
Smokeless Tobacco	Oral cavity	↑	Convincing

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk.

a. Tobacco acts as a co-factor with human papillomavirus (HPV) infection.
b. Tobacco is a cause of cancer of the body and pelvis of the kidney; other urinary includes ureter.

Second-hand smoke exposure

There is convincing evidence that second-hand smoke (also known as involuntary or passive smoking or environmental tobacco smoke) causes lung cancer.[38]

- Limited evidence also suggests an association between second-hand smoke and cancers of the larynx and pharynx.[38]
- Several meta-analyses have demonstrated a 20–40% increased risk of lung cancer among non-smokers exposed to second-hand smoke at home (i.e., from a spouse) or work.[42–44]
- Evidence of a dose response exists for both duration and intensity of exposure to second-hand tobacco smoke.
- Evidence from a recent pooled analysis of head and neck cancers, demonstrates increased risk in response to long duration of exposure to both second-hand smoke at home and work, particularly for laryngeal and pharyngeal cancer.[45]

Use of smokeless tobacco products

- Smokeless tobacco products are ingested through oral or nasal passages. They have been used in several parts of the world for centuries, and have seen a rise in popularity in Europe and North America in the past few decades, especially in men under 40 years of age.[46]
- IARC's most recent assessment of tobacco use concluded that there is now sufficient evidence that smokeless tobacco (e.g., chewing tobacco, snuff, snus, etc.) causes cancer of the oral cavity, esophagus and pancreas.[38]
- Recent meta-analyses have reported that smokeless tobacco increases the risk of oral cancer by approximately 35–80%,[47,48] after adjusting for tobacco smoking. Smokeless tobacco-related oral cancers generally appear to occur more frequently in areas directly in contact with tobacco, including the gums and buccal mucosa.[49]

Nature and magnitude of the association

Active cigarette smoking

- Tobacco smoking is most strongly related to cancers of the respiratory tract, particularly the lung and the larynx, and cancers of the upper digestive tract. A recent meta-analysis reported that current smokers have an approximately 7 times greater risk of laryngeal cancer and a 9 times greater risk of lung cancer than never-smokers;[50] although some studies have estimated lung cancer risk among smokers to be as much as 20 times greater than lifetime never-smokers.[44] Increased risk for cancers of the upper digestive tract (e.g., oral cavity, pharynx and esophagus) associated with tobacco smoke is approximately 3.6 times greater among current smokers.[50] Tobacco smoking has also recently been shown to modestly increase the risk of colorectal cancer by 15–20%.[47,51,52]
- For most cancer sites, evidence demonstrates a strong dose-response relationship with cancer risk increasing with both intensity (i.e., number of cigarettes smoked per day) and duration of smoking.[44] For lung cancer, duration of smoking has been shown to be a stronger determinant of cancer risk than the intensity of smoking.
- Quitting smoking reduces the risk of developing tobacco-related cancers, relative to those who continue to smoke. Cancer risk generally decreases both with increasing time since cessation and with decreasing age at cessation. For some cancers like lung and laryngeal, risk declines rapidly following cessation,[44] while for other cancers such as esophageal cancer,[53] risk reductions are not seen until many years after cessation.

Notable interactions

Active cigarette smoking

- Tobacco smoking and alcohol consumption interact to influence the risk of some cancers, particularly those of the mouth, pharynx, larynx and esophagus.[44,54] Evidence suggests a synergistic and multiplicative relationship of smoking and alcohol consumption, whereby the risk of developing these cancers is greatly increased when both risk factors are present compared to when only one or the other is present.

- An interaction between tobacco smoking and infectious agents is also likely. A recent meta-analysis concluded that tobacco smoke seems to interact with both hepatitis B and C infection to influence the risk of liver cancer.[55] For cervical cancer, tobacco smoke acts as a co-factor with human papillomavirus (HPV) infection.[44]
- Potential gene interactions with tobacco smoke that influence susceptibility to tobacco-related cancers remain largely unclear. The strongest evidence of an interaction is for a variant of the N-acetyltransferase gene (NAT2) in bladder and breast cancer risk, and for the GTSM1 gene variant alone or in combination with the CYP1A1 variant in lung cancer.[38]

Biological mechanisms

Active cigarette smoking

- Tobacco smoke contains more than 170 toxic substances, including over 60 known carcinogens such as polycyclic aromatic hydrocarbons (PAHs), N-nitrosamines, aromatic amines and formaldehyde. When ingested (either directly through tobacco smoke or indirectly by dissolving in saliva), there are several mechanisms through which tobacco smoke may induce cancer:[56]
  - Tobacco carcinogens can form DNA adducts (i.e., carcinogenic molecules that form covalent bonds with DNA), which can lead to DNA damage.
  - Nicotine and tobacco-specific nitrosamines (e.g., 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)) may activate signal transduction pathways and allow damaged epithelial cells, which would normally die, to survive.
  - Co-carcinogens and tumour promoters present in tobacco smoke can lead to promoter methylation of key tumour suppressor genes (e.g., P16 in lung cancer), interfering with the control mechanisms that regulate normal cell growth.

Use of smokeless tobacco products

- Smokeless tobacco may induce cancer through tobacco-specific nitrosamines such as N′-nitrosonornicotine (NNN) and NNK, which are considered "carcinogenic to humans." Once taken up by smokeless tobacco users these may form DNA adducts and/or interfere with signal transduction pathways.[44]

Tobacco use and cardiovascular diseases

Table 6: Summary of selected expert panel assessments of tobacco use and cardiovascular diseases

Specific indicator	Cancer site	Direction of association	Strength of evidence
Active cigarette smoking	Coronary heart disease	↑	Sufficient
	Cerebrovascular disease	↑	Sufficient
Second hand smoke	Coronary heart disease	↑	Sufficient
	Cerebrovascular disease	↑	Suggestive
Smokeless tobacco	Fatal myocardial infarction	↑	—
	Stroke	↑	—
Cigars and cigarillos	Coronary heart disease	↑	Sufficient

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessment and nature of association

Active cigarette smoking

- The health effects of cigarette smoking were first evaluated by the United States Surgeon General in a report published in 1967. A conclusion of this report was that evidence "strongly suggests" cigarette smoking can cause death from cardiovascular disease. In 2004, this relationship was reaffirmed, and conclusions of "sufficient evidence" were cited for coronary heart disease, cerebrovascular disease (all types of stroke), atherosclerosis and other cardiovascular diseases.[39]

Second-hand smoke exposure

- In the Surgeon General's 2006 report on second-hand smoke, it was determined that there was "sufficient" evidence to infer a causal relationship for increased risks of coronary heart disease morbidity and "suggestive but not sufficient" for increased risk of stroke.[42] The United States Institute of Medicine supported these findings.[57]
- The Surgeon General's report also suggested there is "suggestive but not sufficient evidence" for a relationship between second-hand smoke and other cardiovascular diseases such as atherosclerosis.[42]

Use of smokeless tobacco products, and cigar and cigarillo smoking

- An expert panel assessment of the strength of the evidence related to smokeless tobacco use and cardiovascular disease was not available. Authors of a recent systematic review concluded that "an association was detected between use of smokeless tobacco products and risk of fatal myocardial infarction and stroke."[46]
- In 1998, the United States National Cancer Institute determined that there was "sufficient evidence" of a causal relationship between regular cigar consumption and risk of coronary heart disease. Further, they stated that it was probably reasonable to assume that most of the diseases caused by the inhalation of tobacco smoke from cigarettes could also be attributed to the inhalation of tobacco smoke from cigars.[58]

Specific types of exposures and magnitude of effect

Active cigarette smoking

- The dose-response relationship between active cigarette smoking and cardiovascular disease has been described as non-linear, with a sharp increase at low levels of exposure and a shallower dose-response relationship as the number of cigarettes smoked per day increases.[56] The risk of cardiovascular disease may decline following smoking cessation, particularly in the first two years.[59]
- The type of cigarette smoked has little influence on disease risk.[39] Changes in cigarette design including filtered, low-tar, and "light" variations do not have a significant impact on disease risk.[56]
- One review found the relative risk of acute myocardial infarction in current smokers to be 2.87 (95% CI=2.58–3.19) compared to never-smokers, though smoking may increase the risk of stroke by three- to fourfold.[60]

Second-hand smoke exposure

- Though the US Institute of Medicine acknowledged difficulties determining the precise magnitude of increased risk,[57] a meta-analysis of 10 cohort studies found that non-smokers exposed to second-hand smoke had a relative risk of coronary heart disease of 1.25 (95% CI=1.17–1.32) compared to non-smokers not exposed to second-hand smoke. In addition, it found a significant dose-response relationship based on level of exposure.[61]

Use of smokeless tobacco products

- A meta-analysis of eight studies, mainly in men, found the relative risk of myocardial infarction was 1.13 (95% CI=1.06–1.21) compared to non-smoking non-users. The relative risk of fatal stroke, on the basis of five risk estimates, was 1.40 (95% CI=1.28–1.54).[46]

Cigar and cigarillo smoking

- Cigar smoke is made up of the same toxic and carcinogenic components as cigarette smoke. Cigars also have more tobacco per unit, which means they take longer to burn and produce more smoke per unit. In animal models, cigar smoke may be more detrimental to health than cigarette smoking. The same effect does not appear in observational studies in humans, which may be due to differences in patterns of use, including lower frequency of exposure and decreased inhalation.[58]
- Studies of cigar smoking and coronary events have found slightly elevated rates, especially among those who smoke heavily or inhale. For example, the National Cancer Institute reported findings from the Cancer Prevention Study (CSP-I) indicating an increase in risk of coronary heart disease overall (RR=1.05; 95% CI=1.00–1.11) with highest rates among those smoking five or more cigars per day (RR=1.14; 95% CI=1.03–1.24).[58]

Biological mechanisms

- Many biological mechanisms have been proposed to explain the risk associated between tobacco exposure and cardiovascular disease including endothelial injury and dysfunction; chronic inflammation; changes in blood lipid profile (i.e., increases in triglycerides and a decrease in high–density lipoprotein cholesterol); and insulin resistance, which can accelerate macro-vascular and micro-vascular complications.[58]

Notable interactions

- The impact of second-hand smoke exposure may be particularly detrimental for cardiovascular outcomes in children due to their developing physiological systems.[56]
- There is some suggestion in the literature that women who smoke are at a higher risk of cardiovascular disease than men, particularly for cerebrovascular outcomes. Evidence is conflicting, and in the past has been attributed to a potential synergistic effect of smoking and oral contraceptive use.[39]

Tobacco use and chronic respiratory diseases

Table 7: Summary of selected expert panel assessments of tobacco use and chronic respiratory diseases

Specific indicator	Disease	Direction of association	Strength of evidence
Active cigarette smoking	COPD	↑	Sufficient
Second-hand smoke	COPD	↑	Suggestive
Smokeless tobacco	COPD	↔	—
Cigar and cigarillo	COPD	↑	—
Active cigarette smoking	Asthma	↔	Inadequate

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

Active cigarette smoking

- The 2004 United States Surgeon General's report on the health consequences of smoking states that evidence is "sufficient" to infer a causal relationship between active cigarette smoking and chronic obstructive pulmonary disease (COPD) morbidity and mortality.[39]
- Evidence is "inadequate" to infer the presence or absence of a causal relationship between cigarette smoking and physician-diagnosed asthma in childhood, adolescence or adulthood.[39] However, evidence is "sufficient" to infer a causal relationship between active cigarette smoking, asthma-related symptoms, poor asthma control and other respiratory effects.[39]

Second-hand smoke exposure

- The 2006 United States Surgeon General's report on the health consequences of involuntary exposure to tobacco smoke states that evidence is "suggestive but not sufficient" to infer a causal relationship between second-hand smoke exposure and COPD or adult-onset asthma.[39]

Use of smokeless tobacco products or cigars and cigarillos

- The Surgeon General's reports did not directly rate the level of evidence related to use of smokeless tobacco products, or cigars and cigarillos.

Specific types of exposures and magnitude of risk

Active cigarette smoking

- Active cigarette smoking is the single most important causal factor for COPD, and strong evidence indicates that there is no risk-free level of tobacco exposure for developing COPD.[62] The changing design of tobacco products over time, including the introduction of filtered, low-tar and "light" products, has not reduced disease risk. The risk and severity of many adverse health outcomes are directly related to the duration and level of exposure.[56]
- There is evidence that smoking cessation may slow the progression of COPD at all stages of disease.[63]

- A few studies have found that individuals with asthma are more likely to smoke than individuals without asthma, but a causal relationship has not been established.[64] For example, in a study of adults in Norway, a slight increased risk of asthma was found with a greater number of pack years of smoking compared to non-smokers (OR=1.03; 95% CI=1.03–1.04).[65]

Second-hand smoke exposure

- The relationship between second-hand smoke, COPD and asthma is not well understood. Some observational studies show an association with both, but consensus has not been reached.[66,67]

Use of smokeless tobacco products

- It is unlikely that smokeless tobacco products impact the development of chronic respiratory diseases.

Cigar and cigarillo smoking

- A study of 17,774 men revealed an increase of COPD among cigar smokers (RR=1.45, 95% CI=1.10–1.91), compared to non-smokers.[68]

Biological mechanisms

- Exposure to tobacco impacts the inception of chronic respiratory diseases through DNA damage, oxidative stress and, perhaps most importantly, chronic inflammation of the lung.[56]

Notable interactions

- There is some evidence that exposure to second-hand smoke during childhood may cause a disproportionate risk of respiratory disease.[67]

Tobacco use and diabetes

Table 8: Summary of selected expert panel assessments of tobacco use and diabetes

Specific indicator	Disease	Direction of association	Strength of evidence
Active cigarette smoking	Type 2 diabetes	↑	—

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

- The causal relationship between tobacco and type 2 diabetes was not evaluated for strength of evidence in the 2004 United States Surgeon General's Report or other major expert panel assessments on the health effects of tobacco.[56]
- Upon finding consistent results across 25 studies, authors of a meta-analysis concluded that "the relevant question should no longer be whether this association exists, but rather whether this established association is causal."[69]
- Cigarette smoking appears to increase the risk of type 2 diabetes. This may occur through direct metabolic effects, or together with other metabolically unfavourable risk factors.[56] For example, smoking is associated with larger upper body fat distribution, which is a marker of insulin resistance and raised plasma glucose concentrations.[70]
- Smoking also impacts diabetes management. Cigarette smoking in patients with diabetes is associated with decreased metabolic control and risk of cardiovascular complications and death.[56]

Specific types of exposures and magnitude of risk

- The impact of exposure to second-hand smoke, cigars and cigarillos, or smokeless tobacco has not been extensively evaluated in relation to risk of type 2 diabetes. Limited available evidence suggests there is no association between smokeless tobacco use and onset of type 2 diabetes.

- A large meta-analysis found evidence of an increased risk of type 2 diabetes among cigarette smokers in 24 out of 25 included studies, although not all were statistically significant. Compared to non-smokers, active smokers had adjusted relative risks ranging from 0.82–3.74, and a pooled relative risk of 1.44 (95% CI=1.31–1.58).[69]

Biological mechanisms

- Potential causal mechanisms include impaired insulin sensitivity, impaired beta-cell functioning, lipotoxicity due to increased triglyceride levels, and elevated sympathetic activation.[70]

4.2 Alcohol Consumption

Alcohol consumption and cancer

Table 9: Summary of selected expert panel assessments of alcohol consumption and cancer

Specific indicator	Disease	Direction of association	Strength of evidence
Alcohol consumption	Oral cavity and pharynx	↑	Convincing
	Larynx	↑	Convincing
	Esophagus[a]	↑	Convincing
	Colon and rectum[b]	↑	Convincing
	Breast (pre- and post-menopausal)	↑	Convincing
	Liver[c]	↑	Probable

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

a. Association is primarily restricted to squamous cell carcinoma. The association, if any, with adenocarcinoma is weak.

b. Association appears stronger in men than women but evidence regarding effect modification by sex is inconsistent. WCRF/AICR has classified evidence for women as "probable"

c. Cirrhosis is an essential precursor of liver cancer caused by alcohol. IARC has graded alcohol as a class 1 carcinogen for liver cancer.

Expert panel assessment

- Alcoholic beverages have been classified by the IARC as "carcinogenic to humans" (Group 1).[71] Recent expert panel reviews have concluded that alcoholic drinks are a convincing cause of cancers of the mouth, pharynx, larynx, esophagus, colon and rectum, and female breast.[38,72] IARC has also declared alcoholic beverages to be a cause of liver cancer,[71] while a recent review by the World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR)[72] classified the evidence for this association as "probable." The WCRF/AICR review acknowledged that alcohol is causally related to cirrhosis of the liver, which is an essential precursor of liver cancer, but an association between alcohol and liver cancer is difficult to quantity since cirrhosis often leads to a reduction of alcohol drinking.

Nature and magnitude of the association

- Overall, no clear "safe limit" of alcohol intake to prevent an increased risk of cancer has been shown in the literature. However, because of the potential benefits of alcohol consumption on coronary heart disease, recommendations for cancer prevention include limiting alcohol intake to no more than 1 drink per day for women and no more than 2 drinks per day for men.[72]
  - Meta-analyses have estimated that people who drink alcohol at a level in line with these recommendations (25 g/day or approximately 2 drinks) have a 75–85% (RR= 1.75–1.85) increased risk of cancers of the oral cavity and pharynx, a roughly 40% (RR=1.4) increased risk of laryngeal cancer, a 40–50% (RR=1.4–1.5) increased risk of esophageal cancer, a 25–30% (RR=1.25–1.3) increased risk of breast cancer, and a 5–9% (RR=1.05–1.09) greater risk of colon and rectal cancer, compared to non-drinkers.[73,74] Cancer risk increases substantially for alcohol intakes equivalent to four or more drinks per day.[75–80]

- A dose-response relationship exists between alcohol consumption and cancer risk such that risk increases with higher intakes of alcohol. For most cancers, this increase in risk is continuous and is apparent at even low levels of alcohol intake. For example, each 10 g/day (<1 drink) increase in alcohol (ethanol) consumption is associated with a 29% increase in oral cavity and pharyngeal cancer risk[80] and a 7–10% increase in female breast cancer risk.[72,77,81] For colorectal cancer, however, a dose-response is evident for intakes above 30 g/day of alcohol (approximately 2 drinks).[82]

- Increased risk exists regardless of the type of alcoholic drink consumed, suggesting that the risk is due to ethanol, which has also been classified by IARC as "carcinogenic to humans."[71]

- The effects of duration and cessation of the consumption of alcoholic beverages and the lifetime period of exposure on cancer risk remain relatively uncertain.

Notable interactions

- For some cancers, particularly those of the oral cavity, pharynx, larynx and esophagus,[54,71] there is an interaction between alcohol consumption and smoking tobacco. Evidence suggests a synergistic and multiplicative relationship of alcohol consumption and smoking, whereby the risk of developing these cancers is greatly increased when both risk factors are present relative to when only one or the other is present.

- Susceptibility to alcohol-related cancers may be higher among individuals with certain functional variants in the genes involved in alcohol metabolism, including those that encode the major alcohol-metabolizing enzymes, alcohol dehydrogenases (ADH) and aldehyde dehydrogenases (ALDH). In particular, the variant allele ALDH*2, which encodes an inactive subunit of the ALDH2 enzyme that is involved in the metabolism of acetaldehyde, is prevalent in Asian populations and has been shown to increase the risk of upper aerodigestive tract cancers (including those of the oral cavity, pharynx, larynx, and esophagus), in moderate and heavy drinkers.[71,83]

Biological mechanisms

- Evidence suggests several ways by which alcohol may increase cancer risk.[84] Specifically:

  - Reactive metabolites of alcohol may be carcinogenic. In particular, acetaldehyde has been identified as a carcinogen by IARC. Acetaldehyde has been shown to form adducts with DNA in human cells and the resulting genetic damage may lead to increased proliferation of tumour cells.

  - Alcohol may act as a solvent, allowing other carcinogens to penetrate cells more easily. This may contribute to the observed synergistic effect between alcohol and tobacco smoking on cancer risk.

  - The production of prostaglandins, lipid peroxidation and the generation of free-radical oxygen through the metabolism of alcohol may mediate the effects of alcohol.

  - In the case of breast cancer, evidence suggests that alcohol carcinogenicity may be due to changes in circulating hormones, including elevated estrogen levels and proliferation of estrogen receptors, in response to alcohol consumption.[85]

  - The diets of persons who are heavy alcohol consumers may be lacking essential nutrients, which may make body tissues more susceptible to carcinogenesis.

Alcohol consumption and cardiovascular diseases

Table 10: Summary of selected expert panel assessments of alcohol consumption and cardiovascular diseases

Specific indicator	Disease	Direction of association	Strength of evidence
Moderate alcohol consumption	Coronary heart disease	↓	—
	Hemorrhagic stroke	↔	—
	Ischemic stroke	↓	—
Heavy alcohol consumption	Coronary heart disease	↑	—
	Hemorrhagic stroke	↑	—
	Ischemic stroke	↑	—
Irregular heavy drinking occasions	Coronary heart disease	↑	—
	Hemorrhagic stroke	—	—
	Ischemic stroke	—	—

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

- An expert panel assessment rating for the level of evidence linking alcohol consumption and cardiovascular disease was not available.
- Several major publications assert that heavy alcohol consumption is causally associated with many adverse cardiovascular outcomes, including cardiomyopathy, systemic hypertension, supraventricular arrhythmias, hemorrhagic stroke, heart failure not associated with coronary artery disease, and cardiovascular and overall mortality.[86–88] Occasional heavy drinking among low-to-moderate drinkers is also associated with cardiovascular diseases.[89]
- Conversely, light-to-moderate alcohol consumption with no heavy drinking occasions is related to decreased mortality rates, and lower risks of coronary artery disease, ischemic stroke and coronary artery disease-related heart failure. This may be due to a true protective effect or beneficial lifestyle factors in those who consume alcohol in moderation.[86,88] The risk relationship between alcohol consumption and cardiovascular risk is often described as being J-shaped (meaning that moderate alcohol consumption is responsible for a small decline in risk, followed by an increased risk with greater consumption).[90]

Specific types of exposures and magnitude of effect

- Evidence suggests that the type of alcohol—i.e., beer, wine or spirits—is less important than the quantity and pattern of consumption, which implies that health effects should be attributed to ethanol itself. Red wine may provide some additional benefits due to higher levels of anti-oxidant bioflavonoids, but this relationship is controversial.[87,91]
- Based on a meta-analysis of 28 cohort studies, a reduction in risk of coronary heart disease was found in those who consumed less than 20 g of alcohol per day compared to total abstainers (RR=0.80; 95% CI=0.78–0.83). A small protective effect remained until consumption reached 72 g per day (RR=0.96; 95% CI=0.92–1.00). Once consumption reached 90 g per day, risk increased (RR= 1.05; 95% CI: 1.00, 1.11).[92]
- In another meta-analysis, individuals reporting irregular heavy drinking occasions also had an increased risk of coronary heart disease, compared to those reporting regular moderate consumption (RR=1.45; 95% CI=1.24–1.70).[93]
- A third meta-analysis found that consumption greater than 60 g per day was associated with an increased risk of total stroke (RR=1.64; 95% CI=1.39–1.93); ischemic stroke (RR=1.69; 95% CI=1.34–2.15); and hemorrhagic stroke (RR=2.18; 95% CI=1.48–3.20) compared to abstainers. Consumption less than 12 g per day was associated with a reduced risk of total stroke (RR=0.83; 95% CI=0.75–0.91) and ischemic stroke (RR=0.80; 95% CI=0.67–0.96).[94]

Biological mechanisms

- A long list of potential mechanisms for the protective effect of alcohol on cardiovascular disease has been proposed, including: favourable impact on lipid profiles; improvement in coagulation profiles; favourable effects on insulin resistance; favourable effects on hormonal profiles; improved vasodilation; and possible effects of anti-oxidative components of some alcohols.[88]

- Biological mechanisms for adverse cardiovascular events among regular heavy drinkers and low-to-moderate drinkers with heavy drinking occasions are not well understood, but may include a reduced threshold for ventricular fibrillation after heavy alcohol consumption.[89]

Notable interactions

- Several genes play an important role in the metabolism of alcohol. However, few studies have examined the role of genetics, particularly the alcohol dehydrogenase 1C (ADH1C) gene, on the relationship between alcohol consumption and cardiovascular disease.[91]

Alcohol consumption and chronic respiratory diseases

Table 11: Summary of selected expert panel assessments of alcohol consumption and chronic respiratory diseases

Specific indicator	Disease	Direction of association	Strength of evidence
Moderate alcohol consumption	Chronic lung diseases	↓	—

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessment and nature of association

- An expert panel assessment for the causal relationship between alcohol and chronic respiratory disease was not available.
- There is some suggestion in the literature that moderate alcohol consumption, in combination with other dietary practices such as vegetable and fruit consumption, may have a protective effect against the development of chronic lung diseases such as COPD.[95]
- Most studies linking alcohol and chronic respiratory disease focus on bacterial infection, acute lung injury[96] or the exacerbation of existing conditions such as asthma and COPD.[97]

Alcohol consumption and diabetes

Table 12: Summary of selected expert panel assessments of alcohol consumption and diabetes

Specific indicator	Disease	Direction of association	Strength of evidence
Moderate alcohol consumption	Type 2 diabetes	↓	Sufficient/ limited
Heavy alcohol consumption	Type 2 diabetes	↑	Sufficient/ limited

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk.

Expert panel assessments and level of available evidence

- The causal relationship between alcohol consumption and type 2 diabetes has not been directly evaluated by an expert panel. A leading author in the field suggests the strength of evidence is "borderline between sufficient and limited."[89]

Nature and magnitude of association

- Moderate alcohol consumption is associated with a decreased risk of type 2 diabetes, while heavy alcohol consumption may be associated with a small increase in risk. Most studies characterize this relationship as being J-shaped.[89,98,99] It is not clear whether moderate alcohol consumption is truly protective, or whether it is a marker for other healthy lifestyle choices.[89]
- A meta-analysis of 13 cohort studies found a 30% reduction in risk of type 2 diabetes among men and women drinking between 5–30 g of alcohol daily, compared to non-drinkers.[99] Another meta-analysis also found a reduction in risk among moderate drinkers (6–48 g per day) of about 30%, and found that heavy drinkers (>48 g per day) had a risk similar to non-drinkers (RR=1.04, 95% CI=0.84–1.29).[100]

Specific types of exposures

- Both the pattern of consumption and type of drink may influence the association between alcohol and type 2 diabetes, but this relationship remains controversial. Several studies report no difference in risk based on alcohol type, suggesting an ethanol-mediated effect. Others found

that certain types of alcohol may have a greater impact. For example, one study found an increased risk in men related to heavy consumption of spirits as opposed to wine or beer, while others found that wine offers a greater protective effect.[99]

Biological mechanisms

- Several mechanisms may explain the reduction in risk associated with moderate alcohol consumption: increased insulin sensitivity; changes in levels of alcohol metabolites; greater high-density lipoprotein cholesterol concentrations; or the anti-inflammatory effect of alcohol.[89,101] Potential mechanisms for increases in risk due to heavy alcohol consumption are not well understood.

Notable interactions

Some studies show gender differences in the impact of alcohol consumption on type 2 diabetes.[88,101]

4.3 Physical Inactivity

Physical inactivity and cancer

Table 13: Summary of selected expert panel assessments of physical activity and cancer

Specific indicator	Cancer site	Direction of association	Strength of evidence
Physical activity[a]	Colon[b]	↓	Convincing
	Breast (post-menopausal)[c]	↓	Probable
	Endometrium	↓	Probable

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

a. Physical activity of all types: occupational, household, transport, and recreational

b. Evidence is convincing for colon cancer but no conclusion can be drawn for rectal cancer.

c. Evidence is probable for postmenopausal breast cancer but limited for premenopausal breast cancer.

Expert panel assessment

- Physical activity may protect against cancer at several body sites (or physical inactivity may promote cancer). There is now convincing evidence that physical activity reduces the risk of colon cancer and probably protects against cancer of the breast and endometrium.[72,102]
- Physical activity may also indirectly protect against cancers associated with "body fatness" through its role in maintaining energy balance.[72]

Nature and magnitude of the association

- Based on existing reviews and meta-analyses in the literature, physical activity is associated with a 20–25% reduction in colon cancer risk[103–105] a 20–40% reduction in breast cancer risk, and a 20–30% reduction in endometrial cancer risk[106–108] when comparing those who undertake the highest level of physical activity to those with the lowest level of activity.
- Evidence suggests that all types of physical activity (occupational, household, transport and recreational) are associated with reduced cancer risk.
- Evidence from the literature supports an inverse, dose-response relationship between physical activity and cancer risk: risk decreases with higher levels of physical activity.
- It is difficult to ascertain the amount of physical activity that is protective against cancer due to the heterogeneity of published studies with respect to measurement and classification of physical activity. Most studies have examined physical activity with respect to energy expenditure or duration but few studies have provided sufficient details to evaluate the different effects of the intensity of activity. Nonetheless, recommendations for cancer prevention state that individuals should be at least moderately active for 30 minutes per day. As fitness improves, aim for 60 minutes or more of moderate activity, or 30 minutes of vigorous physical activity a day. Sedentary behaviour should be limited.[72]

Notable interactions

- Menopausal status influences the relationship between physical activity and breast cancer risk. Existing evidence supports a stronger and more consistent relationship between physical activity and decreased postmenopausal breast cancer risk compared to premenopausal breast cancer risk. Physical activity has therefore been classified as probably protective against postmenopausal breast cancer but only a possibly protective against premenopausal breast.[72,102] The evidence regarding the effect of physical activity on endometrial cancer risk based on menopausal status is inconsistent.[102]

- For breast cancer, a greater benefit of physical activity is also observed for women without a family history of breast cancer, for women with a normal body mass index (although benefits are seen within all levels of body mass index), and for parous and non-Caucasian women.[102]
- For colon cancer, there is some evidence to suggest that physical activity may have a stronger effect for men than for women.[72]

Biological mechanisms

- Physical activity may protect against cancer through several mechanisms, including promotion of healthier levels of circulating hormones and a healthy body weight.[102] Specifically:
  - Physical activity may protect against colorectal cancer by reducing body fatness, decreasing inflammation, reducing insulin levels, reducing insulin resistance, improving endogenous steroid hormone metabolism, and reducing transit time of food through the gastrointestinal tract.
  - Physical activity may protect against breast cancer by improving endogenous steroid hormone metabolism, possibly strengthening the immune system, reducing levels of circulating estrogens and androgens, and reducing body fatness.

Physical inactivity and cardiovascular diseases

Table 14: Summary of selected expert panel assessments of physical activity and cardiovascular diseases

Specific indicator	Disease	Direction of association	Strength of evidence
Physical activity	Cardiovascular disease	↓	Strong[90]
Physical activity	Ischemic and hemorrhagic stroke	↔	Unclear[90]

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and level of available evidence

- In 1996, the United States Surgeon General stated that epidemiologic evidence supported inverse associations and dose-response gradients between physical activity level (or cardiorespiratory fitness), coronary heart disease and overall cardiovascular disease. Physical activity may also prevent hypertension, but that relationship was not well established. It is unclear whether physical activity protects against stroke.[109]
- Similarly, in 2008 the United States Physical Activity Guidelines Advisory Committee concluded that physical activity protected against development of cardiovascular disease and decreased rates of other cardiovascular risk factors, such as high blood pressure, blood lipid levels, insulin resistance, and obesity. Physical *inactivity* was a major risk for CVD.[110]

Nature of association and specific types of exposures

- There is a clear dose-response relationship between physical activity and cardiovascular disease. Benefits are evident with moderate levels of physical activity or cardiorespiratory fitness and increase with greater amounts of physical activity or higher levels of fitness. These relationships persist regardless of measurement of leisure time or occupational physical activity, or objectively measured physical fitness.[109]
- Physical activity is strongly protective against coronary heart disease. People who are physically active have a substantially lower overall risk for major coronary events, despite the finding that physical exertion may increase the risk of an acute coronary event among persons with advanced coronary atherosclerosis, particularly those who do not exercise regularly.[109,111]
- The impact of physical activity is not uniform across subtypes of stroke (ischemic and hemorrhagic), and these relationships are not well understood. For this reason, the relationship between physical activity and stroke remains uncertain.[109]
- Physical activity may indirectly protect against cardiovascular disease by modifying other risk factors including preventing obesity, promoting healthier distribution of body fat and reducing incidence of type 2 diabetes.[109,112]

Magnitude of association

- A large review found that, on average, physical activity was associated with a 33% decrease in the overall incidence of cardiovascular disease. The strength of the association was greater in studies that employed objective measures of aerobic fitness, with risk reduction reaching 50% or more. An average risk reduction of 31% across all studies was found for both ischemic and hemorrhagic stroke. Levels of risk were similar in men and women, and may actually underestimate the true impact due to adjustment for related confounding factors and within-person variation.[113]
- Pooled analyses of nine studies found the equivalent of 150 minutes per week of moderate-intensity leisure-time physical activity, which is the minimum recommended amount according to the 2008 United States federal guidelines, resulted in a 14% lower risk of coronary heart disease (RR=0.86; 95% CI=0.77–0.96) compared to those reporting no leisure-time physical activity. Higher levels (300 minutes per week) resulted in a greater protective effect (RR=0.80; 95% CI=0.74–0.88).[114]

Biological mechanisms

- Several biologic mechanisms have been proposed to explain the link between physical activity and cardiovascular disease including: decreased atherosclerosis (a disease characterized by arterial plaque build-up); improved plasma lipid/lipoprotein profile; decreased blood pressure; improved blood oxygenation; decreased blood clotting; and the prevention of heart rhythm disturbances.[109]

Physical inactivity and chronic respiratory diseases

Table 15: Summary of selected expert panel assessments of physical-activity and chronic respiratory diseases

Specific indicator	Disease	Direction of association	Strength of evidence
No substantial evidence	—	—	—

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

- The link between physical activity and chronic respiratory diseases has not been directly evaluated by an expert panel. A few individual studies suggest there may be a causal link between physical inactivity and the induction of asthma.[115]

Magnitude of association

- A study of asymptomatic children found that physical fitness was mildly protective against the development of asthma (OR=0.93, 95% CI=0.87–0.99).[116] A population-based study of adults found that decreased physical activity was strongly associated with bronchial hyper-responsiveness, which is related to both asthma and chronic obstructive pulmonary disease. This may be due to systemic inflammation.[115]

Other considerations

- It is likely that physical activity also impacts the development of chronic respiratory disease through prevention of obesity. Although physical activity was not directly measured in most studies, a systematic review of the literature found that those with a body mass index above 30 kg/m^2 had an elevated risk of asthma across all studies, with mostly statistically significant odds ratios ranging from 1.4 to 3.5.[117]
- Most research on physical activity and chronic respiratory diseases is related to disease management. Physical inactivity has a well-established impact on outcomes among individuals with chronic respiratory disease, including a higher number of emergency room visits, work absenteeism, worsened symptoms, sleep problems, and high medication and inhaler use.[115]

Physical inactivity and diabetes

Table 16: Summary of selected expert panel assessments of physical activity and diabetes

Specific indicator	Disease	Direction of association	Strength of evidence
Physical activity[a]	Type 2 diabetes	↓	Strong

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

a Analysis compared "most active" to "least active" group.

Expert panel assessments and nature of association

- According to the United States Surgeon General report on physical activity and health, available evidence "strongly supports" a causal and protective relationship between physical activity and type 2 diabetes.[109]
- In addition, authors of a large systematic review of the evidence determined that observational studies and randomized controlled trials provide "compelling evidence supporting the role of habitual physical activity in the primary prevention of type 2 diabetes."[113] This relationship persists when considered independently and in relation to body weight.[113] Physical activity also delays or prevents onset of type 2 diabetes in people with impaired glucose tolerance.[118]
- In addition to its importance for primary prevention, physical activity in combination with healthy eating is among the most effective treatments for those with mild, unmedicated type 2 diabetes.[109]

Specific types of exposures and magnitude of risk

- The relationship between physical activity and type 2 diabetes persists regardless of use of self-reported physical activity or directly measured aerobic fitness, and also holds true for resistance-type activities.[113]
- It is difficult to characterize the dose-response effect of increasing physical activity on type 2 diabetes. The protective effect has been shown in a range of activities of moderate and vigorous intensity.[119] The impact of light activity is not well understood, but it is clear that small changes in activity can impact risk.[113]
- A meta-analysis of 20 observational studies found an inverse relationship between type 2 diabetes and levels of physical activity or fitness across all studies. Pooled results show that the most active/fit group had an average risk reduction of 42% compared to the least active/fit group. Most (84%) studies included revealed incremental reductions in the risk for type 2 diabetes with increasing activity/fitness levels.[113]
- Another analysis revealed that, even after adjustment for BMI, a high level of physical activity is associated with a 20–30% reduction in diabetes risk.[109]

Biological mechanisms

- It is likely that physical activity prevents type 2 diabetes by increasing sensitivity to insulin. Physical activity improves abnormal glucose tolerance when the abnormality is primarily caused by insulin resistance, as opposed to insulin deficiency. In addition, physical activity may prevent type 2 diabetes by reducing total body fat or specifically intra-abdominal fat, a known risk factor for insulin resistance.[109]

4.4 Unhealthy Eating

Unhealthy eating and cancer

Table 17: Summary of selected expert panel assessments of unhealthy eating and cancer

Specific indicator	Cancer site	Direction of association	Strength of evidence
Dietary fibre	Colon and rectum	↓	Convincing
Sodium[a]	Stomach	↑	Probable
Vegetables and fruit[b]	Oral cavity, pharynx, larynx	↓	Probable
	Esophagus	↓	Probable
	Stomach	↓	Probable
	Lung[c]	↓	Probable
Sugars	—	—	—
Trans fats	—	—	—

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

a. Sodium refers to salt and salt preserved foods

b. Vegetables refer to non-starchy vegetables, which include leafy vegetables (e.g., spinach, lettuce, etc.), cruciferous vegetables (e.g., bok choy, broccoli, cabbage, etc.), and allium vegetables (e.g., onions, garlic, leeks) but exclude roots and tubers, such as potatoes, sweet potatoes, and yams.

c. Probable evidence supports only fruit (not vegetables) as protective of lung cancer.

Expert panel assessment

Dietary fibre

- According to an update of the World Cancer Research Fund (WCRF)/ American Institute for Cancer Research (AICR) expert panel review of food, nutrition and physical activity in the prevention of cancer, there is now convincing evidence that consumption of foods containing dietary fibre protects against cancer of the colon and rectum.[82]

Sodium

- The expert panel review by the WCRF/AICR concluded that salt and salted/salty foods are probable causes of stomach cancer.[72]

Vegetable and fruit consumption

- Consumption of both non-starchy vegetables and fruits has been classified by the expert panel review by the WCRF and the AICR as probably protective against of cancers of the mouth, pharynx, larynx, esophagus, and stomach. Fruit consumption also probably protects against lung cancer.[72]

Sugars

- The WCRF/AICR expert panel review concluded that there is limited evidence on sugars (including refined and other added sugars) as a risk factor for cancer.[72] A similar conclusion was reached in a recent update to the systematic literature review conducted for colorectal cancer.[82]

Trans fat

- The WCRF/AICR expert panel review concluded that there is limited evidence on dietary fat (including trans fats) as a risk factor for cancer.[72] No additional evidence has been added to the literature to support an association with cancer.

Nature and magnitude of association

Dietary fibre

- An inverse dose-response relationship between dietary fibre intake and colorectal cancer risk is present. The recent WCRF/AICR meta-analysis of prospective cohort studies reported a 10% decreased risk (RR=0.9; 95% CI 0.86–0.94) of colorectal cancer for every 10 g/day intake of total dietary fibre. Similar findings were observed for both men and women, and for colon and rectal cancer, although the results were not statistically significant for rectal cancer.[82]
- Evidence supports a reduced risk of colorectal cancer in response to total dietary fibre intake as well as fibre derived from cereals (grains) and whole grains. Fibre from other sources (e.g., vegetables and fruit) appears to be protective as well, but data are not statistically significant.[82]

Sodium

- A positive dose-response relationship between total salt intake and stomach cancer is evident from cohort studies but not case-control studies; although several case-control studies have shown increased risk of stomach cancer with high levels of salt intake.[72] The WCRF/AICR meta-analysis of two cohort studies indicates an 8% increase in stomach cancer risk for every 1 g/day intake of salt.[72]
- Intake of salty/salted foods has been associated with increased risk of stomach cancer in both cohort and case-control studies. A positive dose-response is apparent from case-control studies, with the WCRF/AICR meta-analysis giving a summary estimate of a 5.2-fold increased risk of stomach cancer for each additional serving of salty/salted food per day.[72]

Vegetable and fruit consumption

- Two recent prospective studies have reported 30–40% reductions in the risk of cancers of the mouth, pharynx and larynx[120,121] among people with a high intake of vegetable and fruit compared to those with a low intake, although case-control studies estimated a 45–50% reduction in risk.[72]
- Evidence suggests a dose-response between vegetable consumption and cancer of the mouth, pharynx and larynx. For esophageal cancer a dose-response relationship is supported by some evidence from case-control studies of raw vegetable intake, and for stomach cancer a dose-response is evident in case-control studies but not cohort studies.[72]
- Evidence suggests a dose-response relationship between fruit consumption and lung cancer. Evidence from case-control studies but not cohort studies also suggests a dose-response relationship between fruit consumption and cancer of the mouth, pharynx, larynx, esophagus and stomach. For some cancers, the shape of a possible dose-response relationship is unclear (e.g., for cancers of the mouth, pharynx and larynx, some fruit consumption confers a benefit compared to no consumption, but it is unclear if the benefit continues with linear increases).[72]
- It is unclear if all vegetables and fruits confer a protective effect. It is likely that a small group of vegetables or fruits may have an important effect on certain cancer sites. For example foods containing lycopene probably protect against prostate cancer; foods containing carotenoids probably protect against cancers of the mouth, pharynx, larynx and lung cancer; foods containing vitamin C probably protect against esophageal cancer.[72]

Sugars

- Sugary drinks (i.e., drinks containing added sugars such as sucrose and high-fructose corn syrup), probably cause weight gain, overweight and obesity. Therefore, sugary drinks may indirectly increase the risk of cancer associated with "body fatness" and adult weight gain by promoting excess energy intake.[72]

Biological mechanisms

Dietary fibre

- Several mechanisms by which fibre may protect against colorectal cancer have been proposed, including diluting fecal carcinogens; reducing transit time through the colon; increasing stool weight; altering bile acid metabolism; reducing colonic pH; and increasing the production of short-chain fatty acids, which may induce apoptosis, following fermentation of fibre by the gut flora.[122]

Sodium

- Biologic evidence supports salt and salty/salted food as a cause of stomach cancer. In experimental studies, high salt intake has been shown to damage the stomach lining, which may promote the effect of known gastric and food-derived carcinogens and cause inflammatory responses that increase epithelial cell proliferation.[123]

Vegetable and fruit consumption

- Vegetables and fruits may confer a protective effect against cancer through several generic and cancer-specific mechanisms. For example, vegetable and fruit consumption may reduce risk by preventing nutrient deficiencies.[124] Vegetables and fruits also contain specific potentially cancer-preventive components, including antioxidants (e.g., carotenoids, vitamin C, lycopene), dietary fibre and phytochemicals (e.g., phytoestrogens). Such substances may reduce cancer risk through: antioxidant activity; modulation of detoxification enzymes; stimulation of the immune system; antiproliferative activities; and/or modulation of steroid hormone concentration and hormone metabolism.[72]
- Because they have low energy density and high fibre content, vegetables and fruits may also indirectly protect against certain cancers by preventing weight gain, overweight and obesity.[72]

Notable interactions

Sodium

- Ecological studies demonstrate that stomach cancer incidence rates are highest in areas of the world where traditional diets are high in salt (e.g., Asia, Latin America) due to consumption of foods preserved by salt, or eating salty/salted foods.[123]
- Evidence from case-control studies suggests that salt and salty/salted foods may interact synergistically with Helicobacter pylori infection (an established risk factor for stomach cancer) to promote stomach cancer.[125]

Unhealthy eating and cardiovascular diseases

Table 18: Summary of selected expert panel assessments of healthy/ unhealthy eating and cardiovascular diseases

Specific indicator	Disease	Direction of association	Strength of evidence
High sodium intake	CVD	↑	Convincing
Trans fat	CVD	↑	Convincing
Vegetables and fruit	CVD	↓	Convincing
Dietary fibre (nonstarch polysaccharides)	CVD	↓	Probable

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

- In 2003, the World Health Organization (WHO) reported that there is "convincing" evidence of reduced risk of cardiovascular disease related to consumption of vegetables and fruits, and other dietary factors such as consumption of fish and fish oils, foods high in linoleic acid, and foods high in potassium.[37] WHO determined that there was a "probable" association between consumption of dietary fibre and cardiovascular disease.
- In addition, WHO concluded that there is "convincing" evidence that dietary factors such as trans fatty acids and high sodium intake, in addition to overweight and obesity, increase the risk of cardiovascular disease.[37]

Specific types of exposures and magnitude of association

High sodium intake

- Evidence examining the impact of high sodium intake on cardiovascular disease is most often concerned with its effect on hypertension, which is a key risk factor for both coronary heart disease, and ischemic and hemorrhagic stroke.[37,126] A meta-analysis found that reducing salt intake by about 4.6 g per day lowered systolic blood pressure by an average of 4.96 mmHg and diastolic blood pressure by an average of 2.73 mmHg in patients with hypertension.[127]

Trans fat

- A number of large observational studies have found an association between trans fatty acids, most often consumed through deep-fried fast foods and baked goods, and risk of coronary heart disease.[37] A meta-analysis of four prospective studies found that those with high trans fat intake (2% of daily energy intake or more) had a 23% increase of coronary heart disease (RR=1.23, 95% CI=1.11–1.37), compared to those with low trans fat intake.[128]

Vegetable and fruit consumption

- Although evidence indicates that consumption of vegetables and fruit has a significant protective impact on coronary heart disease and stroke,[37] this relationship is not well understood because vegetable and fruit consumption is related to many other social and behavioural factors that may also contribute towards the protective effect.[129] Still, randomized controlled trials have found that vegetable and fruit consumption is associated with a decrease in blood pressure, which is an important risk factor for cardiovascular disease.[129]
- A review of observational studies found that increased vegetable and fruit consumption resulted in protective relative risks ranging from 0.63 to 0.97 in five of six studies, though the findings were not always statistically significant.[129]

Dietary fibre

- Several large cohort studies have reported that a high fibre diet, as well as a diet high in whole grain cereals, lowers the risk of coronary heart disease.[37] Soluble fibre, as opposed to insoluble fibre, appears to have a greater inverse effect due to its low-density lipoprotein (LDL) cholesterol lowering potential.
- A meta-analysis found there was a 12% decrease in coronary events and a 19% reduction in coronary mortality for every 10 g per day increase in fibre intake.[130]

Other dietary factors

- There are many other dietary factors that may impact cardiovascular disease and have not been examined here. For example, there is limited evidence that sugar intake, particularly through sugar-sweetened drinks, may impact rates of cardiovascular disease. This may occur through increasing development of hypertension, adverse lipid parameters and inflammation.[131,132]

Biological mechanisms

- The biological mechanisms explaining both increased and decreased risks of cardiovascular disease due to dietary factors are not well understood. For example, studies looking at the specific effects of folate, carotenoids, and vitamin C have not succeeded in demonstrating their role in cardiovascular disease prevention.[129]
- More often, the benefits of healthy eating on cardiovascular disease are attributed to the prevention of other cardiovascular disease risk factors such as being overweight, central obesity, high blood pressure, dyslipidemia, diabetes and low cardio-respiratory fitness.[37]

Unhealthy eating and chronic respiratory diseases

Table 19: Summary of selected expert panel assessments of healthy/unhealthy eating and chronic respiratory diseases

Specific indicator	Disease	Direction of association	Strength of evidence
Vegetables and fruit	CVD	↓	N/A
Vitamins A, C, E	CVD	↓	N/A

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

- An ad hoc committee of the American Thoracic Society Environmental and Occupational Health Assembly determined that "dietary factors are likely causes of chronic obstructive pulmonary disease (COPD), although the evidence is insufficient to infer a causal relationship." A diet high in antioxidants may protect against COPD development. However dietary factors may increase risk of developing COPD by disturbing the balance between oxidants and antioxidants, causing an increased oxidant burden.[62]
- A review of asthma-related observational and intervention research revealed evidence of protective causal associations for intake of vegetables and fruit, vitamin A /beta-carotene, vitamin C and vitamin E. Strength of the evidence was dependent on the type of study.[133]

Types of exposures and magnitude of association

- Studies of the relationship between healthy eating and chronic respiratory diseases are limited due to difficulties quantifying dietary intake, and the possibility of reverse causation.[134] Therefore, it is difficult to determine the impact of specific dietary factors and assign a magnitude of association.
- Evidence on the impact of predominant diet type has not shown a clear relationship. In a five-centre European study of 1,174 adults, there was no association between development of asthma and diets based on fish, vegetables and fruits (OR=1.11; 95% CI=0.93–1.33), or meat and potatoes (OR=1.02; 95% CI=0.79–1.31).[135]
- The strongest evidence for COPD is related to the beneficial effect of vitamin C on lung function. Consistent results have been found across studies and methodologies (e.g., self-reported versus serum vitamin levels).[62]
- It is likely that healthy eating also impacts the development of chronic respiratory diseases through its impact on obesity.[136] A systematic review found that those with a body mass index above 30 kg/m^2 had an elevated risk of asthma across all studies, with statistically significant odds ratios ranging from 1.4 to 3.5.[117]

Biological mechanisms

- Biological mechanisms explaining the relationship between dietary factors and asthma are not well understood. For vegetables and fruit, antioxidant properties are likely responsible for their protective effect. This is because the respiratory airways are particularly vulnerable to oxidative damage.[133]

Notable interactions

- Intake of dietary antioxidants and lipids may be especially important during pregnancy and early childhood. Additional research is needed in this area.[66]

Unhealthy eating and diabetes

Table 20: Summary of selected expert panel assessments of healthy/unhealthy eating and diabetes

Specific indicator	Disease	Direction of association	Strength of evidence
Dietary fibre	Type 2	↓	Probable
Total fat intake	Type 2	↑	Probable
Trans fatty acids	Type 2	↑	Probable
Low glycemic index foods	Type 2	↓	Probable

Note: ↑ = increased risk; ↓decreased risk; ↑↓ = J- or U shaped risk; ↔ = no relationship identified in either direction; — indicates that the strength of evidence was not classified

Expert panel assessments and nature of association

- According to the WHO, although all lifestyle and environmental factors that contribute to excess weight gain may be regarded as impacting the incidence of type 2 diabetes, evidence directly relating individual dietary factors to the disease is inconclusive.[37]
- The most convincing evidence of a dietary factor independently related to the risk of type 2 diabetes is dietary fibre, which was determined have a "probable" association.[37] Other dietary factors such as total fat intake, trans fatty acid intake and intake of low glycemic index foods are considered "possible" causal factors.

Specific types of exposures and magnitude of effect

Dietary fibre

- Several studies have found that dietary fibre consumption decreases the risk of type 2 diabetes independent of age, body mass index, smoking or physical activity.[37,137] However, this relationship is still poorly understood, largely due to challenges in quantifying fibre intake in observational studies. Regardless, there is evidence from experimental intervention studies that high intake of dietary fibre results in improved glucose tolerance, reduced blood glucose and improved insulin levels in people with type 2 diabetes. These findings increase the likelihood that dietary fibre intake may impact disease development.[37]

Other factors

- Several other dietary factors have been associated with development of type 2 diabetes, though evidence is not conclusive. In some observational studies, diets high in saturated fat have been associated with impaired glucose tolerance, and higher fasting glucose and insulin levels.[37]
- Foods that have a low glycemic index may reduce the development of type 2 diabetes, although many of these foods are also rich in dietary fibre which makes this relationship difficult to disentangle.[137] Despite the lack of direct causal evidence for disease development, it is well-established that low glycemic index foods are associated with a reduced glycemic response after ingestion when compared with foods of higher glycemic index, and are associated with improved glycemic control in people with diabetes, regardless of the presence of dietary fibre.[37]
- Although most epidemiological studies on intake of refined sugars do not show a direct association with risk of diabetes,[137] there is a small amount of emerging evidence suggesting that consumption of sugar-sweetened beverages may increase the risk of type 2 diabetes due to rapid increases in blood glucose and insulin concentrations. This relationship is difficult to distinguish from the impact of sugar sweetened drinks on total energy intake.[131]
- There is insufficient evidence to suggest a causal relationship between general vegetable and fruit consumption[138] or consumption of saturated fat, chromium, magnesium or vitamin E[37] and type 2 diabetes.

Biological mechanisms

- Biological mechanisms explaining potential increases or decreases in risk of diabetes from dietary factors are poorly understood. A few beneficial effects of high dietary fibre have been proposed, including lower postprandial glucose and insulin responses, improved lipid control and improved insulin sensitivity.[137]
- The most commonly cited mechanisms through which healthy eating impacts diabetes are related to total energy intake, weight gain, central adiposity and obesity. Both waist circumference and waist-to-hip ratio are powerful determinants of risk of type 2 diabetes, even more so that overall body mass index. Voluntary weight loss improves insulin sensitivity and may reduce the risk of progressing from impaired glucose tolerance to type 2 diabetes.[37]

5. Economic Burden

In addition to the human impact of tobacco use, alcohol consumption, physical inactivity and unhealthy eating in Ontario, these risk factors pose a substantial economic burden through health care and other costs. In the absence of high quality, Ontario-specific estimates of the direct health care costs and indirect productivity losses published in the academic literature, a systematic search was conducted to generate estimates based on national and international data. The results of this search are summarized in Chapter 5.

A total of 2,536 citations were returned by a systematic search of MEDLINE, EMBASE, CINAHL and EconLit for estimates of the economic burden of the four risk factors (Table 21). Sixteen studies were retained in this review based on the inclusion criteria. Results are summarized in the text below and in Table 22. Supplementary information on data sources and definitions of direct and indirect costs for each study are provided in Table 23.

Table 21: Summary of search results

Risk factor	Number of citations returned	Number of publications included
Tobacco use	812	5
Alcohol consumption	469	9
Physical inactivity	642	1
Unhealthy eating	613	1
Total	**2,536**	**16**

Economic impact of tobacco use: five studies were identified reporting direct and indirect prevalence-based cost of tobacco use.[139–143] Estimates of the total annual health care costs associated with tobacco use from Western, industrialized countries range from $62 (Sweden) to $202 (United Kingdom) per capita in 2011 Canadian dollars, although most fell between $121 and $202. Canadian estimates are within the average range at $165 per capita. Indirect costs due to lost productivity were only estimated for Sweden and Canada at $147 (which is likely a lower-than-average estimate) and $398 per capita in 2011 Canadian dollars respectively.

Using Canadian data, the cost attributed to tobacco use in the province of Ontario was an estimated $2.2 billion in direct health care costs and $5.3 billion in indirect costs in 2011, totalling $7.5 billion.[142]

Economic impact of alcohol consumption: nine studies were identified that report on direct and indirect prevalence-based costs due to alcohol consumption.[140,142,144–150] Estimates of total health care costs in Western, industrialized countries depend on the measure of alcohol consumption used. Moderate alcohol consumption, which was only measured in Germany,[146] cost an estimated $21 per capita in 2011 Canadian dollars and an additional $0.6 per capita in indirect costs from productivity losses. Alcohol abuse was estimated to cost between $14 and $129 per capita in direct health care costs ($126 in Canada) and between $126 and $703 in indirect costs from productivity losses. Alcohol abuse was estimated to cost between $14 and $129 per capita in direct health care costs ($126 in Canada) and between $126 and $703 in indirect costs ($272 in Canada) due to lost productivity in 2011 Canadian dollars. For all alcohol consumption, estimates of health care costs in Western, industrialized countries range from $47 to $125 per capita in 2011 Canadian dollars Estimates of indirect costs due to lost productivity range from $221 to $702.

Using Canadian data, the cost attributed to alcohol consumption in the province of Ontario was an estimated $1.7 billion in direct health care costs and $3.6 billion in indirect costs in 2011, totalling $5.3 billion.[142]

Economic impact of physical inactivity: one study of the costs of physical inactivity was identified between 2006 and 2011.[140,151] It was estimated that physical inactivity cost the National Health Service in the United Kingdom $35 per capita in 2011 Canadian dollars in direct health care costs (indirect costs were not estimated). A 2004 Canadian study identified through an extended literature search[151] estimated direct health care expenditure of $67 per capita and an additional $152 in indirect costs due to productivity losses per annum in 2011 Canadian dollars.

Using Canadian data, the cost attributed to physical inactivity in the province of Ontario was an estimated $0.9 billion in direct health care costs and $2 billion in indirect costs in 2011, totalling $2.9 billion.[151]

Economic impact of unhealthy eating: no studies estimating the cost of unhealthy eating in Canada were identified through a literature search of published papers from 2006 to 2011. A study from the UK estimated that unhealthy eating cost the National Health Service $217 per capita annually in 2011 Canadian dollars.[140] Indirect costs were not estimated.

Using this estimate, unhealthy eating may have resulted in direct health care expenditures of about $2.9 billion in the province of Ontario in 2011.[140]

Table 22: Summary of direct health care costs and indirect productivity losses due to four risk factors: tobacco use, alcohol consumption, physical inactivity and unhealthy eating

			Cost per capita in country of origin, in 2011 Canadian dollars			Total estimated costs based on the Ontario population, in millions of 2011 Canadian dollars		
First author, year	Country/ region	Risk factor	Direct health care costs per capital	Indirect costs per capital	Direct health care + indirect costs	Estimated direct health care costs	Estimated indirect costs	Estimated direct health care + indirect costs
Tobacco use								
Bolin, 2011[139]	Sweden	Smoking	61.96	146.50	208.48	828.60	1,959.40	2,788.00
Callum, 2011[143]	England	Smoking	120.50	—	—	1,611.40	—	—
Scarborough, 2011[140]	UK	Smoking	122.22	—	—	1,634.50	—	—
Allender, 2009[141]	UK	Smoking	201.55	—	—	2,695.30	—	—
Rehm, 2007[142]	**Canada**	**Tobacco**	**165.24**	**397.51**	**562.75**	**2,209.80**	**5,315.90**	**7,525.60**
Alcohol consumption								
Konnopka, 2009[146]	Germany	Moderate consumption	20.84	0.57	21.41	278.70	7.60	286.30
Scarborough, 2011[140]	UK	All consumption	120.76	—	—	1,614.90	—	—
Balakrishnan, 2009[145]	UK	All consumption	116.65	—	—	1,560.00	—	—
Rehm, 2009[147b]	Global	All consumption	—	—	—	—	—	—
	Canada		**110.10**	**237.35**	**347.45**	**1,472.40**	**3,174.10**	**4,646.40**
	France		70.70	220.91	291.61	945.50	2,954.20	3,899.70
	Scotland		36.64	237.93	274.57	490.00	3,181.80	3,671.80
	USA		122.73	701.74	824.47	1,641.30	9,384.40	11,025.60
Thavornch-aroensap, 2009[148b]	Global	All consumption	—	—	—	—	—	—
	Australia		—	—	415.02[c]	—	—	5,550.10[c]
	Canada		**—**	**—**	**493.74**[c]	**—**	**—**	**6,602.80**[c]
	France		—	—	443.40[c]	—	—	5,929.60[c]

Table 22: Summary of direct health care costs and indirect productivity losses due to four risk factors: tobacco use, alcohol consumption, physical inactivity and unhealthy eating (continued)

			Cost per capita in country of origin, in 2011 Canadian dollars			Total estimated costs based on the Ontario population, in millions of 2011 Canadian dollars		
First author, year	Country/ region	Risk factor	Direct health care costs per capital	Indirect costs per capital	Direct health care + indirect costs	Estimated direct health care costs	Estimated indirect costs	Estimated direct health care + indirect costs
Alcohol consumption (continued)								
	Germany		—	—	431.14[c]	—	—	5,765.60[c]
	Netherlands		—	—	238.19[c]	—	—	3,185.30[c]
	New Zealand		—	—	306.71 to 1,167.57[c]	—	—	4,101.60 to 15,613.90[c]
	Portugal		—	—	98.66[c]	—	—	1,319.40[c]
	Sweden		—	—	308.42 to 443.97[c]	—	—	4,124.50 to 5,937.20[c]
	USA		—	—	981.45[c]	—	—	13,124.90[c]
Jarl, 2008[149]	Sweden	All consumption	47.27	225.61	272.88	632.10	3,017.10	3,649.20
Rehm, 2007[142]								
Rehm, 2007[142]	**Canada**	**All consumption**	**125.29**	**270.06**	**395.35**	**1,675.50**	**3,611.50**	**5,287.00**
Rehm, 2011[150]	**Canada**	**Abuse**	**116.43**	**270.06**	**386.49**	**1,557.00**	**3,611.50**	**5,168.50**
Mohapatra, 2010[144b]	High-income	Abuse	—	—	—	—	—	—
	Australia		14.07	126.32	140.39	13.40	1,689.30	1,702.70
	Canada		**126.22**	**272.09**	**398.31**	**1,687.90**	**3,638.70**	**5,326.60**
	Denmark		165.68	232.47	398.15	2,215.60	3,108.80	5,324.40
	France		85.88	268.31	354.19	1,148.50	3,588.10	4,736.60
	Germany		142.30	321.43	463.73	1,903.00	4,298.50	6,201.50
	Italy		50.57	125.62	176.19	676.30	1,679.90	2,356.20
	New Zealand		21.53	627.51	649.04	287.90	8,391.70	8,679.60
	Spain		55.47	128.21	183.68	741.80	1,714.60	2,456.40

Table 22: Summary of direct health care costs and indirect productivity losses due to four risk factors: tobacco use, alcohol consumption, physical inactivity and unhealthy eating (continued)

			Cost per capita in country of origin, in 2011 Canadian dollars			Total estimated costs based on the Ontario population, in millions of 2011 Canadian dollars		
First author, year	Country/ region	Risk factor	Direct health care costs per capital	Indirect costs per capital	Direct health care + indirect costs	Estimated direct health care costs	Estimated indirect costs	Estimated direct health care + indirect costs
Alcohol consumption (continued)								
Mohapatra, 2010[144b]	Sweden	Abuse	43.15	205.93	249.08	577.00	2,753.90	3,330.90
	Switzerland		98.24	219.94	309.18	1,193.40	2,941.30	4,134.70
	UK (England and Wales)		77.49	342.57	420.06	1,036.30	4,581.20	5,617.50
	UK (Scotland)		49.26	320.13	369.39	658.80	4,281.10	4,939.90
	USA		129.03	703.20	832.23	1,725.50	9,403.90	11,129.40
Physical inactivity								
Scarborough, 2011[140]	United Kingdom	Physical inactivity	35.02	—	—	468.30	—	—
Katzmarzyk, 2004[151]	**Canada**	**Physical inactivity**	**66.62**	**151.79**	**218.41**	**890.90**	**2,029.90**	**2,920.80**
Unhealthy eating								
Scarborough, 2011[140]	United Kingdom	Poor diet	216.71	—	—	2,898.10	—	—

a. Derived by taking the cost per capita (in 2011 CAD) in the country where the costing occurred and multiplying it by the population of Ontario in 2011 (n=13,372,996(3))

b. Note: reviews may contain estimates from studies reported elsewhere in the table. Estimates may differ slightly based on the inflation technique used in the original paper, risk factor definition or costs included in the review.

c. Note: includes all costs related attributed to alcohol (depending on study, may include law enforcement, intangible costs, etc.)

Table 23: Supplementary information on studies included in the estimation of direct health care costs and indirect productivity losses due to four risk factors: tobacco use, alcohol consumption, physical inactivity and unhealthy eating

First author, year	Country/ region	Direct health care costs included	Data source for direct health care costs	Indirect costs included	Data source for indirect costs
Tobacco use					
Bolin, 2011[139]	Sweden	In- and out-patient care, and pharmaceutical utilization.	In- and out-patient care: diagnosis related groups (DRG) unit costs from a representative sample of Swedish hospitals; pharmaceutical: Swedish survey of morbidity-specific pharmaceutical prescriptions and the Swedish Pharmaceutical Register	Years of potential and productive life lost due to premature mortality and permanent disability	Registry data on total mortality and granted early pensions
Callum, 2011[143]	England	Primary care consultations, prescriptions issued and out-patient visits	General practitioner and practice nurse consultations: unit consultation costs calculated by the Personal Social Services Research Unit; prescriptions: Prescribing Analysis and Cost (PAC) data on general practice prescribing in England; out-patient services: derived from the Hospital Episode statistics tables	N/A	N/A
Scarborough, 2011[140]	UK	Total cost to the NHS	NHS costs by disease category from the NHS programme budgeting estimates for England	N/A	N/A
Allender, 2009[141]	UK	NHS in-patient and out-patient costs, NHS primary care expenditure, NHS pharmaceutical expenditure and NHS net community care services expenditure	Proportion of NHS expenditure by disease code in 1992–93 from the National Health Executive (extracted from published study)	N/A	N/A
Rehm, 2007[142]	**Canada**	Hospitalizations, out-patient care, physician visits and prescription drugs	Health service costs: Canadian Institute for Health information data	Productivity costs owing to morbidity and premature mortality	Canadian Community Health Survey (difference of predicted mean income of survey respondents with and without substance use disorders)

Table 23: Supplementary information on studies included in the estimation of direct health care costs and indirect productivity losses due to four risk factors: tobacco use, alcohol consumption, physical inactivity and unhealthy eating (continued)

First author, year	Country/ region	Direct health care costs included	Data source for direct health care costs	Indirect costs included	Data source for indirect costs
Alcohol consumption					
Konnopka, 2009[146]	Germany	Hospitals, out-patient care (registered doctors and other professionals, pharmacies, home care and "other out-patient institutions"), rehabilitation, nursing homes, out-of-pocket expenses, and determinable nonmedical costs of rescue services, administration, prevention, research, education, and investments	Official statistics	Productivity losses due to premature mortality, early retirement and sickness absence	Official statistics
Scarborough, 2011[140]	UK	Total cost to the NHS	NHS costs by disease category from the NHS programme budgeting estimates for England	N/A	N/A
Balakrishnan, 2009[145]	UK	Direct cost to the NHS	Proportion of NHS expenditure by disease code in 1992–93 from the National Health Executive (extracted from published study)	N/A	N/A
Rehm, 2009[147a]	Global	Depends on study	Literature search of existing studies of alcohol-attributable social cost (1992–2007)	Depends on study	Literature search of existing studies of alcohol-attributable social cost (1992–2007)
Thavorncharoensap, 2009[148a]	Global	Depends on study	Systematic review of MEDLINE database from 1990–2007	Depends on study	Systematic review of MEDLINE database from 1990–2007
Jarl, 2008[149]	Sweden	Medical care, co-morbidity, employee assistance programs financed by employers, and some out-patient pharmaceuticals	National data	Absence from work (short- and long-term), early retirement, mortality and lost productivity resulting from incarceration	National data

Table 23: Supplementary information on studies included in the estimation of direct health care costs and indirect productivity losses due to four risk factors: tobacco use, alcohol consumption, physical inactivity and unhealthy eating (continued)

First author, year	Country/ region	Direct health care costs included	Data source for direct health care costs	Indirect costs included	Data source for indirect costs
Alcohol consumption (continued)					
Rehm, 2007[142]	**Canada**	Hospitalizations, out-patient care, physician visits and prescription drugs	Health service costs: Canadian Institute for Health information data	Productivity costs owing to morbidity and premature mortality	Canadian Community Health Survey (difference of predicted mean income of survey respondents with and without substance use disorders)
Rehm, 2011[150]	**Canada**	Cost of health care	Canadian Study of Social Costs Attributable to Substance Abuse (a cost-of-illness study)	Lost productivity due to disability or premature death	Canadian Study of Social Costs Attributable to Substance Abuse (a cost-of-illness study)
Mohapatra, 2010[144a]	High-income	Depends on study	Literature search of various databases from January 1992 to June 2009	Depends on study	Literature search of various databases from January 1992 to June 2009
Physical inactivity					
Scarborough, 2011[140]	United Kingdom	Total cost to the NHS	NHS costs by disease category from the NHS programme budgeting estimates for England	N/A	N/A
Katzmarzyk, 2004[151]	**Canada**	Hospital care expenditures, drug expenditures, physician care expenditures, costs for care in other institutions, and additional direct health expenditures (other professionals, public health, health research, prepayment administration, etc.)	Economic Burden of Illness in Canada (produced by Health Canada)	The value of years of life lost due to premature death and the value of activity days lost due to short-term and long-term disability	Economic Burden of Illness in Canada (produced by Health Canada)
Unhealthy eating					
Scarborough, 2011[140]	United Kingdom	Total cost to the NHS	NHS costs by disease category from the NHS programme budgeting estimates for England	N/A	N/A

a. Note: reviews may contain estimates from studies reported elsewhere in the table. Estimates may differ slightly based on the inflation technique, risk factor definition or costs included in the review.

6. Evidence Summary

To better illustrate the scientific basis for the work of the PWG, the table in Chapter 6 provides a substantive summary of the evidence for each of the recommendations proposed in the report. The list of references in the table includes those cited in the report as well as additional supporting citations. The table breaks down each recommendation into main premises and provides accompanying references to support each premise. For each reference, the table includes the type of study (i.e., a description of the type of evidence/research design as defined by the Centers for Disease Control (CDC) and Prevention chart Continuum of Evidence of Effectiveness.[21] The table also summarizes the main result(s)/conclusion(s) stated by each reference. Each recommendation is preceded by a statement on the strength of evidence and effectiveness based on the application of the CDC Continuum.

Specifically, the CDC Continuum breaks down the evidence supporting the recommendations into the following categories:

Research evidence

- Well-supported—Found to be effective through true experimental designs, RCTS, systematic reviews, applied in different settings, program replication with evaluation replication etc.
- Supported—Found to be effective through quasi-experimental designs, applied studies in similar settings, program replication with evaluation replication
- Promising direction—Some evidence of effectiveness or expected preventive effect, based on non-experimental design or sound theory, single group design, exploratory study, program replication without evaluation replication, partial implementation guidance, real-world informed

Experiential evidence

- Expert panels, stakeholder engagement

Contextual evidence

- Included where available and relevant, e.g., reports on public opinion

Recommendation 1—*Increase tobacco tax*

Immediately increase tobacco tax on all products sold in Ontario. This tax to be equal to (or greater than) the average tobacco tax rate of other Canadian provinces or territories, and be indexed at (or greater than) inflation. It is recommended that the minimum dedicated tobacco tax (DTT) remain a constant percentage of the total, that this percentage may be increased and that the proceeds of the DTT fund the provincial tobacco control program.

Research Evidence—Well Supported: There is substantial evidence that increasing tobacco price through taxation will reduce demand and uptake, and increase cessation. Youth are particularly price-sensitive. **Promising Direction:** Since 1998, a dedicated tobacco tax has been used in California to fund their state tobacco control program.

Main premise	Reference	Type of study	Key findings relative to the main premise
Increasing tobacco price reduces consumption and uptake, and increases cessation attempts.	Chaloupka FJ, Straif K, Leon ME; Working Group, International Agency for Research on Cancer. Effectiveness of tax and price policies in tobacco control. Tob Control. 2011 May;20(3):235–8. Epub 2010 Nov 29.	Systematic review: results of expert consensus panel's review of literature Evidence from Europe of the effect of tobacco price increases	Experts agreed there is sufficient evidence that increased tobacco excise taxes/prices can reduce overall tobacco consumption, prevalence of tobacco use, and initiation and uptake among young people, as well as promote cessation among current users.
	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health organization, Geneva Switzerland, 2011.	Expert body report: prevalence of tobacco control policies Policy has been applied in programs in multiple jurisdictions and countries.	Cites other WHO reports in stating that increasing tobacco prices through higher taxes is the most effective intervention to reduce tobacco use and encourage smokers to quit
	World Health Organization. WHO report on the global tobacco epidemic, 2008: the MPOWER package. [Internet]. Geneva: World Health Organization; 2008 [cited 2011 Sep 12]. Available from: *http://www.who.int/tobacco/mpower/mpower_report_full_2008.pdf*	Expert body report: analysis of six most important and effective tobacco control policies The use of taxes to increase tobacco prices has been implemented in a variety of countries and settings.	Cites World Bank and WHO reports stating that tobacco tax increases are the most effective way to reduce tobacco use, and also have the benefit of increasing government revenues
	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Evidence from programs in multiple American states	Increasing the unit price of tobacco products is one of the key strategies cited in past reports and practice guidelines, has been reported to be effective and should be used as part of a comprehensive approach.

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Increasing tobacco price reduces consumption and uptake, and increases cessation attempts.	Institute of Medicine. Ending the tobacco problem: A blueprint for the nation. Washington, DC: National Academy Press, 2007.	Expert consensus report: based on 16 papers reviewing the literature Evidence from programs in US and other jurisdictions	Comprehensive state programs have achieved substantial reductions in tobacco rates. Increasing cigarette price/excise taxes is one of the most effective policies for reducing the use of tobacco, especially among adolescents. Some evidence that effects of price increases and other antismoking measures can be independent; they are more effective when they are combined.
	Chaloupka FJ, Hu TW, Warner KE, Jacobs R, Yurekli A. The taxation of tobacco products. In: Jha P, Chaloupka FJ, editors. Tobacco control in developing countries. Oxford, UK: Oxford University Press; 2000.	Book chapter: reviews of literature Examples drawn from multiple countries in which taxation has been implemented as a form of tobacco control policy	Studies from developed countries show strong and consistent evidence that increases in the price of cigarettes/tobacco products lead to significant reductions in prevalence/use, particularly among youth.
	US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.	Government monograph reviewed by experts Studies using different approaches (e.g., computer modelling) have shown that in US the demand for cigarettes is affected by price.	Review of aggregate and individual studies suggests that increases in cigarette prices lead to significant reduction in smoking consumption and prevalence.
	Chaloupka FJ. Macro-social influences: the effects of prices and tobacco-control policies on the demand for tobacco products. Nicotine Tob Res. 1999;1 Suppl 1:S105–9.	Peer-reviewed publication: review of econometric studies Data from multiple jurisdictions	Studies show consistent evidence of the effects of higher prices for cigarettes and other tobacco products; there is growing evidence that youth and young adults are more responsive to price than are older adults. There is also consistent evidence that stronger restrictions on smoking lead to reduced smoking.
	Reed MB, Anderson CM, Vaughn JW, Burns DM. The effect of cigarette price increases on smoking cessation in California. Prev Sci 2008 Mar;9(1):47–54.	Peer-reviewed publication: analysis of two cross-sectional surveys. Evidence from a single program.	Regression analyses indicated that following a cigarette price increase in November 1988, a greater proportion of smokers reported quit attempts in the months immediately following. However, the increase was only significant for the first seven months following the price change.

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Increasing tobacco price reduces consumption and uptake, and increases cessation attempts.	Kostova D, Ross H, Blecher E, Markowitz S. Is youth smoking responsive to cigarette prices? Evidence from low- and middle-income countries. Tob Control. 2011 Nov;20(6):419-24. Epub 2011 Jul 7.	Peer-reviewed publication: economic modelling based on cross sectional data Evidence from programs in multiple jurisdictions	Youth smoking in low- and middle-income countries is negatively influenced by cigarette price.
	Ross H, Blecher E, Yan L, Hyland A. Do cigarette prices motivate smokers to quit? New evidence from the ITC survey. Addiction. 2011 Mar;106(3):609-19. doi: 10.1111/j.1360-0443.2010.03192.x. Epub 2010 Nov 9.	Peer-reviewed publication: economic model based on longitudinal survey data Evidence from a single jurisdiction used to test economic model	Higher cigarette prices may be associated with greater motivation to stop smoking among North American adults. The effect is not mitigated by cheaper cigarette sources but suggests it could be intensified if cheaper cigarette sources were not available.
	Debrot K, Tynan M, Francis J, MacNeil A. State cigarette excise taxes --- United States, 2009. MMWR, 2010;59(13):385-388.	Agency report: survey of US states' cigarette excise tax increases Application of tobacco taxes in various jurisdictions but not tied to outcomes/effect	A description of states' tobacco excise taxes; data not linked to smoking rates Cites other reports calling for increases in taxes to promote tobacco reduction
	Blecher EH, van Walbeek CP. Cigarette affordability trends: an update and some methodological comments. Tob Control. 2009 Jun;18(3):167-75. Epub 2009 Jan 29.	Peer-reviewed publication: economic modelling using different techniques and data to model trends 1990–2006 Modelling using data on tobacco price and income from several jurisdictions	In high-income countries, the price of cigarettes has risen and affordability decreased since 1990. In low- and middle-income countries, cigarettes have become more affordable.
	Blecher EH, van Walbeek CP. An international analysis of cigarette affordability. Tob Control. 2004 Dec;13(4):339-46.	Peer-reviewed publication: trends in affordability in 70 countries 1990-2001 Analysis of cigarette price and income data from multiple jurisdictions.	Regression analysis showed that cigarettes may be more expensive in developed countries but because of high levels of income are more affordable compared to developing countries. Authors suggest non-price factors must play a stronger role in reducing cigarette consumption in high income countries.
	Leverett M, Ashe M, Gerard S, Jenson J, Woollery T. Tobacco use: the impact of prices. J Law Med Ethics 2002 Fall;30(3 Suppl):88-95.	Peer-reviewed publication: literature review Discussion of the use of taxes in multiple jurisdictions	Discussion of the effectiveness of excise tax increases on prevention and reduction of smoking, as well as factors that influence the legislative adoption of such increases

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Youth and lower socio-economic group tobacco uptake and consumption are sensitive to price.	Main C, Thomas S, Ogilvie D, Stirk L, Petticrew M, Whitehead M, et al. Population tobacco control interventions and their effects on social inequalities in smoking: placing an equity lens on existing systematic reviews. BMC Public Health. 2008;8:178.	Systematic review: review of 19 systematic reviews Analysis of population-level tobacco control interventions in US and U.K.	Review of American studies found evidence that higher prices for tobacco products are associated with lower overall levels of smoking uptake and tobacco consumption by both adolescents and young adults, especially among males and African Americans. UK data showed smoking prevalence in lowest socioeconomic group was significantly associated with price; females were more responsive to price than were males.
	Thomas S, Falter D, Miso K, Ogilvie D, Pettigrew M, Sodden A, et al. Population tobacco control interventions and their effects on social inequalities in smoking: systematic review. Tub Control. 2008 Aug; 17(4):230–7.	Systematic review: 84 studies met inclusion criteria Analysis of real-world cross-sectional or longitudinal survey data from US, U.K., France, Spain, Canada, South Africa and Taiwan	20 studies restricted to adolescents or college students found these groups were sensitive to price; the review concluded that increasing the price of tobacco products would reduce youth smoking.
	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health organization, Geneva Switzerland, 2011.	Expert body report: prevalence of tobacco control policies Tobacco taxes have been used for tobacco control purposes in a variety of countries and settings.	Does not specifically address youth and lower socioeconomic groups in high-income countries. Makes the claim that increasing tobacco price is one of the most effective measure for encouraging smokers to quit
	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Report shows that comprehensive state and community interventions, which may include increasing the unit price of tobacco products, have been effective in several US states.	Increasing tobacco product excise taxes is recommended as part of comprehensive federal, state and local comprehensive tobacco control programs.
	Botello-Harbaum MT, Haynie DL, Iannotti RJ, Wang J, Gase L, Simons-Morton B. Tobacco control policy and adolescent cigarette smoking status in the United States. Nicotine Tob Res 2009 Jul;11(7):875-885.	Peer-reviewed publication: analysis of cross-sectional survey Evidence from several US states of effect of real-world programs	Compared with students living in states with strict regulations, those living in states with no or minimal restrictions (particularly high school students) were more likely to be daily smokers. The effect reduced in logistic regression adjusted for sociodemographic characteristics and cigarette price. Analysis suggested that higher cigarette prices may discourage youth to access and consume cigarettes independent of other tobacco control measures.

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Youth and lower socio-economic group tobacco uptake and consumption are sensitive to price.	Forster JL, Widome R, Bernat DH. Policy interventions and surveillance as strategies to prevent tobacco use in adolescents and young adults. Am J Prev Med 2007 12;33(6):S335-9.	Peer-reviewed publication: non-systematic review Results from randomized community trials and cohort studies.	Most reports indicate that adolescents are at least as price-sensitive as adults.
	Liang L, Chaloupka F, Nichter M, Clayton R. Prices, policies and youth smoking, May 2001. Addiction 2003 May;98 Suppl 1:105-122.	Peer-reviewed publication: review of literature Evidence from cross-sectional and longitudinal studies concerning demand for cigarettes among American youth and price elasticity	Review cites evidence that cigarette taxation and price can reduce youth smoking.
	Ding A. Curbing adolescent smoking: a review of the effectiveness of various policies. Yale J Biol Med 2005 Jan;78(1):37-44.	Peer-reviewed publication: review of econometric publications Review of econometric studies of price elasticity of cigarettes	Increases in price affect teen smoking to a great degree, with most estimating that a 10% increase in prices (which could be implemented by a per pack tax) is associated with a 15% decrease in cigarettes consumed.
	Roeseler A, Burns D. The quarter that changed the world. Tob Control. 2010 Apr;19 Suppl 1:i3-15.	Peer-reviewed publication: analysis of review of California Tobacco Control Example of program in a US state	Review of sustained programing (including addition of 25-cent per pack tax on cigarettes and proportional tax increase on other tobacco products) conducted 1988 to 2007 in California Since 2000, youth in state have had smoking prevalence rates lower than the US average.
	Debrot K, Tynan M, Francis J, MacNeil A. State cigarette excise taxes --- United States, 2009. MMWR, 2010;59(13):385-388.	Agency report: survey of US states' cigarette excise tax increases Shows the application of tobacco taxes in various jurisdictions.	A description of states' tobacco excise tax; data not linked to smoking rates Cites other reports calling for increases in taxes to promote tobacco reduction
The low cost of tobacco in Ontario is a detriment to tobacco control measures.	Non-Smokers' Rights Association. Cigarette prices in Canada [Internet]. Toronto: Non-Smokers' Rights Association; 2012 [cited 2012 Feb 6]. Available from: *http://www.nsra-adnf.ca/cms/file/pdf/cigarette_prices_Canada_13_April_2011_map_and_table.pdf*	NGO report: price of cigarettes across Canada Shows the application of tobacco taxes in various provinces/territories	As of April 13, 2011, Ontario had the second-lowest price for a carton of 200 cigarettes of all the provinces and territories.
	Leatherdale ST, Ahmed R, Barisic A, Murnaghan D, Manske S. Cigarette brand preference as a function of price among smoking youths in Canada: are they smoking premium, discount or native brands? Tob Control 2009 Dec;18(6):466-473.	Peer-reviewed publication: analysis of cross-sectional survey Study of a practical situation regarding the effect of price on brand preference	Analysis of nationally representative survey of students in grades 5 to 12 in 2006/07 found that, among youth who smoke, those with less money or who were heavier smokers were more likely to smoke discount and native brands.

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
The low cost of tobacco in Ontario is a detriment to tobacco control measures.	Leatherdale ST, Kaiserman M, Ahmed R. The roll-your-own cigarette market in Canada: a cross-sectional exploratory study. Tob Induc Dis 2009 Mar 16;5(1):5.	Peer-reviewed publication: analysis of 2002 CTUMS data Study of a practical situation regarding the effect of price on tobacco products	17% of smokers reported smoking roll-your-own (RYO) cigarettes; they tended to be heavier smokers than those smoking manufactured cigarettes, more addicted to nicotine, and less likely to consider quitting smoking. RYO cigarettes are more common among those with lower income and education.
	Paglia-Boak, A., Adlaf, E.M., & Mann, R.E. (2011). Drug use among Ontario students, 1977-2011: Detailed OSDUHS findings (CAMH Research Document Series No. 32). Toronto, ON: Centre for Addiction and Mental Health. Available from: *http://www.camh.net/research/osdus.html.*	Agency report: analysis of Ontario Student Drug Use and Health Survey, 1977–2011 Responses to youth survey in a single setting	Tobacco the third most common drug reported in past year or lifetime use Decline in tobacco use over study period
Using a dedicated tobacco tax to fund tobacco control program.	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health organization, Geneva Switzerland, 2011.	Expert body report: prevalence of tobacco control policies National tobacco programs have been implemented and found to have an effect in a variety of countries and settings .	Cites other WHO reports in stating that increasing tobacco prices through higher taxes is the most effective intervention to reduce tobacco use and encourage smokers to quit.
	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs State and community comprehensive tobacco control programs across the US	Increasing tobacco product excise taxes is recommended as part of comprehensive federal, state and local comprehensive tobacco control program.
	US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.	Government monograph reviewed by experts Results from statewide comprehensive tobacco control programs have been encouraging but require adequate funding.	Review of aggregate and individual studies suggests that increases in cigarette prices lead to significant reduction in smoking consumption and prevalence.

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Using a dedicated tobacco tax to fund tobacco control program.	Pierce-Lavin C, Geller AC. Creating statewide tobacco control programs after passage of a tobacco tax: executive summary. Cancer 1998 Dec 15;83(12 Suppl Robert):2659-2665.	Coalition conference summary Based on results from campaigns in four US states (California, Massachusetts, Arizona, and Oregon)	Coalition paper claims that public health and policy experts widely view tobacco taxes as the single most effective method of reducing cigarette consumption. States that have dedicated tobacco tax revenue to tobacco control programs have seen an even more significant decline in tobacco use.
	Smoke-Free Ontario—Scientific Advisory Committee. Evidence to Guide Action: Comprehensive Tobacco Control in Ontario. Toronto, ON: Public Health Ontario, 2010.	Report developed by experts Cites evidence that the impact of pricing and tobacco use is consistent across time and has been observed in all parts of the world	Applied studies in different settings Cites evidence that the impact of pricing and tobacco use is consistent across time and has been observed in all parts of the world
	Roeseler A, Burns D. The quarter that changed the world. Tob Control. 2010 Apr;19 Suppl 1:i3-15.	Peer-reviewed publication: analysis of review of California Tobacco Control Analysis of tobacco control program in one jurisdiction	Sustained programming (including addition of 25-cent per pack tax on cigarettes and proportional tax increase on other tobacco products) has been linked between 1988 and 2007 with a 60% reduction in adult per capita cigarette consumption, and 35% reduction in adult smoking prevalence. From 1988 to 2004, lung and bronchus cancer rates in California fell at a rate four times that seen in rest of US, resulting in $86 billion savings in health care costs.
	Debrot K, Tynan M, Francis J, MacNeil A. State cigarette excise taxes --- United States, 2009. MMWR, 2010;59(13):385-388.	Agency short report: survey of US states' cigarette excise tax increases Shows the application of tobacco taxes in various jurisdictions (although not tied to outcomes)	A description of states' tobacco excise tax; data not linked to smoking rates Cites other reports calling for increases in taxes to promote tobacco reduction
Indexing tobacco tax to inflation and maintaining highest price.	Smoke-Free Ontario—Scientific Advisory Committee. Evidence to Guide Action: Comprehensive Tobacco Control in Ontario. Toronto, ON: Public Health Ontario, 2010.	Report developed by experts Cites evidence that the impact of pricing and tobacco use is consistent across time and has been observed in all parts of the world	Expert body advises increase in Ontario provincial tobacco taxes to address inflation and tax increases in other provinces, establishment of a minimum retail market price for tobacco, and enhanced enforcement against contraband tobacco products.
	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health organization, Geneva Switzerland, 2011	Expert body report: prevalence of tobacco control policies Tobacco taxation has been implemented in a variety of countries and settings .	Recommends that taxes should be increased periodically to offset the combined effects of inflation and increased incomes and purchasing power

Recommendation 1—*Increase tobacco tax* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Indexing tobacco tax to inflation and maintaining highest price.	Institute of Medicine. Ending the tobacco problem: A blueprint for the nation. Washington, DC: National Academy Press, 2007.	Expert consensus report based on 16 papers reviewing the literature Description of effect of tobacco control programs in US states	Comprehensive state programs have achieved substantial reductions in rates of tobacco use. Report claims that increasing cigarettes price/ excise taxes is one of the most effective policies for reducing the use of tobacco, including among adolescents. There is some evidence that effects of price increases and other antismoking measures may be independent but interventions are more effective when combined.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system*

Broaden and extend efforts to create an integrated and coordinated Ontario tobacco cessation system that builds upon existing resources in hospitals, primary care and community settings to increase access to cessation treatment and services for all tobacco users regardless of age or background.

Research Evidence—Well Supported: The stated components of the proposed system are effective tobacco cessation measures (i.e., intervention in hospitals and primary care, provision of free cessation medication, and telephone quitlines) are well-supported. **Supported:** Research evidence supports the proposed integration of the stated tobacco cessation components.

Main premise	Reference	Type of study	Key findings relative to the main premise
A systems approach to tobacco cessation has been recommended for Ontario by a number of scientific and expert committees.	US Department of Health and Human Services. The health consequences of smoking: a report of the Surgeon General. Atlanta (GA): US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.	Government monograph: the health consequences of active smoking Description of clinical and related research	Update of information on the health consequences of smoking Based on evidence of health consequence, calls for sustained and comprehensive approach, based on best practices This information should be an impetus for even more vigorous programs to reduce and prevent smoking.
	WHO. *Framework Convention on Tobacco Control: Guidelines for Implementation.* 2011. Available from: *http://whqlibdoc.who.int/publications/2011/9789241501316_eng.pdf*	Report of expert consensus process: WHO Framework Convention on Tobacco Control Guidelines for Implementation WHO monitoring of real-world tobacco control policies in low-, middle- and high-income countries	Article 14 of Guidelines recommends a comprehensive and integrated approach to address tobacco dependence and cessation.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
A systems approach to tobacco cessation has been recommended for Ontario by a number of scientific and expert committees.	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health organization, Geneva Switzerland, 2011.	Expert body report: prevalence of tobacco control policies Monitoring and analysis of tobacco control policies in low-, middle- and high-income countries	Report describes progress in implementation of the WHO Framework Convention on Tobacco Control, which provides a comprehensive direction for implementing tobacco control policy at all levels of government and across multiple strategies.
	Tobacco Strategy Advisory Group. 2010. Building On Our Gains, Taking Action Now: Ontario's Tobacco Control Strategy for 2011–2016.	Government policy Based on experience in US, cites Centers for Disease Control and Prevention recommendation for tobacco-control-spending for a jurisdiction the size of Ontario	A comprehensive smoking cessation system is recommended with a number of specific implementation considerations: ensure smoking status is assessed at all points in all settings; create a user support system; and increase the availability of cessation medication through retail outlets.
	Smoke-Free Ontario – Scientific Advisory Committee. *Evidence to Guide Action: Comprehensive Tobacco Control in Ontario.* Toronto, ON: Public Health Ontario, 2010.	Report developed by experts Cites evidence from several American states showing the effectiveness of comprehensive tobacco control programs	The Smoke-Free Ontario Scientific Advisory Committee recommends a tobacco-user support system that recognizes the complex nature of cessation, the many different approaches or means of stopping, and the need to support quitters at all points in the process.
	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Based on results of programs in multiple US states	The CDC recommends a broad range of cessation approaches and programs, including use of counselling and treatment programs, coverage for cessation medication, and making system changes in the health care system.
	Mental Health Commission of Canada. *Toward recovery and well-being: A framework for a mental health strategy for Canada.* Calgary, AB: Mental Health Commission of Canada, 2009. Available from: *http://www.mentalhealthcommission.ca.*	Jurisdictional review by a Royal Commission Based on consultations on current situation across several Canadian jurisdictions	Mental health care should be provided in a system where services are integrated and people can access services they need, regardless of where they enter the system or the underlying administrative arrangement.
	Ontario Tobacco Research Unit. Indicators of Smoke-Free Ontario progress. Monitoring and Evaluation Series, Vol. 14/15, No. 2 [Internet]. Toronto: Ontario Tobacco Research Unit; 2010 [cited 2011 Sep 8]. Available from: *http://www.otru.org/pdf/15mr/15mr_no2.pdf*	Agency report: monitoring and evaluation of smoking indicators Results of cross-sectional survey	Results of the Ontario Tobacco Survey show that young male smokers aged 19 to 29 have made an average of three quit attempts in their lifetime. Despite repeated attempts to quit, they had low awareness of the variety of quit methods available.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
A systems approach to tobacco cessation has been recommended for Ontario by a number of scientific and expert committees.	Thomsen T, Villebro N, Møller AM. Interventions for preoperative smoking cessation. Cochrane Database of Systematic Reviews 2010, Issue 7. Art. No.: CD002294. DOI: 10.1002/14651858.CD002294.pub3	Systematic review: Cochrane Collaboration review of 8 trials with 1156 participants Results of controlled and quasi-experimental studies among surgical patients	Pre-operative interventions increase short-term cessation among surgical patients and may decrease postoperative morbidity.
	Stead LF, Bergson G, Lancaster T. Physician advice for smoking cessation. Cochrane Database of Systematic Reviews 2008, Issue 2. Art. No.: CD000165. DOI: 10.1002/14651858.CD000165.pub3	Systematic review: Cochrane Collaboration of 41 trials Results of controlled and quasi-experimental studies among primary care patients	Simple brief physician advice has a small effect on cessation rates; more intensive interventions have a small additive effect.
Preoperative intervention including NRT reduces postoperative morbidity and increases short-term cessation.	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Based on evidence-based public health service's clinical practice guideline on cessation	Reminder systems for health care providers are recommended as part of comprehensive tobacco control program.
Simple advice by physician has a small effect on cessation rates.	US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.	Government report reviewed by experts Based on published research trials on brief interventions with patients	Review of literature found substantial evidence that minimal clinical interventions such as health care provider's repeated advice to quit fosters smoking cessation; more multifactorial or intensive interventions produce the best outcomes.
	Rigotti NA, Munafo MR, Stead LF. Smoking cessation interventions for hospitalized smokers: a systematic review. Arch Intern Med 2008 Oct 13;168(18):1950-1960.	Systematic review: peer-reviewed publication of Cochrane Collaboration review Randomized and quasi-randomized trials of hospitalized patients	Smoking cessation counselling with at least one month of follow-up support is effective. NRT may increase cessation rates, especially in patients with nicotine withdrawal symptoms.
	Rigotti N, Munafo' MR, Stead LF. Interventions for smoking cessation in hospitalised patients. Cochrane Database of Systematic Reviews 2007, Issue 3. Art. No.: CD001837. DOI: 10.1002/14651858.CD001837.pub2	Systematic review: Cochrane Collaboration review of 33 trials Randomized and quasi-randomized trials of hospitalized patients	High-intensity smoking cessation interventions, beginning at hospital admission and lasting at least one month after discharge home are effective in promoting cessation.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Hospital based interventions have shown to be effective.	Rice VH, Stead LF. Nursing interventions for smoking cessation. Cochrane Database of Systematic Reviews 2008, Issue 1. Art. No.: CD001188. DOI: 10.1002/14651858.CD001188.pub3	Systematic review: Cochrane Collaboration review of 42 studies Based on randomized studies among patients	There is reasonable evidence for the provision of cessation advice and/or counselling by nurses. The effectiveness of this intervention is stronger with longer interventions and when it is provided by health promotion or cessation nurses.
	Curry SJ, Keller PA, Orleans CT, Fiore MC. The role of health care systems in increased tobacco cessation. Annu Rev Public Health. 2008;29:411–28.	Systematic review: evidence in support of the health care system recommendations in the 2000 US Public Health Service Clinical Practice Guideline, Treating Tobacco Use and Dependence. Based on review of clinical literature	Measurable progress in addressing tobacco use through the health care system is summarized, including accountabilities for addressing tobacco in national health care reporting systems, increases in reported advice to quit smoking from health care providers, and wider availability of insurance coverage for tobacco cessation treatments.
There is reasonable evidence that smoking cessation advice and/or counselling provided by nurses to patients is effective.	Fiore MC, Jaén CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update. Clinical practice guideline. Rockville (MD): US Department of Health and Human Services, Public Health Service; 2008.	Government report: review on the treatment of tobacco use and dependence based on published and evidence-based research Based on review of clinical literature	Clinicians should advise patients who use tobacco to attend tobacco dependence counselling and prescribe medication treatments to these patients. Health care systems, insurers and purchasers should help clinicians in making such effective treatments available to their patients.
	Lancaster T, Fowler G. Training health professionals in smoking cessation. Cochrane Database of Systematic Reviews 2000, Issue 3. Art. No.: CD000214. DOI: 10.1002/14651858.CD000214	Systematic review: Cochrane Collaboration review of 10 trials Based on review of randomized controlled trials	Programs to train health professions in cessation increased the number of patients who received counselling; who set quit dates; and who were given follow-up appointments, materials and NRT gum. However, there was no evidence that training programs increased quit rates.
	Moore D, Aveyard P, Connock M, Wang D, Fry-Smith A, Barton P. Effectiveness and safety of nicotine replacement therapy assisted reduction to stop smoking: systematic review and meta-analysis. BMJ 2009 Apr 2;338:b1024.	Systematic review: Cochrane Collaboration review of 7 trials Results from randomized controlled trials	NRT with behavioural support is effective in sustaining smoking abstinence; its effectiveness without behavioural support is unknown.
Training health care professionals on tobacco cessation increases smoking cessation assessment. There is no strong evidence that smoking behaviour was affected.	Stead LF, Perera R, Bullen C, Mant D, Lancaster T. Nicotine replacement therapy for smoking cessation. Cochrane Database Syst Rev 2008 Jan 23;(1):CD000146.	Systematic review: Cochrane Collaboration review of 132 trials Analysis of randomized trials	All forms of commercial NRT can increase the chance of cessation.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Nicotine replacement therapy can increase the rate of cessation. This effectiveness is greatly enhanced (for both cessation and maintenance) when NRT is accompanied with behavioural support.	Wang D, Connock M, Barton P, Fry-Smith A, Aveyard P, Moore D. 'Cut down to quit' with nicotine replacement therapies in smoking cessation: a systematic review of effectiveness and economic analysis. Health Technol Assess. 2008 Feb;12(2):iii-iv, ix-xi, 1-135.	Systematic review: analysis of trials Results from 7 randomized controlled trials	NRT is effective in achieving sustained abstinence for smokers who are unwilling or unable to stop abruptly. "Cut down to quit" approaches require considerable patient-practitioner contact but this approach may be cost-effective compared with no quit attempts.
	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Based on evidence from clinical research	Reduced or eliminated co-payments for effective cessation therapies is recommended as part of comprehensive federal, state and local comprehensive tobacco control programs.
	US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.	Government report: report reviewed by experts Evidence from clinical trials	Abundant research evidence suggests that both nicotine gum and the patch are effective aids for smoking cessation, as is bupropion. There is promising evidence for clonidine, antidepressants and anxiolytics.
	World Health Organization. WHO Model Lists of Essential Medicines, 16th list (updated) March 2010. Geneva; World Health Organization. Available from: *http://whqlibdoc.who.int/hq/2010/a95060_eng.pdf*	Expert body list of recommended medications	Nicotine replacement therapy is included under medicines used in substance dependence programs.
	Cummings KM, Hyland A. Impact of nicotine replacement therapy on smoking behaviour. Annu Rev Public Health 2005 25:583-99.	Peer-reviewed publication: non-systematic review Evidence from clinical trials	Accumulated evidence from many controlled clinical trials has shown that use of NRT (gum, transdermal patch, nasal spray, inhaler and lozenge) increases quit rates compared with placebos. Not enough smokers are using NRT.
	Lane NE, Leatherdale ST, Ahmed R. Use of nicotine replacement therapy among Canadian youth: data from the 2006-2007 National Youth Smoking Survey. Nicotine Tob Res. 2011 Oct;13(10):1009–14..	Peer-reviewed publication: Analysis of 2006/07 National Youth Smoking Survey (Canada) Summary of the utilization of NRT by youth	NRT is not supposed to be sold to youth. However, 20% of current and former youth smokers in Canada had used NRT and 7% were currently using it. In logistic regression, participation in cessation counselling was significantly associated with NRT use, whereas attending antismoking classes in school was inversely associated with NRT use.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Nicotine replacement therapy can increase the rate of cessation. This effectiveness is greatly enhanced (for both cessation and maintenance) when NRT is accompanied with behavioural support.	Moore D, Aveyard P, Connock M, Wang D, Fry-Smith A, Barton P. Effectiveness and safety of nicotine replacement therapy assisted reduction to stop smoking: systematic review and meta-analysis. BMJ 2009 Apr 2;338:b1024.	Systematic review: review and meta-analysis of 7 trials Analysis of experimental trials	NRT is effective in sustaining tobacco abstinence. Most studies have included behavioural support and monitoring so it is unclear how effective NRT is if provided alone.
	Stead LF, Perera R, Bullen C, Mant D, Lancaster T. Nicotine replacement therapy for smoking cessation. Cochrane Database Syst Rev 2008 Jan 23;(1):CD000146.	Systematic review: Cochrane Collaboration of 132 trials Analysis of controlled trials	All forms of commercial NRT can increase the chance of cessation. Effectiveness of NRT appears to be independent of the amount of support provided to the smoker; however, support may still be beneficial in facilitating cessation.
Distributing free cessation medication and NRT in combination with behavioural therapy is effective at increasing reach, cessation attempts, and complete cessation.	Tinkelman D, Wilson SM, Willett J, Sweeney CT. Offering free NRT through a tobacco quitline: impact on utilisation and quit rates. Tob Control 2007 Dec;16 Suppl 1:i42-6.	Peer-reviewed publication: comparison of quit rates before and after provision of free NRT in Ohio Pre/post comparison of a program	Offering free NRT through a state quitline increased call volume and 7-day point prevalence abstinence at 6 months.
	An LC, Schillo BA, Kavanaugh AM, Lachter RB, Luxenberg MG, Wendling AH, et al. Increased reach and effectiveness of a statewide tobacco quitline after the addition of access to free nicotine replacement therapy. Tob Control 2006 Aug;15(4):286-293.	Peer-reviewed publication: comparison of quit rates before and after provision of free NRT in Minnesota Pre/post comparison of a program	The addition of free NRT to a state quitline was followed by increases in participation and abstinence rates, with an eight-fold increase in program impact. These findings support adding access to pharmacological therapy as part of state quitline services.
	Bauer JE, Carlin-Menter SM, Celestino PB, Hyland A, Cummings KM. Giving away free nicotine medications and a cigarette substitute (Better Quit) to promote calls to a quitline. J Public Health Manag Pract 2006 Jan-Feb;12(1):60-67.	Peer-reviewed publication: results from two population-based promotions for a New York State Smokers' Quitline by offering free cessation products. Comparison of an experiment in a single state quit line program	Among random sample of 732 who received a free NRT voucher, 70% redeemed the voucher and used the medication, and 22% reported they were no longer smoking. Comparison group of quitline callers who did not receive free NRT voucher had 2% quit rate.
	Cromwell J, Bartosch WJ, Fiore MC, Hasselblad V, Baker T. Cost-effectiveness of the clinical practice recommendations in the AHCPR guideline for smoking cessation. Agency for Health Care Policy and Research. JAMA. 1997 Dec 3;278(21):1759–66.	Peer-reviewed publication: cost-benefit analysis to determine the cost-effectiveness of smoking cessation interventions. Economic modelling based on real-world counselling interventions	While all clinically delivered interventions seem to be a good investment of resources, those involving more intensive counselling and the nicotine patch as adjuvant therapy are more effective and worth funding.

Recommendation 2—*Broaden and extend the integrated tobacco cessation system* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Programs to distribute free tobacco cessation medicines are effective.	Cummings KM, Fix B, Celestino P, Carlin-Menter S, O'Connor R, Hyland A. Reach, efficacy, and cost-effectiveness of free nicotine medication giveaway programs. J Public Health Manag Pract 2006 Jan-Feb;12(1):37-43.	Peer-reviewed publication: comparison of three interventions to make free nicotine patches and gum available to smokers Comparison of results from different interventions	Quit rates varied in relationship to the amount (length) of NRT provided, but in all cases cessation was higher than that of smokers not sent NRT. The offer of free NRT appeared to be a cost-effective method to get large numbers of smokers to make a quit attempt.
	Abrams DB, Graham AL, Levy DT, Mabry PL, Orleans CT. Boosting population quits through evidence-based cessation treatment and policy. Am J Prev Med. 2010 Mar;38(3 Suppl):S351–63.	Peer-reviewed publication: review of clinical practice guidelines and other sources regarding impact of five cessation treatment policies Economic modelling based on clinical practice guidelines	There is evidence that policy reducing smokers' out-of-pocket treatment costs and reimbursing providers for cessation services increases treatment use and long-term quitting.
	Stead LF, Perera R, Lancaster T. A systematic review of interventions for smokers who contact quitlines. Tob Control 2007 Dec;16 Suppl 1:i3-8.	Systematic review: peer-review publication of Cochrane Collaboration review of 14 studies Analysis of randomized or quasi-randomized trials using quitlines.	Long-term cessation is improved with multiple call-back counselling. Offering additional calls may improve cessation success rates.
	Stead LF, Perera R, Lancaster T. Telephone counselling for smoking cessation. Cochrane Database Syst Rev 2006 Jul 19;(3):CD002850.	Systematic review: Cochrane Collaboration review of 48 trials Analysis of randomized or quasi-randomized controlled trials using telephone counselling	Proactive telephone counselling is effective for smokers interested in quitting; there is a dose response relationship.
Telephone-based interventions have been shown to be effective.	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Based on evidence from clinical research	Proactive telephone cessation support services (quitlines) are recommended in the report as part of a comprehensive tobacco control program.
	Zbikowski SM, Hapgood J, Smucker Barnwell S, McAfee T. Phone and web-based tobacco cessation treatment: real-world utilization patterns and outcomes for 11,000 tobacco users. J Med Internet Res 2008 Nov 14;10(5):e41.	Peer-reviewed publication: study on a comprehensive integrated phone/web tobacco cessation program Tracking of calls and follow-up with users.	Older and moderate smokers utilized services more than younger and light or heavy smokers. Satisfaction with service was high. Thirty-day quit rate at 6-month follow up was 41% using responder analysis and 21% using intent-to-treat.

Recommendation 3—*Implement a sustained social marketing campaign*

Implement a sustained social marketing campaign that motivates tobacco users to quit, and informs tobacco users of the dangers of all types of tobacco use, and the different options and resources available within Ontario for becoming tobacco-free.

Research Evidence—Well Supported: Comprehensive tobacco control programs that include social marketing (or mass media) campaigns are effective at changing tobacco use behaviour in adults and preventing uptake among youth. **Well Supported:** Mass media campaigns are effective at increasing uptake of tobacco cessation programs and resources.

Main premise	Reference	Type of study	Key findings relative to the main premise
Use of mass media in tobacco control is effective.	Bala M, Strzeszynski L, Cahill K. Mass media interventions for smoking cessation in adults. Cochrane Database of Systematic Reviews 2008, Issue 1. Art. No.: CD004704. DOI: 10.1002/14651858.CD004704.pub2	Systematic review: Cochrane Collaboration review of 11 campaigns Controlled trials in which communities, regions or states were allocated to intervention or control conditions or interrupted time series.	There is evidence that comprehensive tobacco control programs that include mass media campaigns can be effective in changing smoking behaviour in adults, but the evidence comes from a heterogeneous group of studies of variable methodological quality.
	Niederdeppe J, Kuang X, Crock B, Skelton A. Media campaigns to promote smoking cessation among socioeconomically disadvantaged populations: what do we know, what do we need to learn, and what should we do now? Soc Sci Med. 2008 Nov;67(9):1343–55.	Systematic review: peer-reviewed systematic review of 29 articles Analysis of published research involving population surveys in US, Canada, Australia and Western European nations	Mass media campaigns to promote smoking cessation are often less effective, sometimes equally effective, and rarely more effective among socioeconomically disadvantaged (i.e., lower SES) populations than among more advantaged (i.e., higher SES) populations.
	Brinn MP, Carson KV, Esterman AJ, Chang AB, Smith BJ. Mass media interventions for preventing smoking in young people. Cochrane Database of Systematic Reviews 2010, Issue 11. Art. No.: CD001006. DOI: 10.1002/14651858.CD001006.pub2	Systematic review: Cochrane Collaboration review of 7 studies Analysis of population-level randomized trials, controlled trials without randomization and time series studies	There is some evidence that mass media can prevent the uptake of smoking in young people, but the evidence is not strong and most studies have methodological flaws.
	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health	Expert body report: prevalence of tobacco control policies Reports of mass media campaigns in low-, middle- and high-income countries	Report quotes literature and studies citing mass media campaigns as a key component of tobacco control programs.

Recommendation 3—*Implement a sustained social marketing campaign* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Use of mass media in tobacco control is effective.	Smoke-Free Ontario – Scientific Advisory Committee. Evidence to Guide Action: Comprehensive Tobacco Control in Ontario. Toronto, ON: Public Health Ontario, 2010.	Report developed by experts Mass media campaigns have been implemented in several similar settings (e.g., US states) for smoking prevention and cessation.	The report includes a recommendation to implement a sustained and intensive mass media campaign to encourage smokers to quit, either on their own or with help. The report also recommends media and social marketing to denormalize the tobacco industry, highlight the social unacceptability of tobacco, and increase public awareness and knowledge of the health effects of exposure to secondhand smoke.
	Centers for Disease Control and Prevention. Best Practices for Comprehensive Tobacco Control Programs—2007. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; October 2007.	Agency report: updating of best practices first released in 1999 based on review of evidence and state programs Based on review of published literature, including reports of population-level campaigns	Funding and implementation of long-term, high-intensity mass media campaigns using paid broadcasting and media messages developed through formative research are recommended as parts of a comprehensive federal, state and local comprehensive tobacco control program.
	US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.	Government report reviewed by experts Results of large-scale public health programs in the US	Community- and media-based programs have the potential to reach large numbers of smokers who do not seek out formal treatment, although results from major randomized trials and community-based efforts have been disappointing.
	Sowden AJ, Arblaster L. Mass media interventions for preventing smoking in young people. Cochrane Database Syst Rev. 2000;(2):CD001006.	Systematic review: Cochrane Collaboration review of 6 studies Analysis of randomized trials, controlled trials without randomization and time series	There is some evidence that the mass media can be effective in preventing the uptake of smoking in young people, but overall the evidence is not strong.
	Pechman C, Slater M. Social marketing messages that may motivate irresponsible consumption behavior. In: Ratneshwar S, Mick DB, editors. Inside consumption: consumer motives, goals and desires. New York: Routledge; 2005. p. 185–207. Available from: *http://web.gsm.uci.edu/antismokingads/articles/cpAdverseCH.pdf*	Review of literature published as book chapter Based on selective review of programs in multiple jurisdictions	Most of the problems with social marketing campaigns can be avoided by learning how to avoid potential adverse effects. High-quality audience research should be conducted, as should quantitative pretesting of messages.

Recommendation 3—*Implement a sustained social marketing campaign* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Use of mass media in tobacco control is effective.	National Cancer Institute. The role of the media in promoting and reducing tobacco use. Tobacco control monograph no. 19. Bethesda (MD): US Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 2008.	Monograph summarizing a comprehensive and critical review and synthesis of current evidence Discussion of communication theories and research	Media plays a critical role in tobacco control by helping to counterbalance pro-tobacco marketing and cues in the environment. Media channels commonly used for tobacco control advertising include television, radio, print and billboards.
	Biener L, Reimer RL, Wakefield M, Szczypka G, Rigotti NA, Connolly G. Impact of smoking cessation aids and mass media among recent quitters. Am J Prev Med. 2006 Mar;30(3):217–24.	Peer-reviewed publication: analysis of public opinion poll of Massachusetts residents 2001/02 Study of reaction to state mass media campaigns among of sample of recent quitters	Analyses showed that television advertisements were the most frequently mentioned source of help among recent quitters, particularly among those who were younger or had remained abstinent for more than six months. Older more dependent smokers were most likely to find conventional aids helpful.
	McAlister A, Morrison TC, Hu S, Meshack AF, Ramirez A, Gallion K, et al. Media and community campaign effects on adult tobacco use in Texas. J Health Commun. 2004 Apr;9(2):95–109.	Peer-reviewed publication: study of panel of 622 daily smokers Outcomes of a comprehensive tobacco-use prevention and cessation program in Texas	Treatment that combined cessation activities with high-level media campaigns produced rates of smoking reduction almost three times that of areas that received no service. Combined treatment produced smoking cessation rates almost double those in areas with media campaigns alone.
	Sheffer MA, Redmond LA, Kobinsky KH, Keller PA, McAfee T, Fiore MC. Creating a perfect storm to increase consumer demand for Wisconsin's Tobacco Quitline. Am J Prev Med. 2010 Mar;38(3 Suppl):S343–6.	Peer-reviewed publication: description of implementation of free two-week supply of over-the-counter NRT by Wisconsin quit line Description of a quitline intervention in Wisconsin	Consumer demand for quitline services can be improved by increasing service visibility and by providing free NRT.
	Abrams DB, Graham AL, Levy DT, Mabry PL, Orleans CT. Boosting population quits through evidence-based cessation treatment and policy. Am J Prev Med. 2010 Mar;38(3 Suppl):S351–63.	Peer-reviewed publication: an analytic framework and selected literature review that guides two subsequent computer simulation modelling papers Review of the clinical literature and modelling	An analytic framework to inform heuristic simulation models of population smoking cessation Modelling of the implementation of a defined set of treatments and treatment-related policies
	Health Canada. 2008-2009 National Youth Smoking Survey [Internet]. Ottawa: Health Canada; 2010 [cited 2011 Sep 15]. Available from: *http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_survey-sondage_2008-2009/table-eng.php#tab04b*	Government report: survey monitoring tobacco use in school-aged children (grades 6–12) Description of data at the national and regional levels	This report examines the number of smokers who could be influenced by social marketing and the age group distributions of at-risk smokers.

Recommendation 3—*Implement a sustained social marketing campaign* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Use of mass media in tobacco control is effective.	Health Canada. 2009 Canadian tobacco use monitoring survey [Internet]. Ottawa: Health Canada; 2010 [cited 2011 Sep 15]. Available from: *http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutc_2009/ann-eng.php#t2*	Government report: survey whose objective is to track changes in smoking status and amount smoked, especially for 15-24-year-olds, who are most at risk for taking up smoking. Description of data at the national and regional levels	This report examines the number of smokers who could be influenced by social marketing and the age group distributions of at-risk smokers.
	Smoking Profile for Canada. Youth Smoking Survey 2008/2009. Waterloo: Propel Centre for Population Health Impact, University of Waterloo (n.d.). Available from: *http://www.yss.uwaterloo.ca/results/YSS2008-2009_national_smoking_profile.pdf*	Expert report: analysis of youth smoking survey Reference to smoking statistics in a single jurisdiction; interventions suggested but not based on review of evidence	Analysis of results of Youth Smoking Survey and summary of potential intervention approaches.
	Social Marketing [Internet]. Washington, DC: Social Marketing Institute [cited 2001 Nov 15]. Available from: *http://www.social-marketing.org/sm.html*	Website of Social Marketing Institute	Social marketing is the planning and implementation of programs designed to bring about social change using concepts from commercial marketing. Among the important marketing concepts are: • The ultimate objective of marketing is to influence action • Action is undertaken whenever target audiences believe that the benefits they receive will be greater than the costs they incur • Programs to influence action will be more effective if they are based on an understanding of the target audience's own perceptions of the proposed exchange.

Recommendation 4—*Ban smoking on bar and restaurant patios*

The *Smoke-Free Ontario Act* to include the prohibition of smoking on unenclosed bar and restaurant patios (including a buffer zone of nine metres from the perimeter of the patio).

Research Evidence—Well Supported: Indoor smoking bans and restrictions have been proven effective in reducing ETS exposure; outdoor environmental tobacco smoke (ETS) concentration levels on bar and restaurant patios can compare with indoor ETS concentrations where smoking takes place. **Supported:** There is an expected preventative effect from bans to reduce exposures in unenclosed environments.

Main premise	Reference	Type of study	Key findings relative to the main premise
Individuals (employees, patrons) working in outdoor bars and patios are exposed to harmful tobacco smoke.	US Department of Health and Human Services. How tobacco smoke causes disease: The biology and behavioural basis for smoking-attributable disease - A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2010.	Government monograph: the burden of tobacco use and the associated evidence and impetus to increase the urgency to end the epidemic Summary of clinical research on the effects of tobacco smoke	States and localities should enact complete bans on smoking in all non-residential indoor locations, including workplaces, malls, restaurants and bars. Local authorities should have the right to make smoking regulations as restrictive as they want.
	US Department of Health and Human Services. The health consequences of smoking: a report of the Surgeon General. Atlanta (GA): US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.	Government monograph: the health consequences of active smoking Summary of clinical research on the effects of tobacco smoke	This update of a 1964 report on evidence on health risk of tobacco smoke describes the high level of activity in the US to achieve clean indoor air quality at both the local and state levels. More communities and states are considering and adopting laws that cover even more venues.
	Holowaty EJ, Cheong SC, Di Cori S, Garcia J, Luk R, Lyons C. Tobacco or health in Ontario: tobacco attributed cancers and deaths over the past 50 years... and the next 50. Toronto: Cancer Care Ontario; 2002.	Agency monograph: the incidence, mortality and survival for tobacco-related cancers Estimation of disease burden in Ontario	ETS is an important source of exposure to toxic gases and particulates in indoor air. Despite an increasing number of restrictions on smoking in workplaces, public places and households, exposures continue to be a major public health concern in Ontario.

Recommendation 4—*Ban smoking on bar and restaurant patios* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Individuals (employees, patrons) working in outdoor bars and patios are exposed to harmful tobacco smoke.	Klepeis NE, Ott WR, Switzer P. Real-time measurement of outdoor tobacco smoke particles. J Air Waste Manag Assoc. 2007 May;57(5):522–34.	Peer-reviewed publication: observational study (real-time monitoring) of outdoor tobacco smoke particle concentrations. Measurement of outdoor tobacco smoke levels	Results demonstrate that outdoor tobacco smoke (OTS) can be high in locations near active smokers. This supports the development of outdoor tobacco control policy.
	Zhang B, Bondy S, Ferrence R. Do indoor smoke-free laws provide bar workers with adequate protection from secondhand smoke? Prev Med. 2009 Sep;49(2-3):245–7.	Peer-reviewed publication: observational study on 25 bars in Toronto Observation study of multiple sites in one community to establish secondhand smoke levels on patios	Smoking on patios was common and air carcinogenic particulate levels rose with the number of lit cigarettes. Complete smoking bans including outdoor workspaces are needed to adequately protect hospitality workers from secondhand smoke.
	Singer BC, Hodgson AT, Guevarra KS, Hawley EL, Nazaroff WW. Gas-phase organics in environmental tobacco smoke. 1. Effects of smoking rate, ventilation, and furnishing level on emission factors. Environ Sci Technol. 2002 Mar 1;36(5):846–53.	Peer-reviewed publication: experimental study modelling/simulating realistic smoking conditions in residences and offices Experimental modelling of smoke-related carcinogenic compounds under different conditions	This study looked at levels of environmental tobacco smoke-related carcinogenic compounds occurring in a "typical" room when controlling for smoking rate, type of furnishings, and level of ventilation.
Effect of smoking restriction in enclosed places.	Callinan JE, Clarke A, Doherty K, Kelleher C. Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. Cochrane Database Syst Rev. 2010 Apr 14;(4):CD005992.	Systematic review: Cochrane Collaboration review of 50 studies Review of published literature on effect of smoking bans	There was consistent evidence from the studies reviewed that smoking bans reduced exposure to SHS in workplaces, restaurants, pubs and public places.
	Hopkins DP, Briss PA, Ricard CJ, Husten CG, Carande-Kulis VG, Fielding JE, et al. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. Am J Prev Med. 2001 Feb;20(2 Suppl):16–66.	Systematic reviews: peer-reviewed publication of systematic review conducted for Task Force on Community Preventive Services Systematic review of 54 studies regarding the effectiveness of smoking bans or restrictions	From the studies reviewed, there was strong evidence for the effectiveness of smoking bans/restrictions in reducing exposure to environmental secondhand smoke.
	Hopkins DP, Razi S, Leeks KD, Priya Kalra G, Chattopadhyay SK, Soler RE. Smoke-free policies to reduce tobacco use. A systematic review. Am J Prev Med. 2010 Feb;38(2 Suppl):S275–89.	Systematic review: peer-review of 37 studies Analysis of studies that evaluated changes in tobacco-use prevalence or cessation after smoke-free policies were implemented	Smoke-free policies reduce tobacco use among workers when implemented in worksites or in communities. Four studies demonstrated economic benefits from smoke-free workplace policies.

Recommendation 4—*Ban smoking on bar and restaurant patios* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Effect of smoking restriction in enclosed places.	Mackay DF, Irfan MO, Haw S, Pell JP. Meta-analysis of the effect of comprehensive smoke-free legislation on acute coronary events. Heart. 2010 Oct;96(19):1525-30. Epub 2010 Aug 23.	Systematic review: peer-reviewed publication of systematic review and meta-analysis of 17 studies. Review of studies from North American, Europe and Australasia showing effect on acute coronary event rates following introduction of smoke-free legislation	Large body of evidence shows a reduction in acute coronary events following the implementation of comprehensive smoke-free legislation, with the effect increasing over time.
	Meyers DG, Neuberger JS, He J. Cardiovascular effect of bans on smoking in public places: a systematic review and meta-analysis. J Am Coll Cardiol. 2009 Sep 29;54(14):1249-55.	Systematic review: peer-reviewed publication of systematic review and meta-analysis of 10 studies Analysis of 11 reports from 10 studies in various jurisdictions showing CVD outcomes following smoking bans	Smoking bans in public places and workplaces are associated with a significant reduction in heart attack (acute myocardial infarction) incidence, particularly if enforced over several years.
	World Health Organization. WHO Report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. World Health organization, Geneva Switzerland, 2011.	Expert body report: prevalence of tobacco control policies Smoking restrictions have been implemented in a variety of countries and settings	Since 2008, 16 additional countries have passed national legislation banning smoking in all public places and workplaces, including bars and restaurants. This is seen as an important indicator of progress.
	International Agency for Research on Cancer. Handbook of cancer prevention, tobacco control, vol. 13: evaluating the effectiveness of smoke-free policies [Internet]. Lyon, Fr: WHO Press; 2008 [cited 2011 Nov 15]. Available from: *http://www.iarc.fr/en/publications/pdfs-online/prev/handbook13/handbook13-0.pdf; Summary:http://dev.ersnet.org/uploads/Document/62/WEB_CHEMIN_3224_1215093687.pdf*	Expert review of the evidence on the effectiveness of tobacco control policies implemented to protect nonsmokers from secondhand tobacco smoke (SHS). Review of evidence of bans from different jurisdictions	Exposure to secondhand smoke is decreased in high-exposure settings by 80-90% through smoke-free policies. Policies can reduce overall exposure by up to 40%. Working group concluded there was strong evidence that smoke-free workplaces decrease the prevalence of adult smoking and tobacco use in youth.
	US Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. Atlanta (GA): US Dept. of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2006. Available from: *http://www.surgeongeneral.gov/library/secondhandsmoke/report/index.html*	Government report evaluating the evidence concerning the health effects of involuntary exposure to tobacco smoke Summary of clinical evidence regarding the real-world health effects of secondhand smoke	Secondhand smoke is detrimental to health; there is no risk-free level of exposure. Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke. Separating smokers from nonsmokers, cleaning the air and ventilating buildings cannot eliminate exposure of nonsmokers to second hand smoke.

Recommendation 4—*Ban smoking on bar and restaurant patios* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Effect of smoking restriction in enclosed places.	California Environmental Protection Agency, Air Resources Board. Proposed identification of environmental tobacco smoke as a toxic air contaminant. San Francisco: Surveys and Program Evaluations from Outside UCSF, Center for Tobacco Control Research and Education, UC San Francisco; 2005.	Expert report: exposures to environmental tobacco smoke and the potential health effects associated with these exposures Implementation of program in a US setting	Implementation of smoking restrictions in the workplace and public places in California has greatly reduced the overall exposure of non-smokers to ETS.
	Hopkins DP, Fielding JE. The guide to community preventive services: tobacco use prevention and control: reviews recommendations, and expert commentary (Cessation - Increasing the Unit Price of Tobacco Products). Am J Prev Med. 2001;20(2):1-88. Available from: *http://www.thecommunityguide.org/tobacco/tobac-AJPM-evrev.pdf*	Systematic review: peer-reviewed publication of review conducted using Guide to Community Preventive Services method Review of programs implemented in multiple jurisdictions	Reviews and summarizes strength of scientific evidence regarding strategies to reduce exposure to environmental tobacco smoke and to reduce smoking initiation and prevalence.,
	US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.	Government report reviewed by experts Analysis of programs in different US states	Literature shows smoking restrictions are supported by smokers. Restrictions reduce exposure of nonsmokers to environmental tobacco smoke and may contribute to decreases in consumption and prevalence of smoking.
Banning tobacco use in unenclosed bar and restaurant patios.	Non-Smokers' Rights Association. Compendium of smoke-free workplace and public place bylaws [Internet]. Toronto: Non-Smokers' Rights Association; 2009 [cited 2011 Nov 15]. Available from: *http://www.nsra-adnf.ca/cms/file/Compendium_Fall_2009.pdf*	NGO report: compendium of smoke-free workplace and public place by-laws throughout Canada. Shows tobacco regulation has been implemented in a variety of Canadian settings.	All provinces and territories have, to some extent, enacted by-laws that regulate smoking in unenclosed areas.
	Ontario Tobacco Research Unit. Indicators of Smoke-Free Ontario progress. Monitoring and Evaluation Series, Vol. 14/15, No. 2 [Internet]. Toronto: Ontario Tobacco Research Unit; 2010 [cited 2011 Sep 8]. Available from: *http://www.otru.org/pdf/15mr/15mr_no2.pdf*	Expert report: the monitoring and evaluation of Smoke-Free Ontario indicators Results of survey of Ontarians	Over the first six months of 2008, 3 in 4 Ontario adults (75%) agreed that smoking should not be allowed on restaurant and bar patios, a significant increase over 2007 (61%) and a substantial increase from the level of support in 2005.

Recommendation 4—*Ban smoking on bar and restaurant patios* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Banning tobacco use in unenclosed bar and restaurant patios.	Smoke-Free Ontario Act, S.O. 1994, c. 10. Last amendment: 2010, c. 1, Sched. 27.	Government regulation	The Smoke-Free Ontario Act, which came into force on May 31, 2006, assures a gold standard level of protection in indoor workplaces and public places. Smoking is prohibited on outdoor patios if the patio has a partial or complete roof, regardless of whether the roof is permanent or made of temporary coverings.
	Warren CW, Jones NR, Peruga A, Chauvin J, Baptiste JP, Costa de Silva V, et al. Global youth tobacco surveillance, 2000-2007. MMWR Surveill Summ 2008 Jan 25;57(1):1-28. Available from: *http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5701a1.htm.*	Agency report: analysis from 140 WHO member states; cross-sectional, school-based surveys, 2000–2007 Presentation of findings from programs in different countries	Half (55%) of students were exposed to second hand smoke in public places and exposure was highest in Europe (86%). More than three-quarters of students in all regions thought smoking should be banned in all public places.

Recommendation 5—*Maintain and reinforce socially responsible pricing*

Maintain and reinforce the socially responsible pricing of alcohol by:

a) Establishing minimum pricing per standard drink across all alcoholic beverages indexed to inflation

b) Maintaining average prices at or above the consumer price index

c) Adopting disincentive pricing policies for higher alcohol content beverages to create disincentives for the production and consumption of higher-strength alcoholic beverages, and to reduce the overall per capita level consumption of ethyl alcohol

Research Evidence—Well Supported: As is the case with tobacco, pricing and taxation are arguably the strongest countermeasures to control alcohol-related problems including chronic diseases. An extensive body of research, including a systematic review of over 100 studies, confirms the effectiveness of high taxation levels and minimum alcohol prices as deterrents to high levels of consumption.

Main premise	Reference	Type of study	Key findings relative to the main premise
Price increases serve as a disincentive for alcohol consumption.	Gallet CA. The demand for alcohol: a meta-analysis of elasticities. Aust J Agric Resour Econ. 2007;51(2):121–35.	Systematic review: meta-analysis of 132 studies concerning price, income and/or advertising elasticities of alcohol demand Econometric analysis of multiple studies, including those utilizing real data from multiple jurisdictions	Optimal tax on alcohol should take into account the differences in price elasticity across beverages and consumer age groups. Teens are the least responsive to price so policies for this age group will need to involve other approaches.

Recommendation 5—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Price increases serve as a disincentive for alcohol consumption.	Anderson P, Chisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. Lancet2009;373:2234-46	Systematic review: peer-reviewed analysis of published systematic reviews and meta-analyses Based on analysis of studies, including those utilizing real data from multiple jurisdictions	Results found price elasticity in short- and long-term, with elasticities lower for beer than wine or spirits. Increasing taxes and setting minimum price categorized as having high level of evidence (more than one systematic review).
	Chaloupka FJ, Grossman M, Saffer H. The effects of price on alcohol consumption and alcohol-related problems. Alc Res Health2002;26:22-34	Systematic review: peer-reviewed publication analyzing studies concerning effect of price on consumption and adverse consequences Based on analysis of studies, including those utilizing real data from multiple jurisdictions	Majority of research supports the view that increases in the price of alcoholic beverages (which can be achieved by raising federal, state and local alcohol taxes), significantly reduce alcohol consumption.
	Elder RW, Lawrence B, Ferguson A, Naimi TS, Brewer RD, Chattopadhyay SK, Toomey TL, Fielding JE. The effectiveness of tax policy interventions for reducing excessive alcohol consumption and related harms. Task Force on Community Preventive Services. Am J Prev Med. 2010 Feb;38(2):217-29.	Systematic review: peer-reviewed publication of systematic review of 72 papers or technical reports published to July 2005 Based on analysis of studies, including those utilizing real data from multiple jurisdictions	Six of nine studies assessing drinking prevalence among young people found that higher prices or taxes were associated with lower prevalence of drinking. Nine studies that assessed the relationship between price or taxes and alcohol consumption patterns in adults or in the general population also generally found increasing prices or taxes tended to reduce the prevalence of excessive alcohol consumption and related harms.
	Wagenaar AC, Salois MJ, Komro KA. Effects of beverage alcohol price and tax levels on drinking: a meta-analysis of 1003 estimates from 112 studies. Addiction. 2009 Feb;104(2):179-90. Review.	Systematic review: peer-reviewed publication of systematic review of 112 studies Based on analysis of studies, including those utilizing real data from multiple jurisdictions	The review concludes that there is a large literature establishing that beverage alcohol prices and taxes are related inversely to drinking. Effects are large compared to other preventive interventions. Accordingly, public policies that raise alcohol prices may be an effective means of reducing drinking.

Recommendation 5—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Price increases serve as a disincentive for alcohol consumption.	Kendall P. Public health approach to alcohol policy: an updated report from the Provincial Health Officer [Internet]. Victoria (BC): Office of the Provincial Health Officer; 2008 [cited 2011 Sep 15]. Available from: *http://www.health.gov.bc.ca/library/publications/year/2008/alcoholpolicyreview.pdf*	Government report: update of a 2002 report, assessing impact of 2002 policy change, with review of best practice policies Review of best practice policies in B.C. and Canada	Recommendations to reduce harm include: • continue monitoring consumption patterns and assessing benefit/cost ratio • focus on initiatives to reduce harmful use by youth/young adults such as adjusting prices to reflect alcohol content, keeping pace with cost of living and preventing the discounting of high-alcohol-content drinks; • support communities in forming partnerships and implementing programs to reduce harm • implement small levy based on standard drinks and use proceeds for treatment, prevention and research
	Babor T, Caetano R, Caswell S, Edwards G, Giesbrecht N, Graham K, et al. Alcohol: no ordinary commodity: research and public policy (2nd ed). Oxford; New York: Oxford University Press; 2010.	Expert panel monograph of background papers reviewing evidence for alcohol policy options Review of applied studies and practical evidence	Chapter 8 (Controlling Affordability: pricing and taxation) summarizes meta-analyses and systematic reviews confirming effectiveness of taxation and pricing as countermeasures to consumption.
	Fogarty J. The nature of the demand for alcohol: understanding elasticity. Br Food J. 2006 Apr 1;108(4):316–32.	Peer-reviewed publication: meta-analysis of price elasticity of 64 studies in 18 countries. Analysis of studies utilizing data from multiple jurisdictions	When variables such as study design are controlled for, demand for alcoholic beverages became increasingly inelastic up to 1969. After 1969, price became decreasingly inelastic. The average price elasticity in developed countries is –0.38 for beer, –0.77 for wine and –0.7 for liquor.
	Makela P, Rossow I, Tryggvesson K. Who drinks more and less when policies change. In: Room R, editor. The effects of Nordic alcohol policies. Helsinki: Nordic Council for Alcohol and Drug Research; 2002. p. 17–70. Available from: *http://www.drugslibrary.stir.ac.uk/documents/nad42.pdf*	Expert monograph: detailing the impact of alcohol policies in Nordic countries. Review of published literature on effects of alcohol policies in different Nordic countries	Price elasticities in Nordic countries are highest for wine, then for vodka and other spirits, and lowest for beer.
	Giesbrecht N, Stockwell T, Kendall P, Strang R, Thomas G. Alcohol in Canada: reducing the toll through focused interventions and public health policies. CMAJ. 2011 Mar 8;183(4):450–5.	Peer-reviewed publication: non-systematic review of alcohol-related policies Examines evidence from WHO and published literature on effects of policies in different jurisdictions	This review cites evidence from WHO and meta-analysis showing support for pricing interventions. Pricing of alcohol products should be structured so prices increase as percentage of alcohol content increases. There should be a fixed minimum retail price indexed to the cost of living.

Recommendation 5—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Minimum pricing is effective in reducing consumption of alcoholic drinks.	WHO Regional Office for Europe. Evidence for the effectiveness and cost-effectiveness of interventions to reduce alcohol-related harm. 2009. Available from: *http://www.euro.who.int/__data/assets/pdf_file/0020/43319/E92823.pdf*	Expert consensus report: evidence-based approach to alcohol policies Analysis of effects of different interventions in different jurisdictions	Policies that increase alcohol prices have a number of effects on youth drinking such as: delaying the initiation of drinking; slowing the progression towards drinking larger amounts; and reducing heavy drinking. Data from the UK show that setting a minimum price per gram of alcohol can be as effective as an across-the-board tax increase.
	Meier P, Meng Y, Purshouse R, Brennan A. Model-Based Appraisal of Alcohol Minimum Pricing and Off-Licensed Trade Discount Bans In Scotland Using Sheffield Alcohol Policy Model (v2) – An Update Based on Newly Available data. University of Sheffield, 2010. Available from: *http://www.scotland.gov.uk/Resource/Doc/309903/0097778.pdf*	Government report: modelling of effect of minimum pricing and off-licence trade discount bans in Scotland Modelling based on real data from a single jurisdiction	Modelling shows that increasing minimum pricing is associated with steep increases in effectiveness in changing the level of alcohol consumption. Increases are also linked to reduction in alcohol-related hospital admission and deaths, alcohol-related crime and absenteeism from work.
	Meier P, et al. The independent review of the effects of alcohol pricing and promotion. Summary of evidence to accompany report on phase 1: Systematic Reviews. School of Health and Related Research, University of Sheffield, UK, 2008. Available from: *http://www.sheffield.ac.uk/polopoly_fs/1.95617!/file/PartA.pdf* *http://www.sheffield.ac.uk/polopoly_fs/1.95617!/file/PartA.pdf*	Expert report: evidence summary based on systematic review principles (63 studies including 2 meta-analyses) Analysis of published literature, including those utilizing real data from multiple jurisdictions	Although low quality, there is evidence suggesting that minimum pricing might be effective as a targeted public health policy in reducing consumption of cheap drinks. Evidence also suggests that such a policy may be acceptable to many members of the community.
	Christie B. Scotland will set minimum price for a unit of alcohol. BMJ. 2011;343:d5869.	Other: descriptive article	The Scottish parliament has announced that it will introduce legislation to set a minimum price on alcohol to curb the harm of overconsumption.
	Government of Saskatchewan. Beverage alcohol prices to increase [Internet]. 2010 [cited 2012 Feb 2]. Available from: *http://www.gov.sk.ca/news?newsId=b5617ca1-aa9f-454c-9e42-f5215af97796*	Other: government news release	Saskatchewan Liquor and Gaming Authority will strengthen its existing social reference pricing by establishing minimum prices based on the amount of alcohol contained in a product. The measure is intended to help reduce the over-consumption of products with high alcohol content.

Recommendation 5—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Keeping average minimum price above CPI is an effective measure to reduce consumption.			No evidence to support the fact that maintaining average prices at or above the consumer price index would be a deterrent to alcohol consumption, but based on evidence that disincentive pricing has had the widest impact on alcohol control policies, this is a sound theory.
Users of higher alcohol content beverages tend to be heavier drinkers and are not aware of the associated risks.	Mann RE, Stoduto G, Pavic B, Anglin L, Macdonald S, Wells S, Lauzon R, Fallon F, Giesbrecht N, Adlaf EM. Introduction of high-alcohol beer in Ontario: preliminary observations on its use by underage drinkers. Can J Public Health. 1997 Mar-Apr;88(2):114-8.	Peer-reviewed publication: survey of 405 students under the age of 19 3-7 months after introduction of high-alcohol beer Description of attitudes and behaviours of students in a single jurisdiction (no intervention studied)	Half of students who had drunk alcohol within the previous four weeks reported consuming high-alcohol beer. Those who did tended to be heavier drinkers and more likely to experience alcohol-related problems. Both male and female high-alcohol beer consumers drank more frequently, got intoxicated more frequently, and drank five or more drinks on the same occasion more frequently than did non-consumers.
	Hasking P, Shortell C, Machalek M. University students' knowledge of alcoholic drinks and their perception of alcohol-related harm. J Drug Educ. 2005;35(2):95-109.	Peer-reviewed publication: survey of 371 Australian university students Description of attitudes and behaviours of students in a single jurisdiction (no intervention studied)	Students were generally inaccurate in their estimate of alcoholic content, potential harm of beverages and guidelines for low risk drinking. Students also held different perceptions regarding the potential harm of alcoholic beverages.

Recommendation 6—*Ensure effective controls on alcohol availability*

Control the overall risk of exposure to alcohol by:

a) Ensuring that there is no increase in hours of sale

b) Ensuring that the overall population density of on and off-premise outlets per capita does not increase

c) Not undertaking further privatization of "off-premise" alcohol retail sales in Ontario

Research Evidence—Well Supported: Increased physical availability of alcohol is associated with increased consumption and related alcohol problems. A substantive body of research demonstrates that controls on physical availability, through restrictions on hours of sale, population density of outlets, and off-premise monopoly sales systems, are effective measures against high levels of alcohol consumption.

Main premise	Reference	Type of study	Key findings relative to the main premise
Restricting availability of alcohol is an effective measure to reduce alcohol consumption and prevent alcohol-attributable harm.	Popova S, Giesbrecht N, Bekmuradov D, Patra J. Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review. Alcohol Alcohol. 2009 Sep-Oct;44(5):500-16. Review.	Systematic review: peer-reviewed systematic review of 44 studies on density of alcohol outlets and 15 on hours and days of sale Analysis of studies that looked at the relationship between alcohol consumption and outlet density and hours of operation	Higher alcohol outlet density was associated with higher overall consumption and frequency of drinking, although results were not consistent across studies. Of the studies that looked at impact of hours and days of sales, most saw increased harm with increased access. There was limited information suggesting this could also increase consumption, especially among youth.
	Middleton JC, Hahn RA, Kuzara JL, Elder R, Brewer R, Chattopadhyay S, Fielding J, Naimi TS, Toomey T, Lawrence B. Effectiveness of policies maintaining or restricting days of alcohol sales on excessive alcohol consumption and related harms. Task Force on Community Preventive Services. Am J Prev Med. 2010 Dec;39(6):575-89. Review.	Systematic review: peer-reviewed publication of review (14 studies) that met qualifying criteria using methods of Guide to Community Preventive Services Review of studies from different jurisdictions that assessed the effects of changing days of operation	Eleven studies found that increasing the number of days alcohol is sold did not increase excessive alcohol consumption or alcohol-related harms. Three studies assessed the effect of reducing the number of days on which alcohol was sold and generally found decreased alcohol-related harm.

Recommendation 6—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Restricting availability of alcohol is an effective measure to reduce alcohol consumption and prevent alcohol-attributable harm.	Hahn RA, Kuzara JL, Elder R, Brewer R, Chattopadhyay S, Fielding J, Naimi TS, Toomey T, Middleton JC, Lawrence B. Effectiveness of policies restricting hours of alcohol sales in preventing excessive alcohol consumption and related harms. Task Force on Community Preventive Services. Am J Prev Med. 2010 Dec;39(6):590-604. Review.	Systematic review: peer-reviewed publication of review (10 studies) using methods of Guide to Community Preventive Services Review of studies from different jurisdictions that assessed the effects of changing days of operation	All studies looked at the effect of increasing hours of sale in on-premise settings in high-income nations. Changes of less than two hours were unlikely to significantly affect excessive alcohol consumption and related harms. But increasing hours of sale by more than two hours increased alcohol-related harm.
	Kendall P. Public health approach to alcohol policy: an updated report from the Provincial Health Officer [Internet]. Victoria (BC): Office of the Provincial Health Officer; 2008 [cited 2011 Sep 15]. Available from: *http://www.health.gov.bc.ca/library/publications/year/2008/alcoholpolicyreview.pdf*	Government report: update of 2002 report, assessing impact of 2002 policy change, with review of best practice policies Review of impact of policy change in a single jurisdiction	Recommendations to reduce harm include: • focus on initiatives to reduce harmful use by youth/young adults such as strengthening ID enforcement compliance • support communities in forming partnerships and implementing programs to reduce harm
	Babor T, Caetano R, Caswell S, Edwards G, Giesbrecht N, Graham K, et al. Alcohol: no ordinary commodity: research and public policy (2nd ed). Oxford; New York: Oxford University Press; 2010.	Expert panel monograph of background papers reviewing evidence for alcohol policy options Review of applied studies and practical evidence	Chapter 9 (Regulating the physical availability of alcohol) summarizes meta-analyses and systematic reviews confirming effectiveness of policies restricting availability of alcohol as countermeasures to consumption.
	Anderson P, Baumberg B. Alcohol in Europe. A public health perspective. London: Institute of Alcohol Studies, 2006. Available from: h*ttp://ec.europa.eu/health/archive/ph_determinants/life_style/alcohol/documents/alcohol_europe_en.pdf* (accessed Dec 1, 2008).	Expert report derived from synthesis of published reviews, systematic reviews, meta-analyses and individual papers, as well as an analysis of data made available by the European Commission and the World Health Organization Review of studies looking at relationship between policies and alcohol consumption in multiple jurisdictions	This review found good evidence (5 or more studies) showing regulating minimum drinking age and government retail outlets are highly effective policies; 5+ studies showing restricting hours and days of sale are highly effective; 2–4 studies showing restricting density of outlets has a moderate effective; and only 1 study showing restricting number of outlets has a moderate effect.
	Giesbrecht N, Stockwell T, Kendall P, Strang R, Thomas G. Alcohol in Canada: reducing the toll through focused interventions and public health policies. CMAJ. 2011 Mar 8;183(4):450–5.	Peer-reviewed publication: non-systematic review of literature on alcohol-related policies. Review of research in multiple jurisdictions	Substantial international research shows that high per capita or geographic density of alcohol outlets and extended hours and days of sale are associated with high-risk drinking and alcohol-related problems.

Recommendation 6—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Regulating alcohol outlet density is a useful public health tool for the reduction of excessive alcohol consumption and related harms.	Popova S, Giesbrecht N, Bekmuradov D, Patra J. Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review. Alcohol Alcohol. 2009 Sep-Oct;44(5):500-16. Review.	Systematic review: peer-reviewed systematic review of 44 studies Review of research in multiple jurisdictions	Alcohol consumption rates or prevalence of drinking-related problems were found to be higher in jurisdictions with a higher density of outlets, compared to those areas with a lower density. The review concludes that controls on hours and days of sale and on alcohol outlet density are effective control measures.
	Campbell CA, Hahn RA, Elder R, Brewer R, Chattopadhyay S, Fielding J, Naimi TS, Toomey T, Lawrence B, Middleton JC. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. Task Force on Community Preventive Services. Am J Prev Med. 2009 Dec;37(6):556-69. Review.	Systematic review: peer-reviewed publication reviewing 88 articles and books selected using methods of Guide to Community Preventive Services Review of research in multiple jurisdictions	Most of the studies included in this review found that greater outlet density is associated with increased alcohol consumption and related harms. Primary evidence was supported by secondary evidence from correlational studies.
	Anderson P, Chisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. Lancet 2009;373:2234-46	Systematic review: peer-reviewed analysis of published systematic reviews and meta-analyses Review of research in multiple jurisdictions	One systematic review reported consistent evidence for the effect of outlet density on violence, harm to others and drinking/driving fatalities.
	Chikritzhs T, Catalonao P, Pascal R. Predicting alcohol-related harms from licensed outlet density: a feasibility study. National Drug Law Enforcement Research Fund, Monograph, Series No 28,2007. *http://www.ndlerf.gov.au/pub/Monograph_28.pdf*	Government monograph: review of peer-reviewed national and international literature Review of research in multiple jurisdictions	There was strong research evidence that density of licensed premises is positively associated with frequency of assaults; and some evidence of positive relationships between outlet density and other harms such as homicide, child abuse and neglect, self-inflicted injury, and alcohol-related deaths and illnesses.
	Stockwell T, Zhao J, Macdonald S, Vallance K, Gruenewald P, Ponicki W, Holder H, Treno A. Impact on alcohol-related mortality of a rapid rise in the density of private liquor outlets in British Columbia: a local area multi-level analysis. Addiction. 2011 Apr;106(4):768-76. doi: 10.1111/j.1360-0443.2010.03331.x. Epub 2011 Jan 18.	Peer-reviewed publication: analysis of data from B.C. Results from analysis of real-world data from a single jurisdiction	The rapidly rising density of private liquor stores in British Columbia from 2003 to 2008 (measured by total number of liquor stores per 1,000 residents) was associated with a significant local-area increase in rates of alcohol-related mortality.

Recommendation 6—*Maintain and reinforce socially responsible pricing* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Regulating alcohol outlet density is a useful public health tool for the reduction of excessive alcohol consumption and related harms.	Wagenaar AC, Holder HD. Changes in alcohol consumption resulting from the elimination of retail wine monopolies: results from five US states. J Stud Alcohol. 1995 Sep;56(5):566–72.	Peer-reviewed publication: comparative study of privatizing wine sales in five US states Analysis of data from multiple American states on effect of change in alcohol retail policy	The study reported that after controlling for both nationwide and state-specific trends there were significant increases in wine sales after privatization. These increases ranged from 15% to 150%.
	Norström T, Miller T, Holder H, Osterberg E, Ramstedt M, Rossow I, Stockwell T. Potential consequences of replacing a retail alcohol monopoly with a private licence system: results from Sweden. Addiction. 2010 Dec;105(12):2113-9. doi: 10.1111/j.1360-0443.2010.03091.x. Epub 2010 Sep 1.	Peer-reviewed publication: modelling of the effects of alcohol consumption and harm rates in Sweden using two scenarios: replacing retail monopoly with private licence stores and making all alcohol available in grocery stores. Modelling based on data from a single jurisdiction	In the model where retail monopoly was replaced with private-licence stores, alcohol consumption increased by 17%. This resulted in increased deaths, assaults, driving offenses and work absenteeism. The scenario making all alcohol available in grocery stores resulted in a 37% increase in consumption and alcohol-related harms.
	Her M, Giesbrecht N, Room R, Rehm J. Privatizing alcohol sales and alcohol consumption: evidence and implications. Addiction. 1999 Aug;94(8):1125–39.	Peer-reviewed publication: critical review of research evidence Analysis of research evidence of the effect of alcohol availability in multiple jurisdictions	Deregulation/privatization experiences in jurisdictions studied suggest common effects include: higher density of outlets, longer hours or more days of sale, changes in price, a strong orientation to commercial aspects of alcohol sales, and the introduction of new vested economic interests into alcohol management arrangements. While prices are likely to increase in the short-term following privatization, over the long term there may be a decline in real price.

Recommendation 7—*Strengthen targeted controls on alcohol marketing and promotion*

Adopt targeted control policies on alcohol advertising and marketing, especially marketing efforts adopting a "lifestyle promotion" approach to alcohol consumption, marketing targeting youth or high-risk drinkers, or marketing efforts encouraging high-risk drinking.

Research Evidence—Supported: There is evidence on the effectiveness of alcohol marketing and promotion controls and alcohol consumption. The body of evidence is somewhat limited compared to other policy options such as pricing and availability restrictions. Alcohol policy researchers have also recommended greater controls on marketing and promotion in response to the demonstrated link between exposure to advertising and the drinking patterns of young people.

Main premise	Reference	Type of study	Key findings relative to the main premise
The volume of alcohol advertising and marketing promotions is positively associated with increased alcohol consumption.	Gallet CA. The demand for alcohol: a meta-analysis of elasticities. Aust J Agric Resour Econ 2007; 51: 121–35.	Systematic review: meta-analysis of 132 studies concerning price, income and/or advertising elasticities of alcohol demand Analysis of studies looking at relationship between price, income and advertising in multiple settings	Of the various forms of alcohol, demand for spirits is most responsive to advertising. Limits on advertising are most effective in reducing alcohol consumption if directed towards media outlets most often used by distillers.
	Anderson P, de Bruijn A, Angus K, Gordon R, Hastings G. Impact of alcohol advertising and media exposure on adolescent alcohol use: a systematic review of longitudinal studies. Alcohol Alcohol. 2009 May-Jun;44(3):229-43. Epub 2009 Jan 14. Review.	Systematic review: peer-reviewed publication of systematic review of 13 longitudinal studies Real-world informed analysis of studies that have collected real-world data over time in multiple settings	Longitudinal studies consistently suggest that exposure to alcohol advertising is associated with the likelihood that adolescents will start to drink alcohol, and with increased consumption among baseline drinkers. Alcohol advertising and promotion increases the likelihood that adolescents will start to drink alcohol and to drink more if they are already using alcohol.
	Smith LA, Foxcroft DR. The effect of alcohol advertising, marketing and portrayal on drinking behaviour in young people: systematic review of prospective cohort studies. BMC Public Health. 2009 Feb 6;9:51. Review.	Systematic review: peer-reviewed publication reviewing 7 cohort studies following more than 13,000 young people aged 10-26. Review of studies that collected data over time in multiple settings	There is some evidence for association in youth between prior alcohol advertising/marketing exposure and subsequent alcohol drinking behaviour. Three studies showed onset of drinking in adolescents who were non-drinkers at baseline was significantly associated with exposure to advertising.
	Nova Scotia Department of Health Promotion and Protection. Effects of Alcohol Advertising on Alcohol Consumption among Youth. Research Power Inc. March 6, 2009. Available from: *http://www.gov.ns.ca/hpp/publications/alcohol_advertising_literature_review.pdf*	Government report: review of academic literature Analysis of studies collecting data in multiple settings	Alcohol advertising promotes and reinforces perceptions of drinking as positive, glamorous and relatively risk-free. Exposure to repeated high levels of alcohol marketing promotes pro-drinking attitudes and increases the likelihood of heavier drinking.

Recommendation 7—*Strengthen targeted controls on alcohol marketing and promotion* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
The volume of alcohol advertising and marketing promotions is positively associated with increased alcohol consumption.	Giesbrecht N, Stockwell T, Kendall P, Strang R, Thomas G. Alcohol in Canada: reducing the toll through focused interventions and public health policies. CMAJ. 2011 Mar 8;183(4):450–5.	Peer-reviewed publication: non-systematic review of alcohol-related policies Analysis of studies collecting data in multiple settings	Exposing young people to alcohol marketing leads some to start drinking sooner; it also increases the amount consumed by those already drinking. The review concludes that policies to restrict the marketing of alcohol products through advertising, promotions and sponsorship, (as has been done for tobacco), may control the harms from alcohol.
	Babor T, Caetano R, Caswell S, Edwards G, Giesbrecht N, Graham K, et al. Alcohol: no ordinary commodity: research and public policy (2nd ed). Oxford; New York: Oxford University Press; 2010.	Expert panel monograph of background papers reviewing evidence for alcohol policy options Review of applied studies and practical evidence	Chapter 12 (Restrictions on marketing) summarizes evidence linking controls on alcohol advertising and promotion to consumption. It finds strong evidence linking consumption with increased exposure to advertising/promotion, but notes that lack of conclusive evidence on advertising controls reflects limited experiences with implementation.
	Casswell S, Thamarangsi T. Reducing harm from alcohol: call to action. Lancet. 2009 Jun 27;373(9682):2247–57.	Peer-reviewed publication: non-systematic review Analysis of studies collecting data in multiple settings	Expansion of alcohol marketing is linked to increases in alcohol consumption, both in emerging markets and in young people in mature alcohol markets. Cost-effective interventions to restrict harm exist but are in urgent need of scaling up. Most countries do not have adequate policies in place.
	Jernigan D. The extent of global alcohol marketing and its impact on youth. Contemp Drug Probl. 2010;37:57–89.	Peer-reviewed publication: description of review of recent research studies Analysis of studies collecting data in multiple settings	There is a growing body of evidence showing that alcohol marketing influences young people's drinking behavior. Measures to reduce advertising should be part of the mix of regulatory strategies to limit the negative health impacts of alcohol use.
	Henriksen L, Feighery EC, Schleicher NC, Fortmann SP. Receptivity to alcohol marketing predicts initiation of alcohol use. J Adolesc Health. 2008 Jan;42(1):28-35. Epub 2007 Oct 4.	Peer-reviewed publication: longitudinal study of Grade 6, 7, and 8 students at baseline and at a 12-month follow-up Analysis of longitudinal data from a single jurisdiction	Non-drinkers who either owned or wanted to use an alcohol-branded promotional item at baseline were 77% more likely to initiate drinking by follow-up than those not receptive to these items.

Recommendation 7—*Strengthen targeted controls on alcohol marketing and promotion* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
The volume of alcohol advertising and marketing promotions is positively associated with increased alcohol consumption.	Casswell S. Alcohol brands in young peoples' everyday lives: new developments in marketing. Alcohol Alcohol. 2004 Dec;39(6):471–6.	Peer-reviewed publication: non-systematic review of the literature Cites population-based studies conducted in different jurisdictions	New developments in alcohol marketing are likely to be particularly important for younger people because of their use of new technology and the role brands play in their lives. This review cites studies demonstrating that advertising has a causal impact on alcohol consumption.
Targeted controls on marketing can produce positive changes related to alcohol consumption.	Anderson P, Chisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. Lancet2009;373:2234-46	Systematic review: peer-reviewed analysis of published systematic reviews and meta-analyses Review of studies showing impact of advertising in multiple settings	One systematic review of 13 studies noted the effect of advertising on youth initiation and heavier drinking among current users; a meta-analysis of 322 studies estimated advertising expenditure elasticities and detected a positive effect of advertising on consumption.
	Jernigan DH. Framing a public health debate over alcohol advertising: the Center on Alcohol Marketing and Youth 2002-2008. J Public Health Policy. 2011 May;32(2):165-79. Epub 2011 Feb 24. Review.	Peer-reviewed publication: description of the experiences of the Center on Alcohol Marketing and Youth from 2002 to 2008 Description of policies in a single jurisdiction	Claims that new standards, stakeholders and sharpened focus on industry practices resulted in new efforts to reduce youth exposure to alcohol advertising.
	Saffer H. Alcohol consumption and alcohol advertising bans. National Bureau of Economic Research Working Paper Series. June 2000. Available from: *http://www.nber.org/papers/w7758*	Expert report: economic model based on a pooled time series of data from 20 countries over 26 years Modelling based on data from multiple jurisdictions over time	The report concludes that alcohol advertising bans have the potential to decrease alcohol consumption.
	Paschall MJ, Grube JW, Kypri K. Alcohol control policies and alcohol consumption by youth: a multi-national study. Addiction. 2009 Nov;104(11):1849-55.	Peer-reviewed publication: data from cross-sectional surveys from 26 countries based on the Alcohol Policy Index (API), per capita consumption and national adolescent survey data. Comparison of data from multiple jurisdictions	More comprehensive and stringent alcohol control policies, particularly alcohol availability and marketing policies are associated with lower prevalence and frequency of adolescent alcohol consumption and age of first alcohol use.
	Anderson P. Global alcohol policy and the alcohol industry. Curr Opin Psychiatry. 2009 May;22(3):253-7. Review.	Peer-reviewed publication: review of literature on regulatory approaches Review of literature on regulatory approaches in multiple jurisdictions	Regulatory approaches (including those that manage the price, availability and marketing of alcohol) reduce the risk of alcohol-related harm, whereas educational approaches (including school-based education and public education campaigns) have no effect. Industry-funded education actually increases the risk of harm.

Recommendation 7—*Strengthen targeted controls on alcohol marketing and promotion* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Targeted controls on marketing can produce positive changes related to alcohol consumption.	Saffer H, Dave D. Alcohol advertising and alcohol consumption by adolescents. Health Econ. 2006 Jun;15(6):617-37. Review.	Peer-reviewed publication: review of two American cross-sectional databases and information on alcohol advertising Analysis of data in a single jurisdiction	Price and advertising effects are generally larger for females relative to males. One study suggests that a reduction in alcohol advertising would reduce monthly adolescent alcohol consumption modestly, with effects varying by race and gender.

Recommendation 8—*Increase access to brief counselling interventions*

Increase access to brief counselling interventions for moderate to high-risk drinkers, including underage drinkers, via clinics, primary health care services, hospitals, university health care services, workplaces and the Internet.

Research Evidence— Well Supported: Over the past decade, over 100 randomized control trials have shown that statistically significant reductions in drinking and alcohol-related problems can follow brief intervention counselling. Brief interventions have also been shown to reduce demand on alcohol-related health care and attendant costs.

Main premise	Reference	Type of study	Key findings relative to the main premise
Brief interventions reduce alcohol consumption among moderate to high-risk drinkers.	Kaner, Eileen F.S., Dickinson, Heather O, Beyer, Fiona R, Campbell, Fiona, Schlesinger, Carla, Heather, Nick, Saunders, John B, Burnand, Bernard, Pienaar, Elizabeth D. Effectiveness of brief alcohol interventions in primary care populations. Cochrane Database of Systematic Reviews 2007, Issue 2. Art. No.: CD004148. DOI: 10.1002/14651858.CD004148.pub3.	Systematic review: Cochrane Collaboration review of 22 trials Analysis of research from trials involving people who drink excessively	Meta-analysis showed that at one year or longer follow-up participants receiving brief intervention had lower alcohol consumption than did the control group. Brief interventions consistently produced reductions in alcohol consumption.
	Anderson P, Chisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. Lancet. 2009 Jun 27;373(9682):2234–46.	Systematic review: peer-reviewed analysis of published systematic reviews and meta-analyses Analysis of population-based studies as well as trials among patients	One meta-analysis found brief alcohol interventions reduced consumption, mortality, morbidity, health care resources use, laboratory indicators of harmful alcohol use, alcohol-related injuries and social consequences.

Recommendation 8—*Increase access to brief counselling interventions* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Brief interventions reduce alcohol consumption among moderate to high-risk drinkers.	Whitlock EP, Polen MR, Green CA, Orleans T, Klein J. Behavioral Counselling Interventions in Primary Care To Reduce Risky/Harmful Alcohol Use by Adults: A Summary of the Evidence for the US Preventive Services Task Force. Ann Intern Med. 2004 Apr 6;140(7):557–68.	Systematic review: peer-reviewed publication of systematic review Analysis of studies involving patients who drink excessively	Brief intervention counselling participants reduced their average number of drinks per week by 13% to 34% more than controls; the proportion drinking at moderate or safe levels was 10% to 19% greater compared with controls.
	Sullivan L.E., Tetrault J.M., Braithwaite R.S. et al. A meta-analysis of the efficacy of nonphysician brief interventions for unhealthy alcohol use: implications for the patient-centered medical home. American Journal on Addictions: 2011, 20, p. 343–356.	Systematic review: peer-reviewed publication of systematic review and meta-analysis of seven trials Review of studies involving patients who drink excessively	Excluding one study that increased heterogeneity, nonphysician (e.g., nurse-based) brief interventions were associated with a modest but statistically significant reduction in mean number of standard drinks per week.
	Giesbrecht N, Stockwell T, Kendall P, Strang R, Thomas G. Alcohol in Canada: reducing the toll through focused interventions and public health policies. CMAJ. 2011 Mar 8;183(4):450–5.	Peer-reviewed publication: Non-systematic review of alcohol-related policies Review of studies involving patients who drink excessively	Brief interventions are intended for individuals at risk but not meeting the criteria of alcohol use disorder. The review recommends increased access to screening and brief interventions via clinics, university health care services and hospital, and online.
	Babor T, Caetano R, Caswell S, Edwards G, Giesbrecht N, Graham K, et al. Alcohol: no ordinary commodity: research and public policy (2nd ed). Oxford; New York: Oxford University Press; 2010.	Expert panel monograph of background papers reviewing evidence for alcohol policy options Review of studies and practical evidence	Chapter 14 (Treatment and early intervention services) reviews evidence of effectiveness for brief intervention counselling for moderate to high-risk drinkers. Current evidence states that brief interventions are effective.
	Botelho R, Engle B, Mora JC, Holder C. Brief interventions for alcohol misuse. Prim Care. 2011 Mar;38(1):105-23, vii. Review.	Peer-reviewed publication: review of brief interventions using tools such as questionnaires Review of trials and screening programs among patients, conducted in multiple jurisdictions	Based on a review of the literature, the US Preventive Services Task Force recommends brief interventions for reducing alcohol misuse by adults, including pregnant women. Systematic methods in health care settings are required for screening and delivering brief interventions.
	Hyman Z. Brief interventions for high-risk drinkers. J Clin Nurs. 2006 Nov;15(11):1383-96. Review.	Systematic review: peer-reviewed publication reviewing systematic reviews and meta-analysis Review of studies conducted with primary care patients in multiple jurisdictions	Six systematic reviews/meta-analyses support the use of brief intervention in primary care settings. Three randomized controlled trials have highlighted the role of staff or clinic nurses but no systematic review/meta-analyses have studied nurse-delivered brief interventions.

Recommendation 8—*Increase access to brief counselling interventions* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Brief interventions can be delivered effectively through health care services (e.g. clinics, hospitals).	Ballesteros J, Duffy JC, Querejeta I, Ariño J, González-Pinto A. Efficacy of brief interventions for hazardous drinkers in primary care: systematic review and meta-analyses. Alcohol Clin Exp Res. 2004 Apr;28(4):608-18. Review.	Systematic review: peer-reviewed publication of meta-analysis of 13 trials Review of studies conducted with primary care patients in multiple jurisdictions.	Results indicate smaller effect sizes than previous meta-analyses; nevertheless they support moderate efficacy for brief interventions. Effect sizes were similar between men and women.
	Kaner EF, Dickinson HO, Beyer F, Pienaar E, Schlesinger C, Campbell F, Saunders JB, Burnand B, Heather N. The effectiveness of brief alcohol interventions in primary care settings: a systematic review. Drug Alcohol Rev. 2009 May;28(3):301-23.	Systematic review: peer-reviewed publication of meta-analysis of 22 trials; also conducted as Cochrane Collaboration Review in 2007 Review of studies conducted with primary care patients in multiple jurisdictions	Brief interventions can reduce alcohol consumption in men, but are unproven in women due to insufficient research data. Longer counselling has little additional benefit over brief interventions.
	Bertholet N, Daeppen JB, Wietlisbach V, Fleming M, Burnand B. Reduction of alcohol consumption by brief alcohol intervention in primary care: systematic review and meta-analysis. Arch Intern Med. 2005 May 9;165(9):986-95. Review.	Systematic review: peer-review publication of systematic review and meta-analysis of 19 trials Review of studies conducted with primary care patients in multiple jurisdictions	Out of 19 trials of primary care patients, 17 reported a measure of alcohol consumption, of which 8 reported a significant effect of intervention. Adjusted intention-to-treat analysis showed a mean pooled difference of approximately 4 standard drinks per week in favour of brief intervention.
	McQueen, Jean, Howe, Tracey E, Allan, Linda, Mains, Diane, Hardy, Victoria. Brief interventions for heavy alcohol users admitted to general hospital wards. Cochrane Database of Systematic Reviews 2011, Issue 8. Art. No.: CD005191. DOI: 10.1002/14651858.CD005191.pub3.	Systematic review: Cochrane Collaboration review of 14 studies Review of studies conducted with hospitalized patients in multiple jurisdictions	Results show that there are benefits in alcohol consumption and death rates for brief interventions for heavy alcohol users admitted to the hospital. Findings were based on studies involving mainly male participants.
	Wachtel T, Staniford M. The effectiveness of brief interventions in the clinical setting in reducing alcohol misuse and binge drinking in adolescents: a critical review of the literature. J Clin Nurs. 2010 Mar;19(5-6):605-20. Review.	Peer-reviewed publication: review of 14 randomized controlled trials Review of studies conducted with adolescent patients in multiple jurisdictions	It is difficult to generalize the results due to the variance in different interventions, settings, participant age ranges and outcomes measures used in studies. Motivational interviewing (one form of brief intervention) was partially successful in harm minimization. Long-term follow-up trials using motivational interviewing reported significant reductions in alcohol intake and harmful effects but results may be confounded by normal maturation of subjects.

Recommendation 8—*Increase access to brief counselling interventions* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Brief interventions can be delivered effectively through health care services (e.g. clinics, hospitals).	Nilsen P, Baird J, Mello MJ, Nirenberg T, Woolard R, Bendtsen P, Longabaugh R. A systematic review of emergency care brief alcohol interventions for injury patients. J Subst Abuse Treat. 2008 Sep;35(2):184-201. Epub 2008 Feb 20. Review.	Peer-reviewed publication: review of 14 studies Review of studies conducted with emergency department patients in multiple jurisdictions	Of 12 studies that compared pre- and post-brief intervention results, 11 observed a significant effect for at least some of the outcomes: alcohol intake, risky drinking practices, alcohol-related negative consequences and injury frequency. The control group also showed improvements. More intensive interventions yielded more favourable results.
Brief interventions can be delivered effectively through university health care services.	Carey KB, Scott-Sheldon LA, Carey MP, DeMartini KS. Individual-level interventions to reduce college student drinking: a meta-analytic review. Addict Behav. 2007 Nov;32(11):2469-94. Epub 2007 May 17. Review.	Systematic review: peer-reviewed systematic review and meta-analysis of 62 studies Review of studies conducted with primary care patients in multiple jurisdictions	Students receiving interventions reported fewer alcohol-related problems over longer intervals. Analyses of moderators found individual, face-to-face interventions using motivational interviewing and personalized normative feedback were associated with greater reductions in alcohol-related problems.
	Seigers DK, Carey KB. Screening and brief interventions for alcohol use in college health centers: a review. J Am Coll Health. 2010 Nov-Dec;59(3):151-8. Review.	Peer-reviewed publication: review of 12 studies Review of studies conducted in college health centres in multiple jurisdictions	Twelve studies suggested that screening and brief interventions in college health centres are acceptable, feasible and promote risk reduction. Findings support the use of time-limited, single-session interventions with motivational interviewing and feedback.
	Larimer ME, Cronce JM, Lee CM, Kilmer JR. Brief intervention in college settings. Alcohol Res Health. 2004-2005;28(2):94-104. Review.	Peer-reviewed publication: summary of the literature based on 16 studies. Review of studies conducted in multiple college settings	Research evaluating the results of brief interventions with high-risk college students suggests they can be successful in reducing alcohol consumption and/or related consequences.
Brief interventions can be delivered effectively through workplaces.	Webb G, Shakeshaft A, Sanson-Fisher R, Havard A. A systematic review of work-place interventions for alcohol-related problems. Addiction. 2009 Mar;104(3):365-77. Review.	Systematic review: peer-reviewed publication of systematic review of 10 studies Review of studies conducted in workplaces in multiple jurisdictions	Of 10 studies, only 4 were randomized controlled trials All but one study reported statistically significant differences in alcohol consumption, binge drinking and alcohol problems. However, there were methodological weaknesses in all studies including representativeness of samples, consent and participation rates, blinding, post-test timeframes, contamination and reliability, and measurement validity.

Recommendation 8—*Increase access to brief counselling interventions (continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Brief interventions can be delivered effectively via the Internet.	White A, Kavanagh D, Stallman H, Klein B, Kay-Lambkin F, Proudfoot J, Drennan J, Connor J, Baker A, Hines E, Young R. Online alcohol interventions: a systematic review. J Med Internet Res. 2010 Dec 19;12(5):e62. Review.	Systematic review: peer-reviewed publication of 17 trials Review of studies conducted with different web-based alcohol interventions	Online alcohol interventions can be helpful, particularly among groups less likely to access traditional alcohol-related services, such as women, young people and at-risk users. However, results should be interpreted with caution; a limited number of studies allowed calculation of effect sizes (n=8), heterogeneity of outcome measures and follow-up periods, and large proportion were student-based studies (12/17).
	Tait RJ, Christensen H. Internet-based interventions for young people with problematic substance use: a systematic review. Med J Aust. 2010 Jun 7;192(11 Suppl):S15-21. Review.	Systematic review: peer-reviewed publication of a systematic review of 13 studies Review of studies conducted with different web-based alcohol interventions	Online alcohol interventions have a small overall effect on specific outcomes such as binge or heavy drinking frequency and alcohol-related social problems. They were not effective in preventing alcohol-related problems among people who were non-drinkers at baseline. The review concludes that the effect of online interventions is equivalent to brief in-person interventions, but with the advantage that they can be delivered to larger numbers of the target population.
	Cunningham JA, Wild TC, Cordingley J, van Mierlo T, Humphreys K. A randomized controlled trial of an internet-based intervention for alcohol abusers. Addiction. 2009 Dec;104(12):2023–32.	Peer-reviewed publication: randomized control trial of 185 participants recruited through a telephone survey Results of a single alcohol intervention study	Follow-up rates were excellent (92%) and problem drinkers given web-based intervention displayed a 4- to 7-drink reduction in their weekly alcohol consumption at both 3- and 6-month follow-ups, compared to a one drink per week reduction among control group.
	Copeland J, Martin G. Web-based interventions for substance use disorders: a qualitative review. J Subst Abuse Treat. 2004 Mar;26(2):109-16. Review.	Peer-reviewed publication: narrative review of literature Qualitative review of web-based alcohol interventions	This review describes the research on internet-based substance use interventions as sparse and flawed. Nevertheless, it suggests the potential impact of effective interventions is considerable.
	Finfgeld-Connett D. Web-based treatment for problem drinking. J Psychosoc Nurs Ment Health Serv. 2006 Sep;44(9):20-7. Review.	Peer-reviewed publication: narrative review of literature Review of different web-based alcohol interventions	Some studies suggest that online interventions may help reduce alcohol abuse, especially among college students and women.

Recommendation 8—*Increase access to brief counselling interventions* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Brief interventions can be effective for under-aged drinkers.	Clark DB, Gordon AJ, Ettaro LR, Owens JM, Moss HB. Screening and brief intervention for underage drinkers. Mayo Clin Proc. 2010 Apr;85(4):380-91. Review.	Peer-reviewed publication: narrative review of literature Review of studies conducted among underage drinkers in different settings	Brief screening methods have been shown to be effective in identifying underage drinkers at risk of alcohol-use disorders. Brief intervention in general medical practice/family medicine is becoming more feasible due to advances in clinical methods and reimbursement policies.
	Stolle M, Sack PM, Thomasius R. Binge drinking in childhood and adolescence: epidemiology, consequences, and interventions. Dtsch Arztebl Int. 2009 May;106(19):323-8. Epub 2009 May 8. Review.	Peer-reviewed publication: narrative review of literature Report on an intervention for underage drinkers in a single jurisdiction.	The intervention HaLT is performed in a number of regions in Germany. Brief motivating intervention should be developed and evaluated to prevent the development of alcohol-related disorders in children and adolescents that engage in binge drinking.
	[No authors listed]. Interventions for alcohol use and alcohol use disorders in youth. Alcohol Res Health. 2004-2005;28(3):163-74. Review.	Peer-reviewed publication: narrative review Review of different brief interventions tested in different settings	This review cites early evidence related to the effectiveness of brief interventions to reduce or eliminate alcohol-related problems.

Recommendation 9—*Require physical education credits*

Require students to earn a physical education credit in every grade from 9 to 12 to achieve high school graduation.

Research Evidence— Well Supported: Studies reviewed show strong support for the effectiveness of school-based physical education in increasing physical activity and improving physical fitness among children and adolescents.

Main premise	Reference	Type of study	Key findings relative to the main premise
Evidence shows a positive effect between physical activity and health, academic achievement, and cognitive outcomes among children and youth.	Fedewa AL, Ahn S. The effects of physical activity and physical fitness on children's achievement and cognitive outcomes: a meta-analysis. Res Q Exerc Sport. 2011 Sep;82(3):521-35. Review.	Research synthesis: peer-reviewed publication based on quantitative synthesis of 59 studies Included experimental, quasi-experimental and cross-sectional study designs.	Results indicate physical activity has a significant and positive effect on children's achievement and cognitive outcomes, with aerobic exercise having the greatest effect.

Recommendation 9—*Require physical education credits* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Evidence shows a positive effect between physical activity and health, academic achievement, and cognitive outcomes among children and youth.	Janssen I, Leblanc AG. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. Int J Behav Nutr Phys Act. 2010 May 11;7:40.	Systematic review: peer-reviewed publication of systematic review of 86 studies Included cross-sectional, case-control, cohort and intervention studies conducted among children/youth	Results of the systematic review indicate that physical activity is associated with several health benefits. To achieve substantive health benefits, the physical activity should be of at least moderate intensity. Observational studies suggest a dose-response relationship.
	Task Force on Community Preventive Services. Recommendations to increase physical activity in communities. Am J Prev Med. 2002 May;22(4 Suppl):67–72.	Systematic review: peer-reviewed publication of literature review using Guide to Community Preventive Services methodology Included community-wide programs conducted as quasi-experimental or experimental studies.	School-based physical education (PE) is strongly recommended because studies find it is effective in increasing child and adolescent physical activity and physical fitness.
	Centers for Disease Control and Prevention. The association between school-based physical activity, including physical education, and academic performance. Atlanta (GA): US Department of Health and Human Services; 2010. Available from: *http://www.cdc.gov/healthyyouth/health_and_academics/pdf/pape_paper.pdf*	Agency report: research synthesis based on 50 studies Included experimental, quasi-experimental, descriptive or case-study designs.	Eleven of fourteen studies found more than one positive association between school-based physical education and academic performance. Eight of nine studies found positive associations between classroom-based physical activity and cognitive skills and attitudes, academic behaviour, and academic achievement.
Need for physical activity.	Tremblay MS, LeBlanc AG, Kho ME, Saunders TJ, Larouche R, Colley RC, Goldfield G, Gorber SC. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. Int J Behav Nutr Phys Act. 2011 Sep 21;8:98.	Systematic review: peer-reviewed publication reviewing 232 studies Included cross-sectional, retrospective, prospective, case control and RCT designs.	Qualitative analysis showed a dose-response relationship between increased sedentary behaviour and unfavourable health outcomes. Authors suggest that there is a large body of evidence linking decrease in sedentary time among children/youth 5–17 years with reduced health risk.
	Canadian Fitness and Lifestyle Research Institute. Kids CAN PLAY! Activity levels of children and youth in Ontario. Bulletin 1.6 [Internet]. Ottawa: Canadian Fitness and Lifestyle Research Institute; 2010 [cited 2011 Nov 15]. Available from: *http://72.10.49.94/media/node/105/files/ CANPLAY2009_Bulletin1_6_OntarioEN.pdf*	Expert report: analysis of survey by Canadian Fitness and Lifestyle Research Institute Based on survey of a representative sample of Canadian general population	In 2007–09, 86% of Ontario children and youth did not accumulate the number of daily steps recommended in Canada's Physical Activity Guide (CPAG).

Recommendation 9—*Require physical education credits* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Need for physical activity.	Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS. Physical activity of Canadian children and youth: accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. Health Rep. 2011 Mar;22(1):15–23.	Peer reviewed publication: analysis of 2009 Canadian Health Measures Survey Based on four days of accelerometer readings of a sample of Canadian children and youth	The authors suggest that, based on objective measures, it is estimated that only 9% of boys and 4% of girls accumulate 60 minutes of moderate-to-vigorous physical activity at least six days a week.
	Huotari P, Nupponen H, Mikkelsson L, Laakso L, Kujala U. Adolescent physical fitness and activity as predictors of adulthood activity. J Sports Sci. 2011 Sep;29(11):1135–41.	Peer-reviewed publication: 25-year, population-based longitudinal study Based on examining physical activity behaviours over time in a sample of the general population in Finland.	Activity in adolescence predicted activity in adulthood in both males and females. Risk of adult inactivity was significantly lower for those who were physically active during adolescence.
	Kjønniksen L, Anderssen N, Wold B. Organized youth sport as a predictor of physical activity in adulthood. Scand J Med Sci Sports. 2009 Oct;19(5):646–54.	Peer-reviewed publication: 10-year longitudinal study Based on examining physical activity behaviours over time in a sample of the general population in Norway.	Organized sports during childhood and adolescence were positively related to frequency of leisure-time physical activity in young adulthood. Joining organized sports at an early age and continuing through adolescence may increase the likelihood of a physically active lifestyle in young adulthood.
	Tammelin T, Näyhä S, Hills AP, Järvelin MR. Adolescent participation in sports and adult physical activity. Am J Prev Med. 2003 Jan;24(1):22–8.	Peer-reviewed publication: birth cohort study included a mailed survey at ages 14 and 31 Based on examining physical activity behaviours over time in the North Finland 1966 birth cohort.	Participation in sports at least once/week for females and twice/week for males was associated with higher level of physical activity in later life. Adolescent participation in intensive endurance sports and those requiring different sports skill appeared to be more beneficial in promoting physical activity as an adult.
	Allison KR, Adlaf EM, Dwyer JJM, Lysy DC, Irving HM. The decline in physical activity among adolescent students: a cross-national comparison. Can J Public Health. 2007 Apr;98(2):97–100.	Peer-reviewed publication: analysis of data from 2001 Youth Risk Behaviour (US) and Ontario Student Drug Use (Canada) surveys Based on comparison of cross-sectional data from population surveys in two countries.	In both samples there was a strong and consistent decline in physical activity levels between 14 and 18 years.
	Faulkner G, Goodman J, Adlaf E, Irving H, Allison KR, Dwyer JJ. Participation in high school physical education—Ontario, Canada, 1999-2005. JAMA. 2007 Feb 28;297(8):803–4.	Peer-reviewed publication: analysis of survey data from 13,260 students (grades 9-12). Analysis of repeated cross-sectional surveys in one jurisdiction	There was a significant linear decrease from 1999 to 2005 in the percentage of students who were enrolled in PE. Female and older students were least likely to be enrolled in PE and to participate in vigorous physical activity in PE class.

Recommendation 9—*Require physical education credits* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Need for physical activity.	Trudeau F, Shephard RJ. Is there a long-term health legacy of required physical education? Sports Med. 2008;38(4):265-70. Review.	Peer-reviewed publication: narrative review of published literature Based on review of literature from multiple jurisdictions	Physical education should offer a variety of lifelong physical activities or sports to reach children with differing interests. To do so, more time should be allocated to physical education instruction.
	Naylor PJ, McKay HA. Prevention in the first place: schools as a setting for action on physical inactivity. Br J Sports Med. 2009 Jan;43(1):10-3. Epub 2008 Oct 29. Review.	Peer-reviewed publication: narrative review of literature Based on review of literature from multiple jurisdictions	Elementary or secondary school-based strategies that use only classroom-based education did not increase physical activity levels. Evidence is limited but suggests that, at the elementary level, active school models and environmental strategies (interventions that change policy and practice) may promote physical activity.
	Slingerland M, Borghouts L. Direct and indirect influence of physical education-based interventions on physical activity: a review. J Phys Act Health. 2011 Aug;8(6):866-78.	Peer-reviewed publication: narrative review of 14 interventions Based on review of literature from multiple jurisdictions Emphasis on examination of the direct and indirect effect of PE interventions on physical activity	Relatively simple interventions can increase activity in PE classes. There is less convincing evidence that interventions involving PE as a component can increase out-of-class physical activity.
School-based physical activity interventions are effective in increasing physical activity and improving physical fitness.	Kriemler S, Meyer U, Martin E, van Sluijs EM, Andersen LB, Martin BW. Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. Br J Sports Med. 2011 Sep;45(11):923-30. Review.	Research synthesis: peer-reviewed publication summarizing 20 systematic reviews and original controlled and randomized trials Based on summary of reviews from multiple jurisdictions	All 20 trials showed a positive effect on in-school, out-of-school or overall physical activity levels, with 6 out of 11 trials showing increases in fitness.
	Dobbins M, De Corby K, Robeson P, Husson H, Tirilis D. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. Cochrane Database Syst Rev. 2009 Jan 21;(1):CD007651. Review.	Systematic review: Cochrane Collaboration review of 26 studies Based on quasi-experimental and experimental studies conducted in school setting in multiple jurisdictions	School-based physical activity interventions were found to be effective in increasing duration of physical activity and VO^2 max, and reducing TV viewing and blood cholesterol.

Recommendation 9—*Require physical education credits* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
School-based physical activity interventions are effective in increasing physical activity and improving physical fitness.	De Bourdeaudhuij I, Van Cauwenberghe E, Spittaels H, Oppert JM, Rostami C, Brug J, Van Lenthe F, Lobstein T, Maes L. School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. Obes Rev. 2011 Mar;12(3):205-16. doi: 10.1111/j.1467-789X.2009.00711.x. Review.	Systematic review: peer-reviewed results of analysis of 11 studies conducted in Europe Based on school-based research in multiple jurisdictions	Combining educational and environmental components that focus on both physical activity and food consumption produces better and more relevant effects.
	Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, et al. The effectiveness of interventions to increase physical activity. A systematic review. Am J Prev Med. 2002 May;22(4 Suppl):73–107.	Systematic review: peer-reviewed publication of systematic review conducted using Guide to Community Preventive Service method Based on experimental and quasi-experimental studies conducted in a number of settings.	Using the Community Guide rules of evidence it was determined that there is strong evidence in support of school-based physical education in increasing physical activity and physical fitness.
	Matson-Koffman DM, Brownstein JN, Neiner JA, Greaney ML. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? Am J Health Promot. 2005 Feb;19(3):167–93.	Systematic review: peer-reviewed publication of systematic review of 129 studies Based on review of quasi-experimental and experimental studies conducted in multiple jurisdictions	Strongest evidence of effectiveness for interventions reviewed included (in addition to others), school-based physical education with better-trained teachers and increased time of student activity.
	World Health Organization. Interventions on diet and physical activity: what works? Summary report [Internet]. Geneva: World Health Organization; 2009 [cited 2012 Jan 31]. Available from: *http://www.who.int/dietphysicalactivity/summary-report-09.pdf*	Monograph: based in part on a systematic review of 395 studies in school settings. Based on a variety of experimental and quasi-experimental studies of the effectiveness of interventions internationally	Studies of school-based interventions consistently show improvements in knowledge and attitudes, behaviour and, when measured, physical and clinical outcomes.
	Brownson RC, Haire-Joshu D, Luke DA. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. Annu Rev Public Health. 2006;27:341–70.	Peer-reviewed publication: review of lessons learned from literature and practice experience in application of environmental and policy approaches Based on a review of school-based interventions in multiple jurisdictions	Thirteen environmental and policy interventions were selected and reviewed, including school-based physical education. Most interventions reviewed were associated with positive changes in amount and percentage of class time spent in physical activity, as well as with increases in aerobic capacity.
	Lagarde F, LeBlanc C. Policy options to support physical activity in schools. Can J Public Health. 2010 Jul-Aug;101 Suppl 2:S9-13. Review. English, French.	Research synthesis: peer-reviewed publication reviewing literature Based on review of policy interventions conducted in different jurisdictions	The synthesis refers to the effectiveness of interventions that raise the quantity of physical education in schools, as well as interventions that ensure that students receive sufficient physical activity in physical education classes.

Recommendation 9—*Require physical education credits* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Physical activity tracks into adulthood.	Telema R, Yang X, Viikari J, Valimaki I, Wanne O, Raitakari O. Physical activity from childhood to adulthood: a 21-year tracking study. Am J Prev Med 2005 Apr; 28(3):267-73	Peer-reviewed publication: data from 21 years tracking in Cardiovascular Risk in Young Finns Study Based on tracking cohorts longitudinally in Finland	Regular (persistent) physical activity at ages 9 to 18 increased the odds that an individual would be active in adulthood.
	Trudeau F, Laurencelle L, Shephard RJ. Tracking of physical activity from childhood to adulthood. Med Sci Sports Exerc. 2004 Nov;36(11):1937–43.	Peer-reviewed publication: longitudinal study of 166 participants Study tracking physical activity patterns among participants in Canada	Mandatory physical education in early life has a positive impact upon level of physical activity as an adult.

Recommendation 10—*Evaluate daily physical activity*

Evaluate the implementation, feasibility and quality of the daily physical activity policy in Ontario elementary schools, and address the need for continued implementation.

Research Evidence— Well Supported: School-based physical activity interventions are effective in increasing physical activity and associated health-related benefits

Main premise	Reference	Type of study	Key findings relative to the main premise
Policy and program evaluation is important for evidence-informed practice.	Task Force on Community Preventive Services. Recommendations to increase physical activity in communities. Am J Prev Med. 2002 May;22(4 Suppl):67–72.	Systematic review: peer-reviewed publication based on review conducted using Guide to Community Preventive Services methods Based on analysis of research evidence from a variety of interventions implemented and tested in multiple jurisdictions	This summary of the Task Force recommendations to promote physical activity at the community level suggests evaluation of interventions can be used for intervention planning and assessment.
	Centers for Disease Control and Prevention (CDC). School health guidelines to promote healthy eating and physical activity. MMWR Recomm Rep. 2011 Sep 16;60(RR-5):1–76.	Research synthesis: includes an in-depth review of research, theory and best practices in healthy eating and physical activity promotion in school health, public health and education Based on a summary of evidence from multiple studies and interventions in different jurisdictions	As well as summarizing evidence and best practices, the report calls for a coordinated approach to healthy eating, and physical activity policy and practice evaluation. One purpose of evaluation is to identify the strengths and limitations of policies and programs to plan improvements.

Recommendation 10—*Evaluate daily physical activity* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Policy and program evaluation is important for evidence-informed practice.	van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. BMJ. 2007 Oct 6;335(7622):703. Epub 2007 Sep 20. Review.	Systematic review: peer-reviewed publication of systematic review of 57 studies, 24 of which are of high methodological quality Based on review of interventions implemented as controlled trials in multiple jurisdictions	Research evidence makes it possible to identify interventions with evidence of effectiveness from those with limited evidence. Also, studies should assess implementation and cost-effectiveness.
	West Virginia University. West Virginia physical activity plan: one vision – one voice. [Charleston (WV)]: WVU College of Physical Activity & Sport Sciences; 2011	Report developed by a number of government and non-government agencies Recommendations based on input from experts from range of societal sectors who rated interventions on the basis of importance and feasibility or likelihood of implementation	Evaluation of activities is recommended so that the problem of physical inactivity is addressed from alternative perspectives and decision making is based on evidence-informed policy.
	Brownson RC, Haire-Joshu D, Luke DA. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. Annu Rev Public Health. 2006;27:341–70.	Systematic review: peer-reviewed publication of review of 17 interventions Recommendations on evaluation derived from review of multiple studies in different jurisdictions	This review emphasizes that research findings can be used to identify the level of evidence required for different interventions. It also states the need for rigorous policy research and evaluation.
	University of Texas. Active Texas 2020: taking action to improve health by promoting physical activity. Austin: University of Texas; 2010.	Report developed with input from a number of government and non-government agencies Based on literature and expert opinion of interventions	One of the eight guiding principles is evaluation of the effectiveness of interventions.
	Dobbins M, De Corby K, Robeson P, Husson H, Tirilis D. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. Cochrane Database Syst Rev. 2009;(1):CD007651.	Systematic review: Cochrane Collaboration review of 26 experimental studies Based on analysis of studies conducted in various jurisdictions	The review shows how research evidence can be used to identify effective interventions, as well as potential health benefits.
	Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, et al. The effectiveness of interventions to increase physical activity. A systematic review. Am J Prev Med. 2002 May;22(4 Suppl):73–107.	Systematic review: systematic review of literature using Guide to Community Preventive Services methods Based on a large body of community-based experimental and quasi-experimental studies reviewed, including applicability of interventions	Research and evaluation data make it possible to identify effective interventions and policies.
	Matson-Koffman DM, Brownstein JN, Neiner JA, Greaney ML. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? Am J Health Promot. 2005 Feb;19(3):167–93.	Systematic review: peer-reviewed publication of 129 policy and environmental interventions Based on experimental and quasi-experimental studies of interventions implemented in a variety of jurisdictions	The review identified the level of evidence needed for a variety of community-and school-based interventions and policies.

Recommendation 10—*Evaluate daily physical activity* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Policy and program evaluation is important for evidence informed practice.	Marcus BH, Williams DM, Dubbert PM, Sallis JF, King AC, Yancey AK, et al. Physical activity intervention studies: what we know and what we need to know: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity); Council on Cardiovascular Disease in the Young; and the Interdisciplinary Working Group on Quality of Care and Outcomes Research. Circulation. 2006 Dec 12;114(24):2739–52.	Research synthesis: peer-reviewed publication based on a report of expert working groups Based on summary reviews of literature concerning interventions in different jurisdictions	Policy and program interventions require evaluation at various stages. Those interventions that are shown to be effective should be adopted more broadly.
	National Physical Activity Plan Coordinating Committee. National Physical Activity Plan [Internet]. Columbia (SC): National Physical Activity Plan Coordinating Committee; 2010 [cited 2011 Nov 15]. Available from: *http://www.physicalactivityplan.org*	Report by private-public sector collaborative Based on evidence to inform action through a series of strategies and tactics.	The report describes a recommended set of policies, programs and initiatives to increase physical activity. Strategies include establishing a centre for physical activity development and research, and expanding the monitoring (including surveillance and evaluation) of policy and environment determinants and implementation of public health approaches.
	Dwyer JJ, Allison KR, LeMoine KN, Faulkner GEJ, Adlaf EM, Goodman J, et al. A survey of opportunities for school-based physical activity in Ontario elementary schools. Phys Health Educ J. 2008;73(4):36–42.	Peer-reviewed publication: cross-sectional survey of representative sample of Ontario elementary schools Assessed school-level opportunities and student participation based on school surveys	Although provision of physical activity opportunities in Ontario elementary schools appears satisfactory, actual engagement by students is low. Strategies are needed to increase student participation in physical education, intramural programs and inter-school sports programs. Emphasizes the need for periodic monitoring and evaluation.
There are a number of correlates and health benefits of physical activity for children.	Janssen I, Leblanc AG. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. Int J Behav Nutr Phys Act. 2010;7:40.	Systematic review: peer-reviewed publication of 86 studies	This analysis of research identified level/intensity of physical activity required for health benefits.
	Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. Med Sci Sports Exerc. 2000 May;32(5):963–75.	Research synthesis: peer-reviewed publication reviewing 108 studies Based on a review of the psychological, behavioural, social and environmental correlates of physical activity among children and adolescents	The analysis identified the variables that correlate with physical activity of children and adolescents. These factors can be used to develop and evaluate interventions.

Recommendation 10—*Evaluate daily physical activity* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
There are a number of correlates and health benefits of physical activity for children.	Malina RM. Physical activity and fitness: pathways from childhood to adulthood. Am J Hum Biol. 2001 Apr;13(2):162–72.	Research synthesis: peer-reviewed publication summarizing the evidence for an association between physical activity and fitness Based on results of various studies in multiple jurisdictions over time.	There is evidence of significant, but generally low-to-moderate relationships between childhood physical activity and health (including health-related physical fitness), and adult physical activity and health.
	Allison KR, Adlaf EM, Dwyer JJM, Lysy DC, Irving HM. The decline in physical activity among adolescent students: a cross-national comparison. Can J Public Health. 2007 Apr;98(2):97–100.	Peer-reviewed publication: comparative study based on data from the Youth Risk Behaviour Survey (US) and the Ontario Student Drug Use Survey (Ontario). Based on comparative analysis of a representative sample of adolescents over time from repeated cross-sectional surveys	The study shows the comparative patterns of decline in physical activity between jurisdictions and argues that research is needed to explain this trend and guide interventions.
	Kelder SH, Perry CL, Klepp KI, Lytle LL. Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. Am J Public Health. 1994 Jul;84(7):1121–6.	Peer-reviewed publication: a longitudinal study based on the Class of 1989 study (a cohort of grade 6–12 students in Minnesota)	In early school years, physical activity, food preferences and smoking behaviours begin to consolidate and thereafter track consistently. Based on the findings, the authors recommend that interventions should begin prior to sixth grade, before behavioral patterns are resistant to change.
Daily Physical Activity (DPA) in Ontario needs to be evaluated.	Ramanathan S, Allison KR, Faulkner G, Dwyer JJM. Challenges in assessing the implementation and effectiveness of physical activity and nutrition policy interventions as natural experiments. Health Promot Int. 2008 Sep;23(3):290–7.	Peer-reviewed publication: discussing methodological issues involved in assessing natural experiments, using real-world case of Ontario as an example.	Challenges in evaluating "natural experiments" are created when new physical activity and nutrition policies are implemented. The specific example of DPA in Ontario is discussed.
	Robertson-Wilson JE, Lévesque L. Ontario's daily physical activity policy for elementary schools: is everything in place for success? Can J Public Health. 2009 Apr;100(2):125–9.	Peer-reviewed publication discussing use of a policy assessment tool to examine the preconditions for implementation success of DPA in Ontario.	Several preconditions of successful policy implementation were met, based on the assessment tool, although some (including an evaluation plan) were not.

Recommendation 11—*Support active transportation*

Strengthen the *Planning Act* Provincial Policy Statement on active transportation, and provide dedicated funding to municipalities for building walking and cycling infrastructure.

Research Evidence— Promising Direction: Individuals who make use of active forms of transportation such as walking or cycling are likely to have better cardiovascular and respiratory health.

Main premise	Reference	Type of study	Key findings relative to the main premise
Individuals who make use of active transportation have reduced likelihood of obesity, improved cardiovascular and respiratory health.	Hamer M, Chida Y. Active commuting and cardiovascular risk: a meta-analytic review. Prev Med. 2008 Jan;46(1):9-13. Epub 2007 Mar 20. Review	Systematic review: peer-reviewed publication reporting on a meta-analysis of eight studies. Based on an analysis of studies examining the link between commuting and cardiovascular risk in multiple populations (Finland, Sweden, Ireland and Japan)	Active commuting had a robust protective effect on cardiovascular health, particularly among women.
	Pucher J, Buehler R, Bassett DR, Dannenberg AL. Walking and cycling to health: a comparative analysis of city, state, and international data. Am J Public Health. 2010 Oct;100(10):1986–92	Peer-reviewed publication: analysis of cross-sectional health and travel data for 14 countries, all US states and 47 US cities	At all three levels (country, state and city), statistically significant negative relationships were found between active travel and self-reported obesity. At two levels (state and city), there was also a significant positive relationship between active travel and physical activity, and a negative relationship between active travel and diabetes.
	Shephard RJ. Is active commuting the answer to population health? Sports Med. 2008;38(9):751-8. Review.	Peer-reviewed publication: brief review of literature Based on an analysis of studies linking active commuting and cardiovascular fitness	The intensity of walking may have cardiovascular benefits for older adults. However, cycling is more likely to provide cardiorespiratory benefit for younger adults. Studies of the relationship between walking/cycling and all-cause and cardiovascular mortality have produced mixed results. Reduced all-cause mortality is more commonly found in cyclists than in walkers.
	Frank LD, Andresen MA, Schmid TL. Obesity relationships with community design, physical activity, and time spent in cars. Am J Prev Med. 2004 Aug;27(2):87–96.	Peer-reviewed publication based on a travel survey of 10,878 residents in Atlanta, GA.	Each additional hour/day spent in a car increases the risk of obesity by 6%; each additional kilometre walked per day reduces the likelihood of obesity by 4.8%.

Recommendation 11—*Support active transportation* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Individuals who make use of active transportation have reduced likelihood of obesity, improved cardiovascular and respiratory health.	Boone-Heinonen J, Jacobs DR Jr, Sidney S, Sternfeld B, Lewis CE, Gordon-Larsen P. A walk (or cycle) to the park: active transit to neighborhood amenities, the CARDIA study. Am J Prev Med. 2009 Oct;37(4):285-92.	Peer-reviewed publication: data from Coronary Artery Risk Development in Young Adults study based on analysis of observational data from representative sample of adults in US	Active transit (walk-only and any cycling vs. car-only) to any neighbourhood amenity was associated with more favourable BMI, waist circumference and fitness. Only cycling was associated with lower lifetime CVD risk classification.
	Lubans DR, Boreham CA, Kelly P, Foster CE. The relationship between active travel to school and health-related fitness in children and adolescents: a systematic review. Int J Behav Nutr Phys Act. 2011;8:5.	Systematic review: peer-reviewed systematic review of 27 research studies Based on reviews of studies including cross-sectional and longitudinal designs	Forty-eight percent of studies that looked at the relationship between active transportation to school and weight status/body composition reported significant associations. Five studies found positive associations between active transportation to school and youth cardiorespiratory fitness.
Strengthening of PPS to include "active transportation" (and funding it sufficiently) will increase the adoption of building walking and cycling infrastructure.	Pucher J, Dill J, Handy S. Infrastructure, programs, and policies to increase bicycling: an international review. Prev Med. 2010 Jan;50 Suppl 1:S106–125.	Research synthesis: peer-reviewed publication of a review of 139 studies of various methodological rigours	Many studies show that interventions to increase bicycling (e.g., infrastructure change, public transit adaptations, and education and marketing programs) can be effective. Cities that adopted comprehensive packages of interventions experienced large increases in the number of bicycle trips and proportion of people bicycling. The results support the importance of public policy to encourage cycling.
	Perrotta K. Public health and land use planning: how ten public health units are working to create healthy and sustainable communities. Toronto: The Clean Air Partnership (CAP) and the Ontario Public Health Association (OPHA); 2011.	Expert report: case studies of interventions in 10 public health units in Ontario The report discusses the relationship between land use planning and public health, and uses illustrations from recent developments facilitated by public health units	Interventions described focused on promoting development patterns, employment and population densities, land use mixes and/or land/use designs that promote active modes of transportation. The main method recommended is to work with (and try to influence), planning authorities through such means as providing comments on the Provincial Policy Statement.
	Ewing R, Cervero R. Travel and the built environment. J Am Plann Assoc. 2010;76(3):265–94.	Meta-analysis: peer-review publication examining relationship between built environment and travel patterns	Walking is strongly related to measures of land use diversity, intersection density and number of destinations within walking distance.

Recommendation 11—*Support active transportation* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Strengthening of PPS to include "active transportation" (and funding it sufficiently) will increase the adoption of building walking and cycling infrastructure.	Safe Transportation Research and Education Center, University of California Berkeley. Transportation and health: policy interventions for safer, healthier people and communities [Internet]. Berkeley (CA): (SafeTREC) at UC Berkeley, Booz Allen Hamilton, the Centers for Disease Control and Prevention; 2011 [cited 2011 Sep 16]. Available from: *http://www.prevent.org/data/files/transportation/transportationandhealthpolicycomplete.pdf*	Expert report on transportation-related policy interventions and public health, based on review of existing literature	Policies that can enhance community design and promote active transportation can be grouped into four areas: 1) provide better connectivity for pedestrians and bicyclists, 2) increase infrastructure investments that support active transportation, 3) consider the needs of all road users in planning and design standards, and 4) make public transit easier for pedestrians and bicyclists to use.
	Centers for Disease Control and Prevention (CDC). CDC recommendations for improving health through transportation policy [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2010 [cited 2011 Sep 14]. Available from: *http://www.cdc.gov/transportation/recommendation.htm*	Expert report: recommendations to promote active transportation supported by scientific and grey literature	The report makes eight recommendations to promote active transportation.
	Davis A. Value for money: an economic assessment of investment in walking and cycling [Internet]. Bristol, UK: Government Office for the South West, Department of Health; 2010 [cited 2011 Sep 14]. Available from: *http://www.swpho.nhs.uk/resource/view.aspx?RID=74036*	Government report: economic assessment and review of literature Based on review of interventions in multiple jurisdictions	Almost all studies reviewed reported significant economic benefits of walking and cycling interventions. Return on investment was 19:1 for UK, and 13:1 for all studies reviewed.
	Canadian Partnership Against Cancer, Primary Prevention Action Group. Environmental scan of cancer prevention policy and legislation as it relates to food, physical activity, alcohol and public education in Canada [Internet]. Toronto: Canadian Partnership Against Cancer; 2009 [cited 2011 Nov 15]. Available from: *http://www.partnershipagainstcancer.ca/wp-content/uploads/3.2.1.9.1-CPACC_PP_Enviroscan_Mar2009.pdf*	Expert report: environmental scan of cancer prevention policy and legislation Based on scan of policies implemented by different Canadian provinces and municipalities, including a section on transportation policies and physical activity	Transportation planning policies have been introduced to support active transportation in BC and, to some extent, Nova Scotia, as well as in a number of municipalities.

Recommendation 11—*Support active transportation* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Strengthening of PPS to include "active transportation" (and funding it sufficiently) will increase the adoption of building walking and cycling infrastructure.	Ontario, Ministry of Municipal Affairs and Housing. Citizens' guides to land-use planning: 1. the Planning Act [Internet]. Toronto: Queen's Printer for Ontario; 2010 [cited 2011 Sep 14]. Available from: *http://www.mah.gov.on.ca/Page1760.aspx*	Government report explaining *The Planning Act*	Description of land use planning legislation.
	Dill J. Bicycling for transportation and health: the role of infrastructure. J Public Health Policy. 2009;30 Suppl 1:S95-110.	Peer-reviewed publication: data from cycling behaviour of 166 cyclists in Portland, Oregon	Sixty percent of cyclists rode for more than 150 minutes per week and nearly all cycling was for utilitarian purposes, not exercise. Most cycling occurred on streets with bicycle lanes, separate paths or bicycle boulevards. The authors emphasize the importance of comprehensive planning, regulation, and funding for active transportation.
	Brownson RC, Kelly CM, Eyler AA, Carnoske C, Grost L, Handy SL, et al. Environmental and policy approaches for promoting physical activity in the United States: a research agenda. J Phys Act Health. 2008 Jul;5(4):488–503.	Peer-reviewed publication: concept mapping and expert opinion used to develop a research agenda for physical activity	Concept mapping suggested that policy research on city planning and design was the most important component of a research agenda on environmental and policy approaches for promoting physical activity.

Recommendation 12—*Provide leadership through workplace physical activity policy*

Government of Ontario could provide leadership as a model employer by developing, implementing and evaluating a workplace-based policy to increase physical activity participation among employees.

Research Evidence— Supported: There is evidence to support the effectiveness of workplace and physical activity interventions on weight and obesity outcomes.

Main premise	Reference	Type of study	Key findings relative to the main premise
Workplace is an important setting for promoting health and engaging in physical activity.	Conn VS, Hafdahl AR, Cooper PS, Brown LM, Lusk SL. Meta-analysis of workplace physical activity interventions.. Am J Prev Med. 2009 Oct;37(4):330-9. Review.	Meta-analysis: peer-reviewed publication based on assessment of multiple workplace intervention studies in various jurisdictions	There was considerable heterogeneity between studies, but significantly positive effects were observed between worksite physical activity programs and physical activity behaviour, fitness, lipids, anthropometric measures, work attendance and job stress.
	Brown HE, Gilson ND, Burton NW, Brown WJ. Does physical activity impact on presenteeism and other indicators of workplace well-being? Sports Med. 2011 Mar 1;41(3):249-62. doi: 10.2165/11539180-000000000-00000. Review.	Research synthesis: peer-reviewed publication reviewing 13 intervention trials and 7 observational studies	Evidence reviewed indicated a positive association between physical activity and psychosocial health of employees, especially concerning quality of life and emotional well-being. Findings, however, were inconclusive regarding the role of physical activity in promoting workplace well-being, and evidence was mixed for the effects of physical activity on presenteeism.
	Oldenburg B, Hardcastle D, Kok G. Diffusion of innovations. In: Glanz K, Lewis F, Rimer B, editors. Health behavior and health education: theory, research and practice. 2nd ed. San Francisco: Jossey-Bass Publishers; 1997. p. 270–86.	Chapter in edited text provides examples of diffusion of health education programs in different jurisdictions	Innovation diffusion theory, stages and determinants are described in this selective review of health education diffusion programs.
	Sallis JF, Glanz K. Physical activity and food environments: solutions to the obesity epidemic. Milbank Q. 2009 Mar;87(1):123–54.	Research synthesis: peer-reviewed publication providing a review of studies conducted in multiple settings	Numerous cross-sectional studies have consistently demonstrated that some attributes of the built environment are associated with physical activity. In particular, those residing in walkable neighborhoods and who have access to recreation facilities are more likely to be active and less likely to be overweight and obese.

Recommendation 12—*Provide leadership through workplace physical activity policy* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Workplace is an important setting for promoting health and engaging in physical activity.	Johnson & Johnson. Healthy people 2012 goals [Internet]. New Brunswick (NJ): Johnson & Johnson Services Inc.; 2011 [cited 2011 Nov 15]. Available from: *http://www.jnj.com/responsibility/ESG/Social/Our_Employees/Health_and_wellness*	Corporate website Description of existing employee wellness programs	The site describes a company's employee health and wellness program.
Workplace health promotion and physical activity programs can improve health.	Proper KI, Koning M, van der Beek AJ, Hildebrandt VH, Bosscher RJ, van Mechelen W. The effectiveness of worksite physical activity programs on physical activity, physical fitness, and health. Clin J Sport Med. 2003 Mar;13(2):106-17. Review.	Systematic review: peer-reviewed systematic analysis of 15 randomized controlled studies and 11 nonrandomized controlled trials Based on analysis of multiple studies in different jurisdictions and at different points in time	The review found strong evidence of a positive effect of a worksite physical activity program on physical activity and musculoskeletal disorders.
	Anderson LM, Quinn TA, Glanz K, Ramirez G, Kahwati LC, Johnson DB, et al. The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: a systematic review (Task Force on Community Preventive Services). Am J Prev Med. 2009 Oct;37(4):340–57.	Systematic review: peer-reviewed systematic review of 47 articles summarizing studies conducted in various settings Based on analysis of multiple studies in different jurisdictions and at different points in time	The review provides evidence of a positive relationship between workplace nutrition and physical activity on heath improvements, specifically related to employee weight status.
Workplace health promotion and physical activity programs can provide benefits for the organization.	Cancelliere C, Cassidy JD, Ammendolia C, Côté P. Are workplace health promotion programs effective at improving presenteeism in workers? A systematic review and best evidence synthesis of the literature. BMC Public Health. 2011;11:395.	Systematic review: peer-reviewed publication of systematic review of 14 articles summarizing studies in various settings	Preliminary evidence found a positive effect of some workplace health promotion interventions on presenteeism (presenteeism refers to being present at work but performance limited in some ways). Successful programs characterized by organizational leadership, health risk screening, individually tailored programs and a supportive workplace culture.
	Berry LL, Mirabito AM, Baun WB. What's the hard return on employee wellness programs? [Internet]. Harvard Business Review. [cited 2012 Jan 30];Available from: *http://hbr.org/2010/12/whats-the-hard-return-on-employee-wellness-programs/ar/1*	Peer-reviewed publication: business journal article provides a summary of return on investment for worksite wellness programs	The authors indicate that the return on investment is high. The most successful programs include six essential components.
	Carls GS, Goetzel RZ, Henke RM, Bruno J, Isaac F, McHugh J. The impact of weight gain or loss on health care costs for employees at the Johnson & Johnson Family of Companies. J Occup Environ Med. 2011 Jan;53(1):8–16.	Peer-reviewed publication: analysis of longitudinal data for workers in a single workplace Based on a study of change in risk factors and associated health care costs over time	Employees who developed high risk for obesity incurred higher annual health care cost increases. Those that moved from higher to lower risk incurred lower annual health care costs.

Recommendation 12—*Provide leadership through workplace physical activity policy (continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Workplace health promotion and physical activity programs can provide benefits for the organization.	Howard RA, Freedman DM, Park Y, Hollenbeck A, Schatzkin A, Leitzmann MF. Physical activity, sedentary behavior, and the risk of colon and rectal cancer in the NIH-AARP Diet and Health Study. Cancer Causes Control. 2008 Nov;19(9):939–53.	Peer-reviewed publication: analysis of participants in a large cohort study. Baseline data were assessed from participants in the study who were 50–71 years old in 1995–96 Risk of developing colorectal cancer in 2003 was estimated	Engaging in exercise/sports more than five times a week compared to never or rarely exercising was associated with a significant reduction in the risk of developing colon and rectal cancer among men.
	Aldana SG. Financial impact of health promotion programs: a comprehensive review of the literature. Am J Health Promot. 2001 Jun;15(5):296–320.	Research synthesis: peer-reviewed publication of review of 72 studies	Health promotion programs are associated with lower levels of absenteeism and health care costs. In addition, the authors indicate that fitness programs are associated with reduced health care costs.

Recommendation 13—*Create an Ontario food and nutrition strategy*

Implement a whole-of-government, coordinated and comprehensive food and nutrition strategy for Ontario.

Experiential/Contextual Evidence: The development of an Ontario Food and Nutrition Strategy is supported in numerous strategy and policy documents including the WHO 2008-2013 *Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases* which called for "coordinated, comprehensive and integrated strategies and evidence-based interventions across individual diseases and risk factors."

Main premise	Reference	Type of study	Key findings relative to the main premise
Nutrition strategy will guide action, decisions, and resource allocation.	Smoke Free Ontario Strategy. Available from: *http://www.mhp.gov.on.ca/en/smoke-free/*	Government policy: provincial tobacco strategy Multi-sectorial strategy used in Ontario	An example of how multiple strategies are required to effect change.
	Strategic Inter-Governmental Nutrition Alliance of the National Public Health Partnership. Eat Well Australia (EWA). An Agenda for Public Health Nutrition. National Public Health Partnership, 2000-2010. Available from: *http://www.nphp.gov.au/publications/signal/eatwell1.pdf.*	Government report: Australian nutrition strategy Multi-sectorial strategy used in Australia	EWA provides context and support for food and nutrition policies and strategies at the national level. EWA demonstrates the effective use of partnership to address priority areas: overweight and obesity; vegetable and fruit consumption; women, infants and children; the nutrition of vulnerable groups, especially Indigenous people; and capacity building. The strategy employs management, funding and resources, research and development, workforce development, communication, monitoring and evaluation.

Recommendation 13—*Create an Ontario food and nutrition strategy* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Nutrition strategy will guide action, decisions, and resource allocation.	WHO European Action Plan for Food and Nutrition Policy 2007-2012. Available from: *http://www.euro.who.int/__data/assets/pdf_file/0017/74402/E91153.pdf*	Expert report: WHO Second Action Plan for Food and Nutrition Policy Multi-sectorial strategy proposed for multiple countries and settings	This document supports and encourages high-level government integration of policies and programmes on nutrition, food security and food safety to ensure public health outcomes. Six action areas within the document include: 1) supporting a healthy start, 2) ensuring a safe, healthy and sustainable food supply, 3) providing comprehensive information and education to consumers, 4) taking integrated action to address related determinants, 5) strengthening nutrition and food safety in the health sector, and 6) monitoring, evaluation and research.
	WHO 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases.[Internet]. Geneva: World Organization; 2008 [cited 2011 Sept120. Available from: *http://whqlibdoc.who.int/publications/2009/9789241597418_eng.pdf*	Expert report: WHO Strategic plan for prevention and control of noncommunicable diseases Multi-sectorial strategy proposed for multiple countries and settings	A basic premise of this document is to establish and strengthen national policies and plans for the prevention and control of noncommunicable diseases. Strategies include the promotion of interventions to reduce modifiable risk factors for noncommunicable diseases: tobacco use, unhealthy diets, physical inactivity and harmful alcohol use.
	A Pan-Canadian Nutrition Strategy Framework for Health Promotion & Chronic Disease Prevention 2005-2015. CDPAC & CSCC. Available from: *http://www.cdpac.ca/media.php?mid=359*	Expert report: 2005 Pan-Canadian Nutrition Strategy Framework Multi-sectorial strategy proposed for multiple jurisdictions in Canada	This document stresses the need for nutrition and healthy eating to be addressed in a comprehensive and coordinated manner. Diet and physical activity strategies should be part of broader, comprehensive and coordinated public health efforts.
	2010 Development on an Ontario Food and Nutrition Strategy – Background Document. Available from: *http://sustainontario.com/wp2011/wp-content/uploads/2011/11/OFNS-Phase-1-Background_Sept-30-2010.pdf*	Expert report: prepared by Ontario Collaborative Group on Healthy Eating and Physical Activity Multi-sectorial strategy proposed for Ontario	Provides an analysis of Ontario's capacity for a provincial food and nutrition strategy; identifies recommendations and opportunities for action specifically related to a safe, nutritious, affordable, sustainable and accessible food system, food skills development and improved health economy and equity.

Recommendation 13—*Create an Ontario food and nutrition strategy (continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Nutrition strategy will guide action, decisions, and resource allocation.	2004 CMOH Report, Healthy Weights, Healthy Lives (p. 48). Available from: *http://www.health.gov.on.ca/english/public/pub/ministry_reports/cmoh04_report/healthy_weights_112404.pdf*	Government report: 2004 report by the Chief Medical Officer of Ontario on obesity challenge Multi-sectorial strategy proposed for Ontario	The report outlines recommendations for action by governments, the health system, food industry, workplaces, schools/school boards, and individuals, parents and caregivers.
	2006, CCO Report on Cancer 2020: A Call for Renewed Action on Cancer Prevention and Detection in Ontario. Available from: *https://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=13794*	Expert report: action plan for cancer prevention and diabetes by Canadian Cancer Society and Cancer Care Ontario Multi-sectorial strategy proposed for Ontario	This document is a call for action for a solid, well-coordinated, long-term provincial plan for cancer prevention. It provides an outline for action to address immediate and longer-term priorities for cancer prevention and detection, as well as priorities for infrastructure development.
	Healthy Eating Action Group of the Nova Scotia Alliance for Healthy Eating and Physical Activity, in partnership with the Office of Health Promotion. Healthy eating Nova Scotia [Internet]. Halifax: Province of Nova Scotia; 2005 [cited 2011 Oct 11]. Available from: *http://www.gov.ns.ca/hpp/publications/HealthyEatingNovaScotia2005.pdf*	Expert report: report of the Health Eating Nova Scotia initiative for a proposed provincial healthy eating and physical activity strategy Method for developing recommendations not described but appears to reflect literature and feedback from initiative partners	This report includes recommendations for a provincial healthy eating strategy, and addresses leadership, public policy, knowledge development and translation, health communications, and community development and infrastructure.
	BC Healthy Living Alliance. Healthy eating strategy 2007 [Internet]. Vancouver: BC Healthy Living Alliance Secretariat; 2007 [cited 2011 Nov 15]. Available from: *http://www.bchealthyliving.ca/sites/all/files/BCHLA_HealthyEatingStrategy.pdf*	Expert report: multi-sectorial BC Healthy Living Alliance describing a proposed provincial healthy eating strategy Review of evidence focuses upon interventions that have been implemented in other jurisdictions	This document provides the rationale and evidence for development of a comprehensive provincial food and nutrition strategy. It includes a four-pronged strategy, with each initiative supported by epidemiologic or research evidence.
	MacRae R. A joined up food policy for Canada. J Hunger Environ Nutr. 6(4):424–57.	Peer-reviewed publication: review of current Canadian food policy environment Includes narrative review of existing policies	This review presents principles, values and goals that would be consistent with a coherent national food policy.
	Food and Agriculture Organization of the United Nations. The state of food and agriculture 1996 [Internet]. Rome: Food and Agriculture Organization of the United Nations; 1996 [cited 2012 Jan 23]. Available from: *http://www.fao.org/docrep/003/w1358e/w1358e14.htm#P36_6144*	Expert report: UN.Report on agricultural statistics from member countries.	This document is the primary source for the comprehensive definition of food security.

Recommendation 14—*Include compulsory food skills in curricula*

Include the development of food skills as a compulsory component of elementary and secondary curricula, preparing children and youth to be competent in food preparation.

Research Evidence— Promising direction: There is evidence to support the relationship between food skill development and dietary intake. The importance of food preparation and cooking skills, including food skill development in the formal curriculum and the value of family meals, has been noted in several major reports.

Main premise	Reference	Type of study	Key findings relative to the main premise
Relationship between food skills and dietary intake and reduced convenience food consumption.	Food Standard Agency, UK. What's Cooking? Cookery Clubs Final Evaluation Report. February 19, 2008. Available from: *http://www.food.gov.uk/multimedia/pdfs/publication/whatscookingeval.pdf*	Evaluation report of (UK) Food Standard Agency's What's Cooking? Cookery clubs. Evaluation of an implemented program in a single jurisdiction	Process and impact evaluation of an established food skill development program in the UK. The majority of participants who completed the post-questionnaire reported that they had learned something (either a lot or a little) as a result of taking part in the program, and were more knowledgeable about hygiene when preparing food, the difference between healthy and unhealthy food, and how to prepare food safely.
	Region of Waterloo Public Health. What are food skills & who has them? Who uses our peer program? [Internet]. In: What about food skills? Toronto: The Ontario Public Health Convention; 2011 [cited 2012 Feb 6]. Available from: *http://www.tophc.ca/Documents/I.10%20-%20Wed%20Apr%206%20300P%20-%20Pier%203%20-%20Ruth%20Sanderson%20-%20What%20about%20food%20skills.pdf*	Conference presentation Presentation concerning implemented food skills interventions	Cited within the presentation are two recent national reports on the role of improving cooking and food preparation skills. It describes food skills interventions conducted in Waterloo Region, by Toronto Public Health, and the Community Food Advisor program in Ontario, Nova Scotia, New Brunswick, and First Nations communities in Ontario is also discussed. Additionally, another definition of food security is provided.
	Wrieden WL, Anderson AS, Longbottom PJ, Valentine K, Stead M, Caraher M, et al. The impact of a community-based food skills intervention on cooking confidence, food preparation methods and dietary choices - an exploratory trial. Public Health Nutr. 2007 Feb;10(2):203-11.	Peer-reviewed publication: community-based cooking/food preparation skills program implemented in eight urban communities in Scotland with 113 socially deprived adults Multi-sectorial strategy proposed for Ontario	Many socially deprived adults in the study led fragmented lives and found commitment to classes problematic; only 63 completed final assessment. For those assessed, fruit intake increased significantly, compared to a control group. Intervention group members also demonstrated increased confidence in their ability to follow a recipe.

Recommendation 14—*Include compulsory food skills in curricula* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Relationship between food skills and dietary intake and reduced convenience food consumption.	Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better diet quality. J Am Diet Assoc. 2006 Dec;106(12):2001–7.	Peer-reviewed publication: cross-sectional survey of young adults Analysis of data from a survey of young adults in a single jurisdiction	The majority of young adults 18-23 don't do food preparation, even weekly. Young adults who reported frequent food preparation reported less frequent fast-food use and were more likely to meet dietary requirements for fat, calcium, fruit, vegetable and whole-grain consumption.
	Stookey JD, Barker ME. The diets of low-income women: the role of culinary knowledge. Appetite. 1995;24:286.	Conference abstract	Cooking skill was significantly and positively associated with vitamin C and fresh fruit and vegetable intake, and negatively associated with convenience-food consumption.
	Drummond, Claire E. Using nutrition education and cooking classes in primary schools to encourage healthy eating. Journal of Student Wellbeing 2010 4(2):43-54.	Peer-reviewed publication: description of pilot research of nutrition and cooking sessions in primary schools Analysis of pilot project in schools in a single jurisdiction	Nutrition workshops and cooking classes in primary school can positively influence healthy eating habits among school-aged children.
	Health Canada. Improving cooking and food preparation skills: a synthesis of the evidence to inform program and policy development [Internet]. Ottawa: Health Canada; 2010 [cited 2011 Sep 27]. Available from: *http://www.hc-sc.gc.ca/fn-an/nutrition/child-enfant/cfps-acc-synthes-eng.php*	Government report: review of the literature to inform a Healthy Living Issue Group of Pan-Canadian Public Health Network Focus is upon food preparation characteristics rather than impact of interventions, but represents data from multiple settings	This document provides an overview of the state of cooking and food preparation skills, both nationally and internationally. Themes with respect to food preparation are described based on an analysis of literature from different populations using different methodologies and at different times.
	Engler-Stringer R. Food, cooking skills, and health: a literature review. Can J Diet Pract Res. 2010;71(3):141–5.	Peer-reviewed publication: narrative review of the literature Summary of existing knowledge drawn from studies in multiple jurisdictions	Provides a description of the literature concerning characteristics of food skills and health inequalities. The review discusses the importance of developing an understanding of factors within the wider food system as part of food choice and cooking skills, given that food skill development is critical to understanding nutritional health.
	Hammons AJ, Fiese BH. Is frequency of shared family meals related to the nutritional health of children and adolescents? Pediatrics. 2011 Jun;127(6):e1565–1574.	Peer-reviewed publication: meta-analysis to examine the frequency of shared family mealtimes in relation to nutritional health in children and adolescents Analysis of data of a large sample of children and adolescents in a single jurisdictions	Children and adolescents who share family meals more than three times a week are more likely to be in the normal weight range and to have healthier dietary and eating patterns.

Recommendation 14—*Include compulsory food skills in curricula* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Relationship between food skills and dietary intake and reduced convenience food consumption.	Neumark-Sztainer D, Hannan PJ, Story M, Croll J, Perry C. Family meal patterns: associations with sociodemographic characteristics and improved dietary intake among adolescents. J Am Diet Assoc. 2003 Mar;103(3):317–22.	Peer-reviewed publication: analysis of cross-sectional survey data from sample of adolescents Analysis of data of a large sample of adolescents in a single jurisdictions	Frequency of family meals was positively associated with intake of fruits, vegetables, grains and calcium-rich foods and negatively associated with soft drink consumption. Description of sociodemographic characteristics associated with frequent family meals.
	Gillman MW, Rifas-Shiman SL, Frazier AL, Rockett HR, Camargo CA Jr, Field AE, et al. Family dinner and diet quality among older children and adolescents. Arch Fam Med. 2000 Mar;9(3):235–40.	Peer-reviewed publication: analysis of cross-sectional survey data from sample of older children and adolescents Analysis of data of a large sample of older children and adolescents in a single jurisdictions	This study provides a description of the impact and frequency of family dinners on the dietary intake of young children and adolescents. Those who ate family dinner most days were more likely to eat > 5 servings/day of fruits and vegetables which was associated overall with healthy dietary intake patterns.
	Stitt S. An international perspective on food and cooking skills in education. Br Food J. 1996 Nov 1;98(10):27–34.	Peer-review Publication: discussion paper Expert opinion	Discussion of the possible effects of removing food preparation from national school curriculum.
Compulsory school-based food skills curriculum is effective (in improving healthy eating).	Oogarah-Pratap B, Bholah R, Cyparsade M, Mathoor K. Influence of home economics on the nutrition knowledge and food skills of Mauritian school adolescents. Nutr Food Sci. 2004 Dec 1;34(6):264–7.	Peer-reviewed publication: self-administered questionnaires used to collect data from adolescents, science teachers and home economics teachers randomly selected from 12 co-educational secondary schools in Mauritius Study of existing program in a single jurisdiction	Home economics classes were associated with better food skills, especially among boys, and were found to be their main source of nutrition-related information. Nutrition knowledge, however, did not differ significantly between schools with and without home economic classes.

Recommendation 15—*Support healthy eating in publicly funded institutions*

Implement evidence-informed food and nutrition policies that promote healthy eating in provincial workplaces and provincially funded institutions.

Research Evidence— Supported: A systematic review as to whether worksite nutrition and physical activity interventions controlled employee overweight and obesity concluded there were modest improvements in employee weight status at the 6–12 month follow-up.

Main premise	Reference	Type of study	Key findings relative to the main premise
Recommendation has potential to reach a large number of Ontarians.	Breastfeeding Committee for Canada (BCC). BFI integrated 10 steps practice outcome indicators for hospitals and community health services [Internet]. Drayton Valley (AB): Breastfeeding Committee for Canada; 2011 [cited 2012 Feb 6]. Available from: *http://www.breastfeedingcanada.ca/documents/2011-03-30_BCC_BFI_Integrated_10_Steps_summary.pdf*	Expert report: summary of the WHO 10 steps to successful breastfeeding and interpretation for Canadian practice Discussion of strategies without demonstration of real-world application or efficacy	This background document supports the Baby-Friendly Initiative (BFI) and summarizes Canadian application of the WHO 10 steps.
(Public) Workplace interventions to provide healthier food choices lead to improved food related norms.	Ni Mhurchu C, Aston LM, Jebb SA. Effects of worksite health promotion interventions on employee diets: a systematic review. BMC Public Health. 2010 Feb 10;10:62.	Systematic review of eight peer-reviewed programs Based on review of programs implemented in worksites as research projects	Worksite interventions led to positive changes in fruit, vegetable and total fat intake. However, bias is possible because many studies relied on self-reported data.
	Anderson LM, Quinn TA, Glanz K, Ramirez G, Kahwati LC, Johnson DB, et al. The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: a systematic review (Task Force on Community Preventive Services). Am J Prev Med. 2009 Oct;37(4):340–57.	Systematic review: The Task Force on Community Preventive Services uses a scientific systematic-review process to issue evidence-based public health recommendations and findings Based on review of programs implemented in worksites as research projects	This paper presents the results of a systematic review of the effectiveness of worksite nutrition and physical activity programs to promote healthy weight among employees. Worksite nutrition and physical activity programs achieved modest improvements in employee weight status at 6–12 month follow-up. This was done mostly through information and behaviour strategies to influence diet and physical activity.
	Katz DL, O'Connell M, Yeh MC, Nawaz H, Njike V, Anderson LM, Cory S, Dietz W; Task Force on Community Preventive Services. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. MMWR Recomm Rep. 2005 Oct 7;54(RR-10):1-12.	Systematic review: The Task Force on Community Preventive Services uses a scientific systematic-review process to issue evidence-based public health recommendations and findings Based on review of programs implemented in worksites as research projects	To control overweight/obesity among adults, the Task Force found evidence to recommend multicomponent worksite interventions that include nutrition and physical activity.

Recommendation 15—*Support healthy eating in publicly funded institutions* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
(Public) Workplace interventions to provide healthier food choices lead to improved food related norms.	Health Canada. TRANSforming the Food Supply. Final report of the Trans Fat Task [Internet]. Ottawa: Health Canada; 2006 [cited 2011 Nov 15]. Available from: *http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/tf-gt_rep-rap-eng.pdf http://www.hc-sc.gc.ca/fn-an/nutrition/gras-trans-fats/tf-ge/tf-gt_rep-rap-eng.php*	Expert report: Health Canada Task Force on trans fat in the food supply Based on available evidence on effects of trans fat and of trans fat-reduction policies in other jurisdictions	This background document provides a summary of the evidence concerning the health effects of trans fat and makes recommendations for consumer protection, including regulations, industry incentives, research and consumer awareness and public education.
	Health Canada. Sodium reduction strategy for Canada [Internet]. Ottawa: Health Canada; 2010 [cited 2011 Nov 15]. Available from *http://www.hc-sc.gc.ca/fn-an/nutrition/sodium/strateg/index-eng.php*	Expert report: Health Canada Sodium Working Group Based on available evidence on effects of dietary sodium and of sodium-reduction policies in other jurisdictions	This background document provides a summary of the effects of sodium on health and also the associated economic benefits of sodium reduction. Recommendations for sodium reduction are provided in the following four areas: 1) food supply, 2) awareness and education, 3) research, and 4) monitoring and evaluation.
	Institute of Medicine. Local government actions to prevent childhood obesity. Washington, DC: The National Academies Press; 2009	Expert report: developed and reviewed by experts discussing options for preventing childhood obesity Based on review of existing research and policy papers	This document provides recommendations for all levels of government—federal, state and local—for healthy eating and physical activity strategies to reduce childhood obesity.
	World Cancer Research Fund, American Institute for Cancer Research. Food, nutrition, and physical activity: a global perspective. Washington, DC: WCRF/AICR; 2009	Expert panel report: including independently conducted systematic reviews of the literature commissioned by academic institutions in US, UK and continental Europe Based on review of research in multiple settings	This report provides recommendations related to the following throughout adult life: limit foods and drinks that promote weight gain; be physically active; limit red meat consumption; avoid processed meat; eat non-starchy vegetables and fruit; limit alcohol consumption; limit salt intake; and breastfeed children.

Recommendation 15—*Support healthy eating in publicly funded institutions* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
(Public) Workplace interventions to provide healthier food choices lead to improved food related norms.	2004 CMOH Report, Healthy Weights, Healthy Lives (p. 48). Available from: *http://www.health.gov.on.ca/english/public/pub/ministry_reports/cmoh04_report/healthy_weights_112404.pdf*	Government report: 2004 report by the Chief Medical Officer of Ontario on obesity challenge Based on analysis of situation of Ontario and literature regarding interventions in other jurisdictions	The report outlines recommendations for action by governments, the health system, food industry, workplaces, schools/school boards, and individuals, parents and caregivers for the prevention of childhood obesity.
	Glanz K, Sorensen G, Farmer A. The health impact of worksite nutrition and cholesterol intervention programs. Am J Health Promot. 1996 Jul-Aug;10(6):453-70.	Peer-reviewed publication: critical review of worksite health promotion program evaluations published between 1980 and 1995 that address nutrition and hypercholesterolemia Based on review of programs implemented in worksites as research projects	This paper provides a critical review of worksite health promotion program evaluations. Rating for the quality of the evidence was deemed to be between suggestive and indicative, suggesting that worksite nutrition and cholesterol programs are feasible and that participants may benefit in the short term. Although a promising direction, there was no conclusive evidence about a causal relationship.
	Sorensen G, Linnan L, Hunt MK. Worksite-based research and initiatives to increase fruit and vegetable consumption. Prev Med. 2004 Sep;39 Suppl 2:S94–100.	Peer-reviewed publication: review of literature Based on review of literature and theories of behaviour change	Effectiveness of worksite nutrition programs is related to increased intake of vegetables and fruit, and is enhanced when based on social ecological approaches, includes worker participation in program planning and implementation, addresses multiple risk factors, and integrates workers' broader social context (e.g., families, neighbourhoods).
	Kral TVE, Rolls BJ. Energy density and portion size: their independent and combined effects on energy intake. Physiol. Behav. 2004 Aug;82(1):131–8.	Peer-reviewed publication: narrative review of studies Based on laboratory studies of food properties	Studies provide evidence that the energy density and portion size of foods are important determinants of energy intake.
	Garriguet D. Nutrition: findings from the Canadian Community Health Survey. Overview of Canadians' eating habits. Ottawa: Statistics Canada; 2004.	Government report: analysis of Canadian Community Health Survey nutrition data (2004) Based on research on nutrition behaviour of a representative sample of Canadians	Substantial proportions of Canadian children and adults are not eating in a healthy manner. Adults in low and lower-middle income households are less likely than those in the highest income households to get more than 35% of daily calories from fat.

Recommendation 16—*Implement mandatory menu labelling in food service operations*

Require mandatory menu labelling of food and beverages to be visible at point-of-purchase in all large-scale food service operations in Ontario.

Research Evidence— Promising direction: Recent reviews on nutrition labelling for promoting healthier food purchasing and consumption found that there is evidence to indicate that nutrition labelling can enable purchasers to more readily assess the nutritional content of the food options available, and how they fit into a healthy diet, thus contributing to healthier food purchasing and consumption, potentially leading to improved population health.

Main premise	Reference	Type of study	Key findings relative to the main premise
Menu labelling will lead to informed purchases by consumers (i.e., accurate assessment of caloric content).	Morestin F, Hogue MC, Jacques M, Benoit F. Public policies on nutrition labelling: effects and implementation issues. Policy report. Quebec: National Collaborating Centre for Health Public Policy; 2011.	Expert report: inventory of public policies and systematic review of literature Review of feasibility of nutrition labelling programs suggests it depends upon the cooperation of numerous actors	Because people do not necessarily read nutrition information or read only part of it, effectiveness of nutrition labelling varies. Simplified food labelling may be helpful.
	New York City, Department of Health and Mental Hygiene, Board of Health. Notice of adoption of a resolution to repeal and re-enact §81.50 of the New York City Health Code [Internet]. New York: New York City, Department of Health and Mental Hygiene; 2008 [cited 2011 Nov 15]. Available from: *http://www.nyc.gov/html/doh/downloads/pdf/public/notice-adoption-hc-art81-50-0108.pdf*	US government report: municipal by-law brief Provides information on implementation process in a single setting	This is a brief for the creation of a by-law mandating the posting of calorie information in restaurant chains. It includes a narrative summary of evidence for the brief.
	US Food and Drug Administration. New menu and vending machine labelling requirements [Internet]. Silver Spring (MD): US Food and Drug Administration; 2011 [cited 2012 Jan 18]. Available from: *http://www.fda.gov/food/labelingnutrition/ucm217762.htm*	US government report: description of menu and vending machine labelling requirements to meet 2010 legislation Provides information on implementation process in a single setting	This legislation provides an overview of proposed FDA labelling requirements for restaurants, retail food establishments and vending machines. It requires restaurants and similar retail food establishments with 20 or more locations to list calorie content information for standard menu items on restaurant menus and menu boards, including drive-through menu boards. Additionally, total calories, fat, saturated fat, cholesterol, sodium, total carbohydrates, sugars, fibre and total protein must be available upon request.

Recommendation 16—*Implement mandatory menu labelling in food service operations (continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Menu labelling will lead to informed purchases by consumers (i.e., accurate assessment of caloric content).	Elbel B. Consumer estimation of recommended and actual calories at fast food restaurants. Obesity (Silver Spring). 2011 Oct;19(10):1971-8. doi: 10.1038/oby.2011.214. Epub 2011 Jul 21.	Peer-reviewed publication: case-controlled study in which receipt and consumer survey data were collected from consumers outside fast food restaurants in low-income communities that implemented menu labelling in New York City Results were compared to a community that did not implement menu labelling Results from a study conducted after implementation of a food labelling policy in a single jurisdiction	Results of this study found that labelling did increase the number of low-income consumers who correctly estimated (within 100 calories) the number of calories in their fast food (from 15% to 24%).
	Dumanovsky T, Huang CY, Nonas CA, Matte TD, Bassett MT, Silver LD. Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labelling: cross sectional customer surveys. BMJ. 2011;343:d4464.	Peer-reviewed publication: cross-sectional surveys before and after implementation of a menu labelling policy in New York City Results from a pre/post study conducted in a single jurisdiction after policy implementation	Mean calories purchased did not change after menu labelling implemented, though a modest decrease was shown in an adjusted regression model. Several major chains saw significant reductions in calories purchased and one in six customers used the calorie information provided.
	Vadiveloo MK, Dixon LB, Elbel B. Consumer purchasing patterns in response to calorie labelling legislation in New York City. Int J Behav Nutr Phys Act. 2011 May 27;8:51.	Peer-reviewed publication: study of food and beverage purchases before and after implementation of New York City menu calorie labelling legislation Results from a pre/post study conducted in a single jurisdiction after policy implementation	Adults in New York City who reported noticing and using the calorie labels consumed fast food less frequently; however, no favourable differences in foods purchased was found.
	Roberto CA, Larsen PD, Agnew H, Baik J, Brownell KD. Evaluating the impact of menu labelling on food choices and intake. Am J Public Health. 2010 Feb;100(2):312–8.	Peer-reviewed publication: experimental study in which participants were randomly assigned to different menus, one with calorie labels and one without calorie labels. Experimental study involving adult participants in a single setting	Participants who had menus with calorie labels ordered fewer calories than those with menus without calorie information.
	Pulos E, Leng K. Evaluation of a voluntary menu-labelling program in full-service restaurants. Am J Public Health. 2010 Jun;100(6):1035-9. Epub 2010 Apr 15.	Peer-reviewed publication: analysis of restaurant sales before, during and after adding nutrition information to menus Experimental study in real-life setting in one jurisdictions	The study states that 71% of patrons reported noticing the nutrition information, 24% reported ordering an entrée lower in calories as a result, and 16.5% reported ordering an entrée lower in fat.

Recommendation 16—*Implement mandatory menu labelling in food service operations* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Menu labelling will lead to informed purchased by consumers (i.e., accurate assessment of caloric content).	Harnack LJ, French SA. Effect of point-of-purchase calorie labelling on restaurant and cafeteria food choices: a review of the literature. Int J Behav Nutr Phys Act. 2008 Oct 26;5:51.	Review of the literature: review found 6 studies published in peer-reviewed journals that evaluated calorie labelling of cafeteria or restaurant menu items Review of quasi-experimental studies but in a number of settings (e.g., restaurants, worksite, university and hospital cafeterias) in different jurisdictions	Results from five of the six studies provide some evidence that calorie information may influence food choices in a cafeteria or restaurant setting; however, the effect may be weak or inconsistent. Authors concluded that better-designed studies for evaluation of menu labelling are necessary.
	Nielsen SJ, Siega-Riz AM, Popkin BM. Trends in energy intake in US between 1977 and 1996: similar shifts seen across age groups. Obes Res. 2002 May;10(5):370–8.	Peer-reviewed publication: analysis of representative cross-sectional population data across different time periods Description of dietary habits over time in a single jurisdiction	Over time, all age groups experienced greater away-from-home food consumption. There were large increases in total energy from salty snacks, soft drinks and pizza, and large decreases in energy from low- and medium-fat milk and medium- and high-fat beef and pork.
	Pereira MA, Kartashov AI, Ebbeling CB, Van Horn L, Slattery ML, Jacobs DR Jr, et al. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. Lancet. 2005 Jan 1;365(9453):36–42.	Peer-reviewed publication: analysis of data from a longitudinal health study Analysis of data from a sample of young adults followed over time in a single jurisdiction	After adjustment for lifestyle factors, fast-food frequency was directly associated with changes in bodyweight and insulin resistance.
	Chandon P, Wansink B. The biasing health halos of fast-food restaurant health claims: lower calorie estimates and higher side-dish consumption intentions. J Consum Res. 2007 Oct;34(3):301–14.	Peer-reviewed publication: results of a study of consumer knowledge and attitudes Based on study of a sample of consumers in a single jurisdiction in experimental setting	A general "health-halo" led people to believe that a 1,000-calorie Subway meal contained fewer calories than same-calorie McDonald's meal, even among consumers familiar with both restaurants. The "health-halo" effect was also in effect when it was found that consumers chose beverages, side dishes and desserts containing more calories when the main course was positioned as "healthy" compared to when it was not. "Health-halo" effect can be reversed when participants are given information contradicting the health claims.

Recommendation 16—*Implement mandatory menu labelling in food service operations* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Menu labelling will lead to informed purchased by consumers (i.e., accurate assessment of caloric content).	Harnack LJ, French SA, Oakes JM, Story MT, Jeffery RW, Rydell SA. Effects of calorie labelling and value size pricing on fast food meal choices: results from an experimental trial. Int J Behav Nutr Phys Act. 2008 Dec 5;5:63.	Peer-reviewed publication: randomized 2x2 factorial study of 594 adolescents and adults Experimental study among human volunteers in a single setting	No significant differences in energy composition of meals ordered/eaten were found between different menu conditions in which calorie information was provided, and those in which value size pricing was used. This leads researchers to suggest that better evaluation of the effects of calorie labelling and value size pricing on fast food meal choice is required.
Menu labelling will encourage the reformulation of recipes to include healthier options.	Jargon J. Restaurants begin to count calories: Applebee's, Starbucks push healthier food items to boost customer foot traffic amid federal health-care debate [Internet]. The Wall Street Journal. 2010 Jan 22. Available from: *http://online.wsj.com/article/SB10001424052748704381604575005530811257728.html*	Newspaper report Description of current corporate activities.	This article describes corporate efforts to reduce calorie counts in restaurants meals and the impact it is having on food choices and the offering of lower calorie choices in response to consumer demand.

Recommendation 17—*Adopt a whole-of-government approach*

Adopt a whole-of-government approach for the primary prevention of chronic disease. This approach would guide goal and objective setting, policy and program planning, performance monitoring and accountability, and coordination and management of partner relationships.

Research Evidence— Promising Direction: Some evidence of effectiveness has been shown through observational, non-experimental design. Whole-of-government approaches vary widely by jurisdiction and are often non-replicable. There is strong support from experts internationally, nationally and provincially in recent documents. There are some guidance documents on implementation.

Main premise	Reference	Type of study	Key findings relative to the main premise
A whole-of-government approach helps to address determinants of health that are outside of the health sector.	Australian Public Services Commission, Management Advisory Committee. Connecting government: whole-of-government responses to Australia's priority challenges. Canberra: Commonwealth of Australia, 2004. Available from: *http://www.apsc.gov.au/mac/connectinggovernmenta2bali.pdf http://www.apsc.gov.au/mac/connectinggovernment.pdf*	Government report Includes examples of integrated strategies in Australia	The report discusses the need to adopt a whole-of-government approach to address the major challenges facing Australia. Enabling strategies are presented, as well as case studies of integrated strategies undertaken in Australia, such as the Australian government's National Illicit Drugs Strategy, Tough on Drugs.
	Jacobs P, Moffatt J, Jonsson E, Ohinmaa A, Gladwin C. Everybody's business: the cost of multi-department involvement in public health in Alberta [Internet]. Edmonton: Institute of Health Economics; 2011 [cited 2012 Jan 31]. Available from: *http://www.ihe.ca/documents/EverybodysBusinessWebReport%202.pdf*	Expert report by independent, not-for-profit Institute for Health Economics	This report describes services, costs and agents contributing to preventive outcomes in Alberta. Public health-related functions were found to be provided by many agencies and sectors; health department spending accounted for approximately 19% of total current health-related spending (from 2009 to 2010) whereas non-health department spending accounted for over 75% of health-related spending.
	World Health Organization, Government of South Australia. Adelaide Statement on Health in All Policies. Geneva: WHO Press; 2010. Available from: *http://www.who.int/social_determinants/hiap_statement_who_sa_final.pdf*	International conference report: statement developed by 100 senior expert participants at the Health in All Policies International Meeting, Adelaide 13–15 April 2010	The statement describes the need for a joined-up government approach to health policies. It describes how to take a health approach in all policies, including tools and instruments, drivers for change and a new role for the health sector. Provides examples of joined-up government action.

Recommendation 17—*Adopt a whole-of-government approach* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
A whole-of-government approach helps to address determinants of health that are outside of the health sector.	Department of Health, Government of South Australia. Health in All Policies: Adelaide 2010 International Meeting. Public Health Bulletin SA. 7 (2), July 2010. Available from: *http://www.health.sa.gov.au/pehs/publications/publichealthbulletin-pehs-sahealth-1007.pdf*	Government report	This report summarizes the WHO Adelaide 2010 Statement and provides examples and related expert commentary on health in all policy initiatives in multiple jurisdictions. Joined-up leadership within government, across sectors and between levels of government is needed to improve health outcomes. Enabling strategies are presented and discussed.
	World Health Organization. 2008-2013 Action plan for the global strategy for the prevention and control of noncommunicable diseases [Internet]. Geneva: WHO Press; 2008 [cited 2011 Sept120. Available from: *http://whqlibdoc.who.int/publications/2009/9789241597418_eng.pdf* Also *http://www.who.int/nmh/publications/ncd_report_annex6.pdf*	Agency report: describes the WHO strategic plan for prevention and control of non-communicable diseases (NCD)	The report recommends a multi-sectoral framework for chronic disease prevention and control, which includes: 1) a comprehensive multi-sectoral policy and plan; 2) a high-level mechanism for planning, monitoring and evaluating the involvement of non-health sectors; 3) comprehensive assessment and analysis of the impact of NCDs; and, 4) strengthening of evidence-based legislation and policies that address risk factors and determinants of NCD. Annex 6 of the report provides recommendations on approaches to implementing multi-sectoral action on health.
	United Nations, General Assembly. Draft Political Declaration of the High-Level Meeting of the General Assembly on the prevention and control of non-communicable diseases. New York: United Nations; 2011. Available from: *http://www.un.org/ga/search/view_doc.asp?symbol=A/66/L.1*	Political declaration by UN General Assembly based on extensive international and multi-sectoral consultations	These recommendations respond to the challenge of non-communicable diseases and include adopting whole-of-government and whole-of-society efforts.
	Federal, Provincial and Territorial Advisory Committee on Population Health. Strategies for population health: investing in the health of Canadians. Ottawa: Minister of Supply and Services Canada; 1994. Available from: *http://www.phac-aspc.gc.ca/ph-sp/pdf/strateg-eng.pdf*	Government report: discussion paper to advise Conference of Deputy Ministers	This report summarizes the determinants of health, proposes a common framework for action on population health, and stresses the importance of intersectoral collaboration for successful population health strategies.

Recommendation 17—*Adopt a whole-of-government approach* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
A whole-of-government approach helps to address determinants of health that are outside of the health sector.	Federal, Provincial and Territorial Advisory Committee on Population Health. Intersectoral action…towards population health, June 1999. Ottawa: Minister of Supply and Services Canada. 1999. Available from: *http://www.phac-aspc.gc.ca/ph-sp/pdf/inters-eng.pdf*	Government report: discussion paper	This report provides a definition and framework for intersectoral action on health and describes the proposed benefits and necessary conditions for success.
	Manuel DG, Creatore MI, Rosella LC, Henry DA. What does it take to make a healthy province? A benchmark study of jurisdictions in Canada and around the world with the highest levels of health and the best health behaviours. ICES Investigative Report. Toronto: Institute for Clinical Evaluative Sciences; 2009. Available from: *http://www.ices.on.ca/file/Healthy%20province%20November%20release.pdf*	Expert report: benchmark study of health data and review of literature and programs	Five key "lessons learned" from leading health jurisdictions are described, including seeking solutions that are applied across governments and which involve civil society.
	Chief Medical Officer of Health of Ontario. Public Health – Everyone's Business. 2009 Annual report of the Chief Medical Officer of Health of Ontario to the Legislative Assembly of Ontario. Toronto: Queen's Printer for Ontario; 2010. Available from: *http://www.alphaweb.org/docs/lib_013600220.pdf*	Government report: annual report of Chief Medical Officer of Health of Ontario	The report describes prevention as the next evolution in health care. It calls for action to address obesity and physical inactivity, early childhood development, injury prevention, tobacco control and health equity. It notes that health is shaped by factors outside the health care system and that "Public health is everyone's business."
	Chief Medical Officer of Health of Ontario. Health, Not Health Care – Changing the Conversation. 2010 Annual report of the Chief Medical Officer of Health of Ontario to the Legislative Assembly of Ontario. Toronto: Queen's Printer for Ontario; 2011. Available from: *http://www.health.gov.on.ca/en/public/publications/ministry_reports/cmoh_10/cmoh_10.pdf*	Government report: annual report of Chief Medical Officer of Health of Ontario	This report recommends multi-sectoral and healthy public policy approaches to address the determinants of health and chronic disease prevention. The report provides examples of these approaches in Ontario at the provincial and municipal levels. In the concluding remarks, the report recommends adopting a "new conversation for about health," which involves every government ministry, stakeholder, community leader and Ontarians.

Recommendation 17—*Adopt a whole-of-government approach* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
A whole-of-government approach helps to address determinants of health that are outside of the health sector.	Senate of Canada. A Healthy, Productive Canada: A Determinant of Health Approach. Final Report of the Subcommittee on Population Health of the Standing Senate Committee on Social Affairs, Science and Technology, June 2009. Ottawa: Senate of Canada, 2009. Available from: *http://www.parl.gc.ca/Content/SEN/Committee/402/popu/rep/rephealth1jun09-e.pdf*	Government report: Senate report review of presentations and written submissions, visits to Canadian communities and a fact-finding mission	A whole-of-government approach should be adopted to address population health issues in a coordinated manner.
Keys to success: Leadership	Beaglehole et al. for The Lancet NCD Action Group and the NCD Alliance, 2011. Priority actions for the non-communicable disease crisis. Lancet, 377:9775, 1438 – 1447.	Peer-reviewed publication: report of *The Lancet* Non-Communicable Disease Action Group and the NCD Alliance	Five priority actions (leadership, prevention, treatment, international cooperation, and monitoring and accountability) are proposed for five priority interventions (tobacco control, salt reduction, improved diets and physical activity, reduction in hazardous alcohol intake, and essential drugs and technologies). Strong and sustained leadership at the highest level is considered essential.
	Public Health Agency of Canada; World Health Organization Collaborating Centre on Non Communicable Disease Policy. Mobilizing intersectoral action to promote health: The Case of ActNow BC in British Columbia, Canada [Internet]. Ottawa: Public Health Agency of Canada; 2009 [cited 2011 Sep 9]. Available from *http://www.phac-aspc.gc.ca/publicat/2009/ActNowBC/pdf/anbc-eng.pdf:*	Government report: case study and scoping review	ActNow BC is considered to be a promising best practice for an integrated approach to health promotion and chronic disease prevention. High-level political and public service leadership and the adoption of intersectoral and whole-of-government approaches were identified as enablers of success.
	ActNowBC. ActNowBC Measuring our Success Progress Report II. Victoria: Government of British Columbia, 2010.	Government report: monitoring report on progress of ActNow BC Based on an analysis of population survey data; complemented by a discussion of related initiatives	This report documents progress towards ActNow BC 2010 targets, and updates information on current programs and initiatives associated with ActNow BC. It concludes that it is premature to fully evaluate the success of the initiative and that further work is required to address health inequities.

Recommendation 17—*Adopt a whole-of-government approach* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Keys to success: Leadership	World Health Organization. WHO Evaluation of the National Health Plan of Portugal (2004-2010). Denmark: WHO Regional Office for Europe, 2010. Available from: *http://www.euro.who.int/__data/assets/pdf_file/0003/83991/E93701.pdf*	Agency report: external evaluation of the National Health Plan (NHP) of Portugal.Statistical analysis of monitoring indicators, reviews of NHP studies, interviews, round table discussions, literature reviews	The National Health Plan of Portugal has many elements characteristic of a whole-of-government approach, such as the involvement of broad range of stakeholders, creation of a High Commission for Health supporting an inter-ministerial committee, and development of regional health strategies to support the national plan. Leadership through the Office of the High Commissioner (to coordinate the development, implementation, monitoring and evaluation of the NHP), is considered a critical enabler of success. At the time of review, almost half of 62 performance indicators had been achieved, or were close to achieving their 2010 targets.
Keys to Success: Explore legislation mandating health-impact assessments for all laws and regulations.	Gagnon F, Turgeon J, Dallaire C. National Collaborating Centre for Healthy Public Policy. Health impact assessment in Quebec: when the law becomes a lever for action [Internet]. Montreal: Institut national de sante publique, Quebec; 2008 [cited 2012 Jan 23]. Available from: *http://www.ncchpp.ca/docs/GEPPS_HIAQu%C3%A9becANoct2008.pdf*	Expert report: analysis of health impact of government legislation Case studies conducted in four departments of the Government of Quebec	Section 54 states that any government department or agency involved in formulating a bill, regulation or other measure must assess the potential impact of its actions on the population's health and consult with the Minister of Health and Social Service if impact appears significant. The authors suggest that legislation is necessary but not sufficient for action and that "the law may be a lever for action" when coupled with political and administrative leadership and collective will.
	National Collaborating Center For Healthy Public Policy. March 2008. The Quebec Public Health Act's Section 54. Available from: *http://www.ncchpp.ca/docs/Section54English042008.pdf*	Expert report: description of implementation of section 54 of Quebec's *Public Health Act* Compilation of various studies, interviews, preliminary evaluation	The report provides background and preliminary assessment of Quebec's effort to mandate health impact assessments in policy-making. Section 54 obliges all ministries and agencies to ensure that their legislation does not adversely affect population health. Preliminary evaluation suggested limited adherence and lack of knowledge by some agencies and sectors; greater knowledge was demonstrated in sectors with a social mission than in those with an economic mission.

Recommendation 17—*Adopt a whole-of-government approach* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Keys to Success: Explore legislation mandating health-impact assessments for all laws and regulations.	Wismar M., Blau, J., Ernst, K., Figueras, J. The effectiveness of health impact assessment, scope and limitations of supporting decision-making in Europe. Copenhagen: European Observatory on Health Systems and Policies, 2007. Available from: *http://www.euro.who.int/__data/assets/pdf_file/0003/98283/E90794.pdf*	Expert report: mapping and analysis of effectiveness of case studies of health impact assessments in 19 European countries	The report describes case examples of health-impact assessments in various settings and jurisdictions. Applications included transportation, urban planning, agriculture, environment, industry, infrastructure and nutrition. Four types of effectiveness were identified. Effective application of HIA resulted in modification of program or policy decisions; however, in no case did HIA application result in cancellation of a program or policy.
Keys to Success: A comprehensive, multi-level health promotion and chronic disease prevention strategy for Ontario with goals, objectives and measurable outcomes.	Smoke-Free Ontario – Scientific Advisory Committee. Evidence to Guide Action: Comprehensive Tobacco Control in Ontario. Toronto, ON: Public Health Ontario, 2010. Available from: *http://www.oahpp.ca/services/documents/evidence-to-guide-action/Evidence%20to%20Guide%20Action%20-%20CTC%20in%20Ontario%20SFO-SAC%202010E.PDF*	Expert report: based on literature reviews and expert consensus	This report reviews and provides recommendations on the elements of a comprehensive plan. It describes trends in tobacco use since introduction and maintenance of comprehensive tobacco control strategies in California, Massachusetts, New York State and Ontario, and provides recommendations for comprehensive tobacco control for Ontario.
	California Department of Public Health. California tobacco control update 2009: 20 years of tobacco control in California. [Internet]. Sacramento, CA: State of California; 2009 [cited 2012 Jan 23]. Available from: *http://www.cdph.ca.gov/programs/tobacco/Documents/CTCPUpdate2009.pdf*	Government report: updated report by the California Department of Health Services on its tobacco control program	This summary of 20 years of comprehensive tobacco control programs in California describes key elements of a comprehensive tobacco control strategy. It provides data demonstrating declines in smoking prevalence and tobacco-related diseases and deaths over this time.
	Koh HK. Accomplishments of the Massachusetts Tobacco Control Program. Tob Control. 2002 Jun;11 Suppl 2:ii1–3.	Peer-reviewed publication: description of Massachusetts tobacco control program	This brief summary of multi-faceted activities of the Massachusetts tobacco control program describes declines in adult smoking prevalence, which exceed those in US states without comparable comprehensive programs.
	RTI International. Fifth annual independent evaluation of New York's tobacco control problem [Internet]. Research Triangle Park (NC): RTI International; 2009 [cited 2012 Jan 23]. Available from: *http://www.health.ny.gov/prevention/tobacco_control/docs/independent_evaluation_report_july_2009.pdf*	Expert report: independent evaluation of New York State's tobacco control program	This independent report assesses the New York State tobacco control program, makes recommendations for improvement and describes trends in outcome indicators, including declines in youth and adult smoking rates that were faster than national rates over 2003–2008.

Recommendation 17—*Adopt a whole-of-government approach* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Keys to Success: A comprehensive, multi-level health promotion and chronic disease prevention strategy for Ontario with goals, objectives and measurable.	Nutbeam D., Wise M., 1996. Planning for Health for All: international experience in setting health goals and targets. Health Promotion International. 11(3): 219-226.	Peer-reviewed publication	This study describes experiences in setting health goals, targets and objectives in health planning in different countries. It suggests that a balance is needed between implementation, measurements, and target and objective setting.
	Kindig DA, Asada Y, Booske B. A population health framework for setting national and state health goals. JAMA. 2008 May 7;299(17):2081-3.	Peer-reviewed publication: expert commentary	This editorial advocates a population health planning framework that sets national and state health goals.
	World Health Organization. Global status report on noncommunicable diseases 2010 [Internet]. Geneva : WHO Press; 2011 [cited 2011 Sep 26]. Available from: *http://whqlibdoc.who.int/publications/2011/9789240686458_eng.pdf*	Agency report: WHO Report on non-communicable diseases	This UN report summarizes the international situation in terms of non-communicable disease, population- and individual-based interventions, and the development of national capacity. It recommends comprehensive and multi-sectoral actions, including participation of civil society and the private sector.
	United Nations, General Assembly. Prevention and control of non-communicable diseases. Report of the Secretary-General (A/66/83) [Internet]. New York: United Nations; 2011 [cited 2011 Sep 21]. Available from: *http://www.un.org/ga/search/view_doc.asp?symbol=A/66/83&Lang=E*	United Nations report Recommendations based on evidence derived from multiple jurisdictions	This UN report briefly describes the international situation and makes five recommendations for progress. One of these recommendations is for a "complete government approach to adopting population-wide interventions that address risk factors."

Recommendation 18—*Improve measurement, increase accountability*

Create a coordinated, province-wide, population health assessment and surveillance system to provide complete, timely, continuous and accurate data essential for the planning, delivery and evaluation of policies and programs aimed at reducing the burden of chronic diseases and related risk factors.

Contextual/Experiential Evidence: Strong expert support with sound theory for recommendation. Surveillance systems vary widely across jurisdictions and are often informed by real-world experiences.

Main premise	Reference	Type of study	Key findings relative to the main premise
Surveillance, monitoring, and evaluation are key capacities required to improve chronic disease outcomes.	Riley B, Garcia J. Primary prevention of chronic diseases in Canada: a framework for action. Ottawa: Chronic Disease Prevention Alliance of Canada; 2008. Available from: *http://cdpac.ca/media.php?mid=832*	Expert report: based on evidence for comprehensive primary prevention and in consultation with experts	Key system capacities include health surveillance, program evaluation, and performance monitoring and accountability.
Theoretical constructs underpinning a chronic disease and related risk factor surveillance system.	Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. Int J Epidemiol. 2002 Apr;31(2):285–93	Peer-reviewed publication: narrative review of concept	This article describes a life-course approach to chronic disease epidemiology, including study of long-term effects on chronic disease, and risk of physical and social exposures during gestation, childhood, adolescence, young adulthood and later adult life.
	Krieger N. Theories for social epidemiology in the 21st century: an ecosocial perspective. Int J Epidemiol. 2001 Aug;30(4):668–77.	Peer-reviewed publication: narrative review of concept	This review discusses the emergence of a literature of social epidemiology.
Need for comprehensive, connected, complete, valid, accessible and responsive surveillance system.	Ontario Risk and Behaviour Surveillance System Advisory Committee. Moving Risk and Behaviour Surveillance Forward in Ontario: A Proposal and Recommendations, May 30, 2011. Toronto: Public Health Ontario; 2011. Available from: *http://www.oahpp.ca/resources/projects/orbss/documents/Moving%20Risk%20and%20Behaviour%20Surveillance%20Forward%20in%20Ontario-%20ORBSS%20May%2030,2011.pdf*	Expert report: environmental scan and consultation on the need for a comprehensive risk and behaviour surveillance system for Ontario.	This report presents a vision for Ontario: "Public health priorities and decisions are informed by a province-wide risk and behaviour surveillance system." Recommendations are enabled by the following mission: "To coordinate a province-wide surveillance system that provides timely and accurate provincial and local health unit-level estimates of health behaviours, attitudes and other risk factors to support public health decision-making." The report makes recommendations concerning coordination, central analytics and funding, among others.

Recommendation 18—*Improve measurement, increase accountability* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Need for valid data.	Katzmarzyk PT, Tremblay MS. Limitations of Canada's physical activity data: implications for monitoring trends. Can J Public Health. 2007;98 Suppl 2:S185–94.	Peer-reviewed publication: review and evaluation of physical activity data sources in Canada	This description of current physical activity surveillance procedures in Canada and their limitations supports recommendation to develop better measures and data collection mechanisms.
	LeBlanc AGW, Janssen I. Difference between self-reported and accelerometer measured moderate-to-vigorous physical activity in youth. Pediatr Exerc Sci. 2010 Nov;22(4):523–34.	Peer-reviewed publication: comparison of objective (accelerometer) and subjective (self-reported) measure of physical activity in a sample of Canadian youth	Self-reported measures of moderate-to-vigorous physical activity were higher than were objective measures.
	Theis B, Raut R, Irving H, Marrett LD. Interprovincial physical activity rankings vary with activity domain. Am J Epidemiol. 2011 Jun;173(suppl 11):s161	Conference presentation abstract	This study analyses leisure-time, active transportation and occupational physical activity from the 2005 Canadian Community Health Survey. Different provincial rankings point to the need to refrain from drawing conclusions on the basis of leisure or leisure+transport domains.
Support for measurement.	Ontario, Ministry of Health and Long-Term Care. Foundational standard [Internet]. Toronto: Queen's Printer for Ontario; 2008 [cited 2011 Nov 15]. Available from: *http://www.health.gov.on.ca/english/providers/program/pubhealth/oph_standards/ophs/foundationalstandard.html*	Government policy: government website	The Foundational Standard of the Ontario Public Health Standards includes population health assessment, surveillance, research and knowledge exchange, and program evaluation.
	Government of Ontario. Ontario Public Health Standards 2008. Toronto: Queen's Printer for Ontario. Available from: *http://www.health.gov.on.ca/english/providers/program/pubhealth/oph_standards/ophs/progstds/pdfs/ophs_2008.pdf*	Government policy: Ontario Public Health Standards	Boards of Health are required to undertake activities in accordance with the Population Health Assessment and Surveillance Protocol, including "assessing current health status, health behaviours, preventive health practices, health care utilization." (Foundational Standard P. 15)
	World Health Organization. Global status report on noncommunicable diseases 2010 [Internet]. Geneva : WHO Press; 2011 [cited 2011 Sep 26]. Available from: *http://whqlibdoc.who.int/publications/2011/9789240686458_eng.pdf*	Agency report	Improving surveillance systems is a priority nationally and internationally, and includes monitoring exposures, outcomes and health care impacts.

Recommendation 18—*Improve measurement, increase accountability* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Support for measurement.	WHO 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases.[Internet]. Geneva: World Organization; 2008 [cited 2011 Sept120. Available from: *http://whqlibdoc.who.int/publications/2009/9789241597418_eng.pdf*	Agency report: WHO strategic plan for prevention and control of non-communicable diseases	The report presents a surveillance framework for monitoring NCDs and their risk factors. Accurate data is vital to reversing current trends in NCD. The report recommends that member states strengthen surveillance and data collection on NCD risk factors, disease incidence and mortality.
	Health Surveillance Coordination Division, Centre for Surveillance Coordination Population and Public Health Branch, Health Canada, July 2, 2003. Chronic Disease Surveillance in Canada: A Background Paper. Ottawa: Health Canada, 2003. Available from: *http://publications.gc.ca/collections/Collection/H39-666-2003E.pdf*	Government report: expert review of current surveillance activities and options for enhancement	The purpose of the report was to identify the business requirements needed to improve chronic disease surveillance in Canada. Gaps exist in organization, people, process, information, technology and standards.
	International Union for Health Promotion and Education, World Alliance for Risk Factor Surveillance, Draft 2011. White Paper on Surveillance and Health Promotion, Draft May 2011. Available from: *http://www.iuhpe.org/uploaded/Activities/Scientific_Affairs/GWG/WARFS_white_paper_draft_may_2011.pdf*	Expert report: expert consensus background paper	The paper was prepared to share knowledge developed by the World Alliance for Risk Factor Surveillance, clearly define what is meant by surveillance for health promotion, provide a better understanding of the role of surveillance in health promotion, and guide members to participate in the development of a surveillance system.
	Institute for Medicine. A Nationwide Framework for Surveillance of Cardiovascular and Chronic Lung Diseases. Washington: Institute for Medicine, 2011. Available from: *http://www.iom.edu/Reports/2011/A-Nationwide-Framework-for-Surveillance-of-Cardiovascular-and-Chronic-Lung-Diseases.aspx*	Expert report: consensus report that included a survey of common and emerging US surveillance tools	A coordinated national surveillance system is needed, and existing systems should be strengthened.
	National Public Health Partnership (NPHP). Blueprint for Nation-Wide Surveillance of Chronic Diseases and Associated Determinants. Melbourne, Australia: Department of Health and Ageing, Government of Australia, 2006. Available from: *http://www.health.gov.au/internet/main/publishing.nsf/content/33BF7AB2BC3690BFCA2571410079196A/$File/blueall.pdf*	Government report: report prepared for 2005 Australia Health Ministers' Conference	The report outlines some of the significant gaps in chronic disease surveillance. Several action items are presented (for Australia), including, establishing a national chronic disease network, reporting on existing data and developing common indicators.

Recommendation 19—*Connect knowledge with practice*

Build capacity for delivering effective chronic disease prevention interventions.

Contextual/Experiential Evidence: There is strong expert support with sound theory. Knowledge exchange and capacity building are established best practices in the public health community in Ontario and are informed by real-world experiences.

Main premise	Reference	Type of study	Key findings relative to the main premise
Build capacity for delivering effective chronic disease prevention interventions.	Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, et al. Lost in knowledge translation: time for a map? J Contin Educ Health Prof. 2006;26(1):13–24.	Peer-reviewed publication: narrative review and discussion	This article summarizes lessons for practice, and reviews and defines terms: knowledge translation/transfer/exchange, research utilization, implementation, dissemination, diffusion, continuing education, continuing professional development.
	Riley B, Garcia J. Primary prevention of chronic diseases in Canada: a framework for action. Ottawa: Chronic Disease Prevention Alliance of Canada; 2008. Available from: *http://cdpac.ca/media.php?mid=832*	Expert report: review of policy and program options/best practices, developed primarily in consultation with experts	Knowledge exchange and capacity building are recognized as key capacities in the CDPAC framework for action on chronic disease prevention.
	Smith BJ, Tang KC, Nutbeam D. WHO health promotion glossary: new terms. Health Promot Int. 2006 Dec 1;21(4):340 –345.	Peer-reviewed publication: health promotion glossary Based on review of literature and expert consensus	This article lists and defines new terms to be included in WHO health promotion glossary.
	Program Training and Consultation Centre. About Us - PTCC [Internet]. Toronto: Program Training and Consultation Centre; n.d. [cited 2011 Sep 28]. Available from: *http://www.ptcc-cfc.on.ca/about_us/*	Resource centre of the Smoke Free Ontario Strategy website	This online resource centre is the home of the Program Training and Consultation Centre, part of the Smoke-Free Ontario Strategy.
	Green LW, Ottoson JM, García C, Hiatt RA. Diffusion theory and knowledge dissemination, utilization, and integration in public health. Annu Rev Public Health. 2009 Apr 29;30:151–74.	Peer-reviewed publication: narrative review of the concepts used in guiding public health in bridging science and practice	This review describes theory and history of diffusion theory and calls for more research.
	Canadian Health Services Research Foundation (CHSRF). Glossary of knowledge exchange terms as used by CHSRF [Internet]. Ottawa: CHSRF; n.d. [cited 2011 Sep 21]. Available from: *http://www.chsrf.ca/PublicationsAndResources/ResourcesForResearchers/KEYS/GlossaryOfKnowledgeExchangeTerms.aspx*	Research funding agency website	This web page lists the glossary of knowledge exchange terms used by the Canadian Health Services Research Foundation.

Recommendation 20—*Implement a coordinated health communications campaign*

Implement and sustain an evidence-based, comprehensive, integrated and coordinated chronic disease prevention communication campaign that builds upon existing campaigns in Ontario.

Research Evidence— Supported: Evidence has shown small to moderate effects on knowledge, attitudes, beliefs and behaviours with targeted, well executed campaigns.

Main premise	Reference	Type of study	Key findings relative to the main premise
Communications is a fundamental mandate for public health.	Riley B, Garcia J. Primary prevention of chronic diseases in Canada: a framework for action. Ottawa: Chronic Disease Prevention Alliance of Canada; 2008. Available from: *http://cdpac.ca/media.php?mid=832*	Expert report: review of policy and program options developed primarily in consultation with experts	Communication is a key functional capacity identified in the CDPAC framework for action on chronic diseases.
	United Nations, General Assembly. Draft political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases (A/66/L.1) [Internet]. New York: United Nations; 2011. Available from: *http://www.un.org/ga/search/view_doc.asp?symbol=A/66/L.1*	Political declaration by UN General Assembly based on extensive international and multi-sectoral consultations	The declaration recommends that governments: "Develop, strengthen and implement, as appropriate, multi-sectoral public policies and action plans to promote health education and health literacy, including through evidence-based education and information strategies and programmes in and out of schools, and through public awareness campaigns."
	Centers for Disease Control and Prevention. Health communication basics - what is health communication? [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2011 [cited 2012 Feb 6]. Available from: *http://www.cdc.gov/healthcommunication/HealthBasics/WhatIsHC.html*	Government website: description of concepts in social marketing and health communications	This summary of health communication and social marketing sets out the basics for public health used by the Centers for Disease Control and Prevention.
	Healthy People 2020. Health communication and health information technology: overview [Internet]. Washington, DC: US Department of Health and Human Services; 2012 [cited 2012 Jan 18]. Available from: *http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=18*	Government website: overview of basic of concepts in health communications and information technology	This website provides an overview of basic health communications.

Recommendation 20—*Implement a coordinated health communications campaign* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Communications is a fundamental mandate for public health.	Healthy People 2020. Health communication and health information technology: objectives [Internet]. Washington, DC: US Department of Health and Human Services; 2012 [cited 2012 Jan 18]. Available from: *http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=18*	Government website: objectives and US data source that could be used in evaluating activities	This website provides an inventory of health communication objectives and related database sources and indicators, including developmental objectives to increase social marketing in health promotion and disease prevention. Interventions are provided on a related tab. While many objectives relate to communication in a health care setting, one developmental objective is focused on increasing social marketing in health promotion and disease prevention. Links to resources are provided that include links to the Community Guide of the Community Preventive Task Force.

Recommendation 21—*Reduce health inequities*

Reduce health inequities by ensuring that actions taken to address chronic diseases and their associated risk factors recognize the higher burden of disease experienced by some sub-populations in Ontario.

Contextual/Experiential Evidence: Strong expert support with sound theory for recommendation. Awareness of the unequal distribution and burden of chronic disease across Ontario's populations highlight the need to conduct health equity impact assessments.

Main premise	Reference	Type of study	Key findings relative to the main premise
Provincial data collection systems are needed to identify and assess disparities among sub-populations.	National Collaborating Centre for Determinants of Health. (2010). Integrating Social Determinants of Health and Health Equity into Canadian Public Health Practice: Environmental Scan 2010. Antigonish, NS: National Collaborating Centre for Determinants of Health, St. Francis Xavier University	Expert report: based on environment scan, key informant interview, focus groups and online survey Based on scan of existing programs and interviews	One of the recommendations supports establishment of "purposeful reporting" mechanisms to illustrate the relationship between health and social inequities and tracking changes over time.

Recommendation 21—*Reduce health inequities* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Provincial data collection systems are needed to identify and assess disparities among sub-populations.	Ministry of Health and Long-Term Care. Preventing and Managing Chronic Disease: Ontario's Framework. Toronto: Ministry of Health and Long-Term Care, May 2007. Available from: *http://www.health.gov.on.ca/english/providers/program/cdpm/pdf/framework_full.pdf*	Expert report: Ministry of Health and Long-Term Care Chronic Disease Prevention and Management Framework	The report describes Saskatchewan's proposed policy framework for chronic disease prevention and management, which is based on models developed in the US and British Columbia, and includes effective data collection systems.
	Senate of Canada. A Healthy, Productive Canada: A Determinant of Health Approach. Final Report of the Subcommittee on Population Health of the Standing Senate Committee on Social Affairs, Science and Technology, June 2009. Ottawa: Senate of Canada, 2009. Available from: *http://www.parl.gc.ca/Content/SEN/Committee/402/popu/rep/rephealth1jun09-e.pdf*	Government report: Senate report Based on review of Canadian population health statistics and challenges	There are striking disparities in access to fundamental determinants of health across Canada, including disparities between high and low SES groups, and Aboriginal and non-Aboriginal Canadians. Priority should be given to: clean water, food security, parenting and early childhood learning, education, housing, economic development, health care and violence against Aboriginal women, children and elders.
Addressing the upstream determinants of health for sub-populations.	Schwartz R, O'Connor S, Minian N, Borland T, Babayan A, Ferrence R, et al. Evidence to inform smoking cessation policymaking in Ontario: a special report by the Ontario Tobacco Research Unit. [Internet]. Toronto: Ontario Tobacco Research Unit; 2010 [cited 2012 Feb 6]. Available from: *http://www.otru.org/pdf/special/special_CAP_august2010.pdf*	Expert report: report by the Ontario Tobacco Research Unit that includes review of scientific literature, population surveys, evaluation reports and the Performance Indicators Monitoring System Presents data upon which to identify higher-risk sub-groups for one chronic disease risk factor (smoking) in Ontario	Smoking rates differ by geography, ethnicity (higher among Aboriginal peoples), gender and age (highest among younger males) and occupation (highest among trades).
	Mikkonen J, Raphael D. Social Determinants of Health, The Canadian Facts. Toronto: York University School of Health Policy and Management, 2010. Available from: *http://www.thecanadianfacts.org/The_Canadian_Facts.pdf*	Expert report: narrative review of Canadian studies and data on SDOH Narrative review of real data from Canada Discussion of policy implications but no systematic analysis of interventions to address inequalities	This report documents the key sources of data concerning the social determinants of health and health inequalities for sub-populations in Canada.
Conducting healthy equity impact assessments prior to program and policy implementation.	Ontario, Ministry of Health and Long-Term Care. Health Equity Impact Assessment (HEIA) [Internet]. Toronto: Queen's Printer for Ontario; 2008 [cited 2011 Nov 15]. Available from: *http://www.health.gov.on.ca/en/pro/programs/heia/*	Decision-making tool used to assess equity impacts of programs/policies on vulnerable populations and identify remedial mitigation strategies	This web link connects to the Ministry of Health and Long-Term Care Health Equity Impact Assessment (HEIA) tool.

Recommendation 22—*Address First Nations, Inuit and Métis health*

Ensure that the actions taken to address risk factors associated with chronic diseases consider the barriers to health faced by First Nations, Inuit and Métis in Ontario.

Contextual/Experiential Evidence: Strong expert support with sound theory for recommendation. Awareness of the unequal distribution and burden of chronic disease across Ontario's populations highlights the need to engage Ontario's First Nations, Inuit and Métis populations to address the barriers these communities face.

Main premise	Reference	Type of study	Key findings relative to the main premise
Addressing risk factors and barriers to health faced by First Nations, Inuit and Métis in Ontario.	Reading CL, Wien F. Health Inequalities and Social Determinants of Aboriginal Peoples' Health. Prince George, BD: National Collaborating Centre for Aboriginal Health, 2009. Available from: *http://www.nccah-ccnsa.ca/docs/social%20determinates/NCCAH-loppie-Wien_report.pdf*	Expert report: review of data concerning health inequalities among Aboriginal peoples in Canada Analysis of determinants of health for Aboriginal peoples based on review of data and literature but does not discuss interventions or means of addressing them	Report notes that little is known about the distinct influence of social determinants of health in the lives of Aboriginal people; determinants may be distal (e.g., historic, political, social and economic), intermediate (e.g., community infrastructure, resources, systems and capacities), and/or proximal (e.g., health behaviours, physical and social environment).
	Cancer Care Ontario. Let's take a stand against … colorectal cancer!. Colorectal cancer in First Nations. [Internet] Toronto: Cancer Care Ontario; 2011. [cited 2012 Feb 26] Available from: *https://www.cancercare.on.ca/cms/One.aspx?portalId=1377&pageId=37272*	Cancer Care Ontario website Does not provide results but shows how public education can be adapted for Aboriginal audiences	Although the overall cancer incidence rate in First Nations people is lower than in the Ontario population as a whole, the rate is rising more quickly and much of this increase is due to rapid rises in the incidence of lung and colorectal cancers. A brief summary of public education toolkits adapted for Aboriginal audiences is provided.
	Cancer Care Ontario. Cancer fact: colorectal cancer increasing in Ontario First Nations people [Internet]. Toronto: Cancer Care Ontario; 2005 [cited 2011 Sep 23]. Available from: *https://www.cancercare.on.ca/search/default.aspx?q=first%20nations%20people& type=0,6-76,6-40484|-1,1377-78*	Expert report: analysis of colorectal incidence in First Nations people, 1968/75 to 1997/2001 Longitudinal analysis of colorectal cancer data	Although the overall cancer incidence rate in First Nations people is lower than for the Ontario population as a whole, the rate is rising more quickly and much of this increase is due to rapid rise in the incidence of lung and colorectal cancers.
	Statistics Canada. Aboriginal peoples in Canada in 2006: Inuit, Métis and First Nations, 2006 Census. Ottawa: Statistics Canada; 2008. Available from: *http://www12.statcan.ca/census-recensement/2006/as-sa/97-558/index-eng.cfm*	Government report: analysis of 2006 Canadian census data Census-based estimate of number of Aboriginal peoples in Canada	This report includes information on the number of Aboriginal peoples (Inuit, Métis and First Nations) in Canada, according to the 2006 census.

Recommendation 22—*Address First Nations, Inuit and Métis health* *(continued)*

Main premise	Reference	Type of study	Key findings relative to the main premise
Addressing risk factors and barriers to health faced by First Nations, Inuit and Métis in Ontario.	Statistics Canada. Aboriginal Peoples Survey 2001 — initial findings: well-being of the non-reserve Aboriginal population. Catalogue No.: 89-580 XIE. Ottawa: Statistics Canada; 2003. Available from: *http://www.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=89-589-XIE&lang=eng*	Government report: results of 2001 Aboriginal Peoples Survey Information on health status and care based on self-report of a sample of non-reserve Aboriginal peoples in Canada	Rates of diabetes are considerably higher for non-reserve Aboriginal populations than for total Canadian population. Those living in the Arctic report fewer contacts with health professionals.
	Smylie J. The health of Aboriginal people. In: Raphael D, editor. Social determinants of health: Canadian perspectives. 2nd ed. Toronto: Canadian Scholars Press; 2009. p. 280–302.	Book chapter Review of existing information	This review of literature documents inequities in the health status of FNIM peoples.
	Tjepkema M, Wilkins R, Senécal S, Guimond E, Penney C. Mortality of Métis and registered Indian adults in Canada: an 11-year follow-up study. Health Rep. 2009 Dec;20(4):31–51.	Peer reviewed publication: analysis of longitudinal Canadian data Analysis of real-world data to show health challenge but does not look at approaches for addressing the issue	Compared with non-Aboriginal members of the same cohort, life expectancy at age 25 was shorter for Métis and Inuit.
	Marrett LD, Chaudhry M. Cancer incidence and mortality in Ontario First Nations, 1968-1991 (Canada). Cancer Causes Control. 2003 Apr;14(3):259–68	Peer-reviewed publication: analysis of longitudinal cohort data Longitudinal analysis of cancer incidence and mortality data in Ontario's First Nations.	First Nations people in Ontario had significantly lower all-cancers incidence rate compared to the general population; there were differences by different cancer sites.
	Sheppard AJ, Chiarelli AM, Marrett LD, Mirea L, Nishri ED, Trudeau ME. Detection of later stage breast cancer in First Nations women in Ontario, Canada. Can J Public Health. 2010 Feb;101(1):101–5.	Peer-reviewed publication: case-case design to compare First Nations women with a frequency-matched random sample of general population women Study demonstrates need for improvement in breast cancer diagnosis in a single jurisdiction	First Nations women were diagnosed with a later stage of breast cancer significantly more often than were non-First Nations women.

7. Equity Analysis

To assess the potential for unintentional positive and negative impacts on sub-populations in Ontario that could result from implementing each of the recommendations put forward in the report, the PWG completed an assessment using the Ministry of Health and Long-Term Care (MOHLTC) Health Equity Impact Assessment (HEIA). The results of this assessment, which was compiled through interviews with risk factor leads and literature searches, are summarized in Table 24.

Table 24: Summary of interview-based underlying premises and evidence from the literature assessing the unintended positive and negative impacts of recommendations for chronic disease prevention in Ontario (adapted from the Ministry of Health and Long-Term Care Health Equity Impact Assessment tool).[152]

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Tobacco use				
Recommendation 1: Increase tobacco tax				
Low income (includes rural/remote, sex/gender, First Nations, Inuit and Métis (FNIM), lone mothers, people with mental illness and youth)	Interviewee comment	Taxes have the largest impact on people with less money.	May increase smuggling and contraband.	N/A
	Evidence from the literature	Increasing tobacco prices through taxation is the most effective way to reduce consumption among low income groups[153] and youth.[154,155]	According to the World Bank, even in the face of high levels of smuggling, increases in taxes reduce cigarette consumption.[156] For those who continue to smoke at the same rate, such policies may further reduce the spending ability of people in poverty.[157]	For detailed information on contraband prevention in Ontario, see Luk et al (2007).[158]
Recommendation 2: Broaden and extend the integrated tobacco cessation system				
Groups that experience barriers in accessing services (includes low income, homeless, immigrants, refugees, ethno-racial groups, people with disability and FNIM)	Interviewee comment	This recommendation is focused on services beyond medical services, thus there is an opportunity for people to benefit in different ways.	Homeless people may not have access to these tobacco cessation services.	Providing greater access to a broad range of services (e.g., housing services) may garner better access to cessation services for sub-populations, including the homeless.

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Groups that experience barriers in accessing services (including low income, homeless, immigrants, refugees, ethno-racial groups, people with disability and FNIM)	Evidence from the literature	A United Kingdom (UK) cohort study found that proactively identifying smokers from deprived areas and offering subsidized nicotine replacement therapy (NRT) increased quit rates and reduced consumption.[159]	According to Health Canada, even services that are universally accessible have barriers, such as availability of services (i.e., proximity to services), financial barriers (e.g., transportation and childcare costs), non-financial barriers (i.e., language and cultural appropriateness) and equitable treatment. Groups that disproportionately experience barriers are the homeless, immigrants, refugees, ethnically or racially groups, people with disabilities, FNIM groups and those with low income, among others.[160] Evidence also suggests that even when traditional barriers to access are reduced, disadvantaged groups still do not take up traditionally designed universal health promotion programs as readily,[161] and despite cessation services that target smokers with low socioeconomic status (SES), quit rates were still lower.[162–164]	Interventions should tackle the socio-economic barriers to smoking cessation.[162,165–168]
Recommendation 3: Implement a sustained social marketing campaign				
Populations with high smoking rates/high susceptibility (includes youth, low income and FNIM)	Interviewee comment	N/A	If messaging does not reach populations with high smoking rates/ high susceptibility, these groups will not benefit.	Develop appropriate messaging for priority groups.
	Evidence from the literature	N/A	It is not clear whether broad social media campaigns benefit priority groups.[169–172] For example, a systematic review of media campaigns to promote smoking cessation found that just one third of reviewed media campaigns were equally effective in promoting smoking cessation among smokers of high and low SES.[169]	Targeted messaging may be an effective mitigation strategy,[169,171] particularly for reaching youth.[173–176] However, the impact may be limited: a systematic review found that among studies specifically targeting low-socioeconomic smokers, there was no clear evidence that a media campaign promoted sustained cessation.[169]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Other groups without access to social media tools	Interviewee comment	N/A	Those who do not have access to television, radio, Internet and other social media tools will not be impacted by this recommendation.	N/A
	Evidence from the literature	N/A	Conversely, a systematic review found that social media interventions were effective in reaching a variety of groups for a wide range of interventions.[177]	N/A
Recommendation 4: Ban smoking on bar and restaurant patios				
Those that do not use bar and restaurant patios	Interviewee comment	This recommendation impacts all patrons of bar and restaurant patios, not just active smokers, by decreasing exposure to second-hand smoke.	Those who patronize bar and restaurant patios will not be impacted.	N/A
	Evidence from the literature	There is considerable evidence that policies of this kind have no differential impact by income, education level, age, sex/gender or ethnicity.[177–179]	N/A	N/A
Alcohol consumption				
Recommendation 5: Maintain and reinforce socially responsible pricing				
Low income (includes FNIM and sex/ gender)	Interviewee comment	Low-income groups are more "price sensitive".	N/A	N/A
	Evidence from the literature	Increasing alcohol prices through taxation can effectively reduce consumption among youth[180] and FNIM groups.[181]	N/A	N/A
Recommendation 6: Ensure effective controls on alcohol availability				
Low income, underemployed, or unemployed people; urban populations	Interviewee comment	Controlling the physical availability of alcohol may avoid disproportionately high alcohol retailer density in high-risk areas.	N/A	N/A

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Low income, underemployed, or unemployed people; urban populations	Evidence from the literature	The density of private alcohol retailers is associated with poverty, lower education, and race and ethnicity in urban areas in the continental United States.[182] This may have a substantial impact on these groups: there is evidence from British Columbia, for example, that increased density in alcohol sales leads to increases in alcohol-related harms including death.[183,184]	N/A	N/A
Recommendation 7: Strengthen targeted controls on alcohol marketing and promotion				
Age-related groups (youth)	Interviewee comment	Youth are particularly susceptible to messaging in advertising, and disproportionately benefit from targeted controls.	N/A	N/A
	Evidence from the literature	Youth experience both higher exposures to marketing and greater susceptibility to advertised messaging.[185,186] Adolescents may be particularly attracted to products that are branded through "lifestyle" oriented campaigns linking their consumption to immediate gratification, thrills and social status.[185]	N/A	N/A
Recommendation 8: Increase access to brief counselling interventions				
Low income (includes FNIM and rural/remote)	Interviewee comment	This recommendation can have a positive impact on health inequities, if supportive mechanisms are put into place.	N/A	Implement supportive mechanisms: access to subsidized transportation, extended hours for counselling, subsidized childcare, resources that are appropriate for all disadvantaged populations.
	Evidence from the literature	N/A	See Tobacco Cessation System Recommendation 2 -Low Income.	Interventions need to tackle the socio-economic barriers to smoking cessation.[168]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Sex/gender	Interviewee comment	Women and men experience counselling interventions differently.	N/A	N/A
	Evidence from the literature	Evidences shows that comprehensive services are valuable for men and women, but that more women receive services and experience greater absolute reduction in drug use at post-treatment. On the other hand, men are more receptive to on-site services and counselling.[187]	Research has found that women seeking treatment for substance abuse problems have lower incomes than do men seeking treatment.[188] A 2007 systematic review found that the low entry of women in substance abuse treatment is due to barriers such as pregnancy, lack of services for pregnant women, fear of losing custody of children, fear of prosecution, child responsibilities, lack of childcare outside or as part of treatment, higher rates of multiple disorders, sexual and physical abuse, etc.[189]	Comprehensive services, such as housing, transportation, education and income support reduce post-treatment substance use among both men and women, but greater numbers of women need such services.[187]
Physical inactivity				
Recommendation 9: Require physical education credits				
Sex/gender	Interviewee comment	Physical activity (PA) decreases among teenage girls.	N/A	N/A
	Evidence from the literature	Physical education (PE) school-based interventions have been effective in increasing PA activity among adolescent girls.[190–192]	N/A	N/A
Low income (includes FNIM and rural/remote)	Interviewee comment	Low SES groups may not have access to structured PA (such as organized sports) outside of school, or have time, available facilities or equipment.	FNIM and rural/remote areas may not adopt this recommendation because they may not have the facilities, proper attire, etc.	N/A
	Evidence from the literature	Evidence shows that targeted PE school-based interventions increased PA participation among low-income groups.[193]	FNIM and rural/remote areas face barriers that impede the adoption of healthy school-based interventions such as a lack of resources and facilities.[194]	Healthy school-based interventions must consider disadvantaged populations, such as FNIM and rural/ remote areas, and encourage schools to participate in the design of the intervention to ensure successful implementation .[194]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
People with disability	Interviewee comment	May provide more opportunity and thus increase PA among children with a disability.	Children with a disability may get excluded.	
	Evidence from the literature	N/A	In schools designed for students with four types of special needs (mild intellectual disability, hearing impairment, and visual impairment), the children with physical disabilities were the least active during both PE and recess compared with children with other disabilities.[195]	Increased PE frequency and lesson intensity, more PA opportunities during non-structured school time, and collaborations with home and community agencies are needed to reach PA levels.[195]
Overweight/ obese	Interviewee comment	N/A	Increasing physical education requirements in schools may stigmatize kids who are overweight, who may feel uncomfortable wearing "gym" clothes, not having proper change rooms, showers, etc.	Provide proper facilities should be provided, that is, changing rooms, showers, etc. PE credits should not have a grade system.
	Evidence from the literature	An advantage of a school-based PA strategy is that it targets all students through the curriculum, and thus could avoid stigmatizing children who are overweight/ obese.[196]	A Cochrane Review suggested that school-based interventions could exacerbate stigmatization of children who are overweight. Stigmatization has been shown to negatively impact self-esteem, self-worth and mental health. Therefore interventions that target all students could negatively impact children who feel "unfit" or self-conscious, and are potentially subjected to ridicule.[196]	A reward system (such as a grade), results in students becoming unmotivated to engage in PA because they now perceive it to be 'work.'[196]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Recommendation 10: Evaluate daily physical activity (DPA)				
Groups impacted by differential implementation of the DPA requirement (includes rural/remote, inner-urban populations, low income, and FNIM)	Interviewee comment	An evaluation may expose areas where the DPA was implemented unequally due to a lack of facilities or other barriers; this could lead to improvements in implementation.	If the evaluation does not look at unequal implementation in schools in rural/remote/low-SES/FNIM areas, these groups may "disappear" in aggregated results.	Ensure that contextual information and information on sub-populations are captured in evaluations.
	Evidence from the literature	N/A	N/A	For evaluations to have an impact on reducing inequalities, context considerations will have to be built in, which have been described as "the circumstances or events that form the environment within which something exists or takes place."[197]
Recommendation 11: Support active transportation				
Low income neighbourhoods	Interviewee comment	Active transportation infrastructure may be more affordable.	Low SES neighbourhoods may not have access to active transportation infrastructure.	Ensure that low SES neighbourhoods are reached.
	Evidence from the literature	N/A	Inequality in availability of PA facilities and limited control over PA due to inaccessible environments may contribute to ethnic and SES disparities in PA.[198–200]	Municipal governments need to monitor differences in walking conditions among high- and low-SES neighbourhoods, to ensure that policies are addressing inequitable walking conditions.[201]
Age-related groups (includes children/youth and seniors)	Interviewee comment	Active transportation infrastructure may increase physical activity among children and youth, and seniors.	N/A	N/A
	Evidence from the literature	Evidence shows that children were more active when there was an absence of road hazards (i.e., roads to cross, traffic density/speed) more than the provision of amenities (i.e., sidewalks, presence of destinations, controlled intersections).[202] Supportive walking environments are important for older people, as walking is a preferred form of PA[203,204] and is another possible means of transportation.[201]		Neighborhood interventions to increase safety and reduce disorder may be efficacious in increasing PA.[205]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Recommendation 12: Provide leadership through workplace physical activity policy				
Employment	Interviewee comment	May disproportionately positively impact lower income workers within the public service who may not have access to infrastructure at home.	May be perceived as unequal because it will only benefit public servants in the short term.	Encourage diffusion of the program using incentives, i.e., increased productivity.
	Evidence from the literature	N/A	Healthy work-based interventions face barriers, such as lack of resources, competing work, lack of participation, lack of time,[206,207] and size of workplace.[208] This may impact the ability of other organizations to adopt these policies. Workplace programs are likely to attract employees who are active already, who need the least incentive of on-site facilities or programs.[209]	
Unhealthy Eating				
Recommendation 13: Create an Ontario food and nutrition strategy				
Groups with higher rates of unhealthy eating (includes low income)	Interviewee comment	The purpose of the recommendation is to create equitable access to healthy foods; if it is implemented successfully, it would increase access for all Ontarians. May have a disproportionately large positive impact on disadvantaged groups with poorer baseline nutrition.	N/A	N/A
	Evidence from the literature	N/A	The potential for comprehensive, universal health promotion programs to increase disparities should be considered. Interventions may not be taken up by individuals at greatest risk, and disparities may actually increase if benefits are concentrated among higher SES individuals.[178,210,211]	Interventions should focus on the social context that leads to detrimental health behaviours instead of the behaviours themselves.[211]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Recommendation 14: Include compulsory food skills in curricula				
Low income (includes FNIM)	Interviewee comment	May educate low income students on cooking.	There are still challenges to adopting a healthy diet among disadvantaged populations.	N/A
Low income (includes FNIM)	Evidence from the literature	There is some evidence showing that community-based interventions among socially deprived adults have little, yet positive relationship to healthy food choices.[212]	There is some consensus that nutrition knowledge alone does not necessarily lead to a healthy diet.[213,214] Evidence shows that a community-based nutrition education programme targeted at low-income groups in UK found that "even using more contemporary methods of nutrition education, people with limited resources are still less likely to adopt recommended dietary changes. The main barrier preventing them from adopting healthy eating was not ignorance, but the sum effect of socio-cultural norms, lack of resources, financial instability, limited access to and availability of affordable healthy food and lack of choice."[214]	Broader political, economic and social factors should be incorporated into the strategy.[214]
Recommendation 15: Support healthy eating in publicly funded institutions				
Private institution employees or those who do not use public services	Interviewee comment	N/A	It may not benefit those who do not work in the public sector or use public services. Some may question why there is a focus on provincial employees (most already have reasonable salaries and benefits).	These standards are meant to inspire other workplaces to adopt similar practices (may remain challenging for small businesses).
	Evidence from the literature	N/A	N/A	N/A

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Recommendation 16: Implement mandatory menu labelling in food service operations				
Education; people with disability; linguistic communities	Interviewee comments	N/A	Utilizing menu labels may not be accessible for some groups.	An easy-to-understand symbol system or similar technique that accounts for varying levels of health literacy should be considered.
	Evidence from the literature	N/A	This may be particularly true for those who have low health literacy (those who speak English as a second language, low literacy, low education, etc.)[215,216]	A systematic review found that an individual's ability to interpret nutrition labels accurately reduces as complexity increases.[217] Prior knowledge is also an important predictor of nutrition information comprehension, an effect that is compounded in older age.[216,218]
Capacity-building recommendations				
Recommendation 17: Adopt a whole-of-government approach				
FNIM	Interviewee comment	A whole-of-government approach should truly be a representation of the population.	Must consider those who may be left out, e.g., this approach will not meet the needs of FNIM due to governance structure.	Need the perspectives of FNIM leaders on a "joined-up governance" approach. Would it be meaningful to them?
	Evidence from the literature	The Senate Subcommittee's Report, *A Healthy, Productive Canada: A Determinant of Health Approach,* states that the "reduction of inequities and improvements to population health can only be tackled through population health policy and a whole-of-government approach that targets health disparities in all policies ."[219] Countries such as Australia, England, Finland, New Zealand, Norway and Sweden have all taken bold steps to implement a whole-of-government approach with the objective of closing the health inequity gap .[220]	N/A	The whole-of-government approach will require intersectoral action among governments, businesses, organizations and community, as well as leadership from the prime minister and first ministers, mayors, municipal leaders, community leaders and FNIM leaders.[219]

Table 24: (continued)

Population to consider	Premise/ evidence	Unintended positive impacts	Unintended negative impacts	Mitigation strategies
Recommendation 18: Improve measurement, increase accountability				
All potentially disadvantaged populations	Interviewee comment	Improved measurement may promote equity by ensuring accurate identification of potentially disadvantaged groups.	N/A	Ensure socio-demographic variables are incorporated. Ensure that the sampling frame adequately captures small at-risk populations.
	Evidence from the literature	For example, FNIM policy makers need comprehensive and reliable health-assessment measures that reflect the needs, priorities and understandings of health, in local and regional jurisdictions.[221]	N/A	N/A
Recommendation 19: Connect knowledge with practice				
All potentially disadvantaged populations	Interviewee comment	N/A	Capacity for chronic disease prevention is not equitably distributed across Ontario.	Capacity building activities (tools, training, consultations, workshops etc.) must be designed and implemented to reach a broad range of health promotion intermediaries across Ontario.
	Evidence from the literature	N/A	N/A	N/A
Recommendation 20: Implement a coordinated health communications campaign				
All potentially disadvantaged populations	Interviewee comment	May reduce disparities across disadvantaged populations, although some previously implemented strategies have had limited success (see recommendation 3).	N/A	Targeted messaging for disadvantaged populations may be an effective mitigation strategy for promoting equitable implementation of this recommendation.
	Evidence from the literature	N/A	N/A	This has been shown with limited success in some populations.[169,171]

Note: Recommendations 21 and 22 were not included because they are specifically focused on improving equity

8. Limitations

Chapter 8 summarizes limitations of the methodology used to generate the report recommendations. The section includes a discussion of limitations pertaining to:

- the risk factor and disease evidence data
- the economic burden of chronic disease
- gaps in risk factor population health assessment and surveillance in Ontario
- the assessment conducted to identify the health equity impacts of the recommendations.

8.1 Risk Factor and Disease Evidence

The risk factor and disease evidence presented here is limited by two factors: the dependence on previously completed analyses (which was essential given the timeframe of the project), and the data available in Ontario.

Limiting the content to existing analyses completed for other purposes or by other groups meant that the cut points, disease and risk factor definitions, may not have been optimal for our purposes. As a result, some of the risk factor indicator definitions (e.g., alcohol consumption, physical inactivity) used to present prevalence estimates for the Ontario population as a whole differs from those used in the equity analyses. Furthermore, we were unable to present additional measures of risk factor burden, such as population-attributable fractions, since recent estimates of these have not been comprehensively prepared and published for the Ontario population. Population-attributable fractions would have provided additional quantification of the burden of tobacco, alcohol, unhealthy eating and physical inactivity on the Ontario population by providing an estimate of the proportion of the chronic disease related morbidity and/or mortality due to these factors. Lastly, the use of existing analyses limited our ability to present data on the distribution of chronic disease burden across socio-demographic groups, since these analyses have not been routinely or consistently conducted at a population level in Ontario.

The second factor stems from the lack of availability of critical data for Ontario as a whole and for certain sub-populations (e.g., Aboriginal groups). Problems with existing data included: questions around validity (especially for physical inactivity and self-reported obesity), and lack of availability. Physical activity data available from the Canadian Community Health Survey (CCHS), for example, does not reflect all aspects and domains of physical activity, cannot be easily correlated with objective measures, and may produce misleading and invalid estimates.[34,222,223] Furthermore, since chronic diseases and their determinants are not reported consistently in Ontario, we were not able to provide complete estimates on the burden of certain chronic diseases and the prevalence of risk factors. For example, incidence estimates for the majority of chronic diseases including cardiovascular disease (e.g., heart disease and stroke) and chronic respiratory diseases (e.g., asthma and chronic obstructive pulmonary disease) are not complete due to a lack of complete population data. Furthermore, estimates of unhealthy eating in the Ontario population are limited to vegetable and fruit consumption, since data on other dietary factors (e.g., total fat and trans fat consumption, red and processed meat consumption, fibre intake, etc.) are not available at a population level for recent years.

8.2 Economic Burden

The principal limitation to estimating the direct and indirect costs of tobacco use, alcohol consumption, physical inactivity and unhealthy eating for the purpose of this report was the lack of published literature directly assessing costs for the province of Ontario. For this reason, per capita estimates from Western industrialized countries, with a focus on Canadian estimates, were multiplied by the population size of Ontario in 2011 to approximate the magnitude of the potential costs. The resulting estimates are limited further because they account for costs incurred by all risk-factor-related diseases and injuries, not just cancer, cardiovascular disease, chronic respiratory disease and diabetes.

These estimates should be interpreted cautiously because direct and indirect costs were defined differently across studies, costing techniques varied, and studies differed in their reporting of net versus gross costs (this is especially important for alcohol consumption, where moderate consumption may result in some cost savings). For these reasons, many estimates reported here are not directly comparable.

8.3 Gaps in Risk Factor Population Health Assessment and Surveillance in Ontario

Risk factor surveillance ideally extends beyond cross-sectional surveys of individual behaviours. The impact of various program and policy measures could most effectively be evaluated by including several components. Each component needs to use sets of core indicators agreed by experts in the field to be 1) valid for measuring what they purport to measure, 2) feasible, and 3) clearly defined as to data collection and analytic methods.

Gaps in risk factor population health assessment and surveillance impeded the development of this report and warrant further action. While a number of gaps in risk factor surveillance have previously been identified by the Ontario Risk and Behaviour Surveillance System advisory committee,[224] three stood out:

- improved individual behaviour measurement in cross-sectional surveys
- systematic longitudinal data collection on individual behaviour (that is, survey design in which the same individuals are re-contacted)
- coordinated surveillance of the program and policy environments for key risk factors

Aspects and examples of these gaps are described in the risk factor sections below. While the examples given for each risk factor may emphasize one or another component, all three components listed will apply to these key risk factors and to other chronic disease risk factors. Thus while the physical inactivity section stresses the validity and completeness of individual measures, these issues are no less important for the other risk factors. Likewise, integrated collection and analysis of individual and program/policy data issues mentioned for tobacco and unhealthy eating also apply to physical inactivity.

Risk factor	Gaps identified—aspects and examples
Tobacco	■ None of the current provincially funded data collection initiatives collects relevant ongoing data to evaluate the impact that changes in the program or policy environment have on individual tobacco use behavior. Such data should be measured consistently over time to assess trends in individual tobacco use behavior, and the program and policy environment in Ontario. This is required to understand the factors that influence changes in tobacco use over time. ■ Such data should be collected from different sup-populations (e.g., youth, young adults, adults, etc.), and also measure different domains of the program and/or policy environment (e.g., schools, workplaces, municipalities, etc.), which may be changed over time to impact individuals. Data of this nature would inform the provincial government's understanding of which programs or policies (or combination of programs and/or policies) have an impact on reducing tobacco use, with which populations, and why.
Alcohol	■ There is no designated lead agency to champion the consistent definition of Canada's new low-risk drinking guidelines[225] in a manner that permits ongoing monitoring at the provincial, regional and local levels. Such a definition should address how it can be operationalized using available Canadian Community Health Survey data (because of its geographic representativeness) but also be consistent with any new definitions developed for reporting related data from the Centre for Addiction and Mental Health (CAMH) Monitor and the Ontario Student Drug Use and Health Survey. A set of questions could be developed to monitor population-level awareness of risks associated with moderate (as opposed to high) levels of alcohol consumption to better target public health action. ■ Use of existing GIS technology would enable ongoing monitoring of environmental factors of public health importance such as alcohol outlet geographic density to guide preventive action. ■ While alcohol policy is more easily tracked because of the extent to which alcohol is regulated, information on programs or resources addressing moderate and high-risk drinkers is poorly monitored. This monitoring would include availability of brief counselling interventions and other resources.

Risk factor	Gaps identified—aspects and examples
Physical inactivity	■ Many aspects of physical activity go unmeasured in current surveys. All aspects (frequency, intensity and duration) and domains (occupational, household, transport [walking and cycling for travel to and from work, school, and for other travel purposes], and recreational or leisure-time) must be measured if the data used are to accurately assess the degree of local and subpopulation need, evaluate the population-level effect of interventions, and inform public policy.[72,226] In particular, occupational physical activity measurement should be included if population risk for chronic disease is being assessed.[227] The assessment of physical activity levels in children presents additional challenges.[228] ■ The geographic level of measurement is not standardized and often insufficient for local planning. Only in the Canadian Community Health Survey (CCHS) are physical activity data currently collected across different levels in Ontario (provincial, at the level of Local Health Integration Networks (LHIN) and public health unit). The CCHS does not, however, currently reflect all aspects and domains of physical activity and, as such, collection may produce data that are incomplete.[34,222,223] ■ Generally, Ontario lacks a comprehensive and valid system for monitoring physical activity at the population level; ideally, such a system would have indicators aligned with measures from other jurisdictions.[228,229]
Unhealthy eating	■ Ontario lacks periodically collected in-depth data on nutrition at reasonable intervals. Detailed information on healthy eating at the provincial or lower level has been collected only once, in the focused nutrition survey of the Canadian Community Health Survey (CCHS) in 2004. It is not scheduled for collection again until 2015. Routine collection of nutrition information in the CCHS is limited to questions on food insecurity, and vegetable and fruit intake. ■ Food skills data are needed to guide interventions for the provision of such skills in Ontario and to evaluate their impact on healthy eating.[230] These should include measurement of the frequency of family meals and involvement in food preparation among adolescents and young adults, and the tracking of trends over time. ■ Ontario lacks routinely collected data to monitor the impact of programs and policies for healthy eating. Such measures as the *Healthy Food for Healthy Schools Act* require timely evaluation and monitoring to determine their impact and to guide future programs and policy.

8.4 Equity Analysis

The main limitation to performing a comprehensive assessment of potential unintended positive and negative impacts of the recommendations in this report is the lack of published research that measures impacts on sub-populations. Further, existing research is difficult to find because it is not indexed in a standard way and does not lend itself to traditional search strategies. For this reason, this assessment contains ideas about potential impacts that have not been demonstrated in the literature, and makes inferences from similar interventions when possible.

References

1. Beaglehole R, Ebrahim S, Reddy S, Voûte J, Leeder S. Prevention of chronic diseases: a call to action. Lancet. 2007 Dec 22;370(9605):2152–7.

2. World Health Organization. Preventing chronic diseases: a vital investment [Internet]. WHO Press; 2005. Available from: http://www.who.int/chp/chronic_disease_report/full_report.pdf

3. Abegunde D, Stanciole A. An estimation of the economic impact of chronic noncommunicable diseases in selected countries. Geneva: WHO Press; 2005.

4. Pan American Health Organization. Regional strategy and plan of action on an integrated approach to the prevention and control of chronic diseases [Internet]. Washington, DC: Pan American Health Organizatio; 2007. Available from: http://amro.who.int/English/ad/dpc/nc/reg-strat-cncds.pdf

5. World Health Organization. Global status report on noncommunicable diseases 2010 [Internet]. Geneva Switzerland: World Health Organization; 2011. Available from: http://whqlibdoc.who.int/publications/2011/9789240686458_eng.pdf

6. United Nations, General Assembly. Draft political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases (A/66/L.1) [Internet]. New York: United Nations; 2011. Available from: http://www.un.org/ga/search/view_doc.asp?symbol=A/66/L.1

7. World Health Organization. 2008-2013 action plan for the global strategy for the prevention and control of noncommunicable diseases [Internet]. Geneva: World Health Organization; 2008. Available from: http://whqlibdoc.who.int/publications/2009/9789241597418_eng.pdf

8. Beaglehole R, Bonita R, Horton R, Adams C, Alleyne G, Asaria P, et al. Priority actions for the non-communicable disease crisis. Lancet. 2011 Apr 23;377(9775):1438–47.

9. Riley B, Garcia J. Primary prevention of chronic diseases in Canada: a framework for action. Ottawa: Chronic Disease Prevention Alliance of Canada; 2008.

10. Ontario, Ministry of Health and Long-Term Care. Preventing and managing chronic disease: Ontario's framework [Internet]. Toronto: Queen's Printer for Ontario; 2007. Available from: http://www.health.gov.on.ca/english/providers/program/cdpm/pdf/framework_full.pdf

11. Commission on the Reform of Ontario's Public Services. Public services for Ontarians: a path to sustainability and excellence [Internet]. Toronto, ON: Queen's Printer for Ontario; 2012. Available from: http://www.fin.gov.on.ca/en/reformcommission/chapters/report.pdf

12. Bank of Canada. 10-year currency converter [Internet]. [cited 2012 Mar 14]. Available from: http://www.bankofcanada.ca

13. Bank of Canada. Inflation calculator [Internet]. [cited 2012 Mar 14]. Available from: http://www.bankofcanada.ca

14. Ontario Ministry of Finance. Ontario Fact Sheet February 2012 [Internet]. [cited 2012 Mar 14]. Available from: http://www.fin.gov.on.ca/en/economy/ecupdates/factsheet.html

15. Brownson RC, Haire-Joshu D, Luke DA. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. Annu Rev Public Health. 2006;27:341–70.

16. Sallis JF, Glanz K. Physical activity and food environments: solutions to the obesity epidemic. Milbank Q. 2009 Mar;87(1):123–54.

17. Ontario Ministry of Health and Long-Term Care. Health Equity Impact Assessment (HEIA) - Ministry Programs - Health Care Professionals - MOHLTC [Internet]. [cited 2012 Mar 14]. Available from: http://www.health.gov.on.ca/en/pro/programs/heia/tool.aspx

18. Kohatsu ND, Robinson JG, Torner JC. Evidence-based public health: an evolving concept. Am J Prev Med. 2004 Dec;27(5):417–21.

19. Waters E, Doyle J, Jackson N, Howes F, Brunton G, Oakley A. Evaluating the effectiveness of public health interventions: the role and activities of the Cochrane Collaboration. J Epidemiol Community Health. 2006 Apr;60(4):285–9.

20. Brownson RC, Fielding JE, Maylahn CM. Evidence-based public health: a fundamental concept for public health practice. Annu Rev Public Health. 2009 Apr 29;30:175–201.

21. Puddy RW, Wilkins N. Understanding evidence part 1: best available research evidence. A guide to the continuum of evidence of effectiveness [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2011. Available from: http://www.cdc.gov/ViolencePrevention/pdf/Understanding_Evidence-a.pdf

22. Green LW, Glasgow RE. Evaluating the relevance, generalization, and applicability of research: issues in external validation and translation methodology. Eval Health Prof. 2006 Mar;29(1):126–53.

23. Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. Obes Rev. 2005 Feb;6(1):23–33.

24. Ontario, Ministry of Health and Long-Term Care. Health Equity Impact Assessment (HEIA) workbook: how to conduct HEIA [Internet]. Toronto: Queen's Printer for Ontario; 2011. Available from: http://www.health.gov.on.ca/en/pro/programs/heia/docs/workbook.pdf

25. Ministry of Health and Long-Term Care. Ontario mortality data. IntelliHEALTH Ontario. Toronto, ON: Queen's Printer for Ontario; 2007 [extracted 2011 Sep].

26. Ontario Ministry of Finance. Ontario population projections update [Internet]. Toronto: Queen's Printer for Ontario; 2011. Available from: http://www.fin.gov.on.ca/en/economy/demographics/projections/

27. Lipscombe LL, Hux JE. Trends in diabetes prevalence, incidence, and mortality in Ontario, Canada 1995-2005: a population-based study. Lancet. 2007 Mar 3;369(9563):750–6.

28. Manuel D, Rosella L, Tuna M, Bennett C. How many Canadians will be diagnosed with diabetes between 2007 and 2017? Assessing population risk [Internet]. Toronto, ON: ICES Investigative Report; Available from: http://www.ices.on.ca/file/Diabetes%20Risks%20June%2016%202010.pdf

29. Manuel DG, Perez R, Bennett C, Rosella L, Taljaard M, Roberts M, Sanderson R, Meltem T, Tanuseputro P, Manson H. The impact of smoking, alcohol, diet, physical activity and stress on health and life expectancy in Ontario. An ICES/PHO Report. Toronto: Public Health Ontario; 2012. Joint publication of the Institute for Clinical Evaluative Sciences.

30. Ialomiteanu AR, Adlaf EM, Mann RE, Rehm J. CAMH monitor eReport: addiction and mental health indicators among Ontario adults, 1977-2009 (CAMH research document series no. 31) [Internet]. Toronto: Centre for Addiction and Mental Health; 2011. Available from: http://www.camh.net/Research/Areas_of_research/Population_Life_Course_Studies/CAMH_Monitor/CM2009_eReport_Final.pdf

31. Yang WS, Leatherdale ST, Ahmed R. Smoking susceptibility among never-smokers: data from the 2006-07 National Youth Smoking Survey. Can J Public Health. 2011 Aug;102(4):254–7.

32. Ontario Tobacco Research Unit. Indicators of Smoke-Free Ontario progress. Monitoring and Evaluation Series, Vol. 14/15, No. 2 [Internet]. Toronto: Ontario Tobacco Research Unit; 2010. Available from: http://www.otru.org/pdf/15mr/15mr_no2.pdf

33. Young MM, Saewyc E, Boak A, Jahrig J, Anderson B, Doiron Y. Cross-Canada report on student alcohol and drug use: technical report [Internet]. Ottawa: Canadian Centre on Substance Abuse; 2011. Available from: http://www.ccsa.ca/2011%20CCSA%20Documents/2011_CCSA_Student_Alcohol_and_Drug_Use_en.pdf

34. Katzmarzyk PT, Tremblay MS. Limitations of Canada's physical activity data: implications for monitoring trends. Can J Public Health. 2007;98 Suppl 2:S185–94.

35. Garriguet D. Diet quality in Canada. Health Rep. 2009 Sep;20(3):41–52.

36. Chief Medical Officer of Health of Ontario. 2004 Chief Medical Officer of Health report. Healthy weights, healthy lives [Internet]. Toronto: Queen's Printer for Ontario; 2004. Available from: http://www.mhp.gov.on.ca/en/heal/healthy_weights.pdf

37. World Health Organization, Food and Agriculture Organization. Diet, nutrition and the prevention of chronic diseases. Report of a joint WHO/FAO Expert Consultation. WHO technical report series 916. Geneva: World Health Organization; 2003.

38. Secretan B, Straif K, Baan R, Grosse Y, El Ghissassi F, Bouvard V, et al. A review of human carcinogens—Part E: tobacco, areca nut, alcohol, coal smoke, and salted fish. Lancet Oncol. 2009 Nov;10(11):1033–4.

39. US Department of Health and Human Services. The health consequences of smoking: a report of the Surgeon General. Atlanta (GA): US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.

40. Collishaw N, Boyd N, Cantor K, Hammond S, Johnson K, Millar J, et al. Canadian Expert Panel on Tobacco Smoke and Breast Cancer Risk. Toronto, ON: Ontario Tobacco Research Unit; 2009.

41. California Environmental Protection Agency, Air Resources Board. Proposed identification of environmental tobacco smoke as a toxic air contaminant. San Francisco: Surveys and Program Evaluations from Outside UCSF, Center for Tobacco Control Research and Education, UC San Francisco; 2005.

42. US Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General [Internet]. Atlanta (GA): US Dept. of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2006. Available from: http://www.surgeongeneral.gov/library/secondhandsmoke/report/index.html

43. Taylor R, Najafi F, Dobson A. Meta-analysis of studies of passive smoking and lung cancer: effects of study type and continent. Int J Epidemiol. 2007 Oct;36(5):1048–59.

44. International Agency for Research on Cancer. IARC monographs on the evaluation of carcinogenic risks to humans: tobacco smoke and involuntary smoking. Lyon, FR: IARC Press; 2004.

45. Lee Y-CA, Boffetta P, Sturgis EM, Wei Q, Zhang Z-F, Muscat J, et al. Involuntary smoking and head and neck cancer risk: pooled analysis in the International Head and Neck Cancer Epidemiology Consortium. Cancer Epidemiol. Biomarkers Prev. 2008 Aug;17(8):1974–81.

46. Boffetta P, Straif K. Use of smokeless tobacco and risk of myocardial infarction and stroke: systematic review with meta-analysis. BMJ. 2009;339:b3060.

47. Boffetta P, Hecht S, Gray N, Gupta P, Straif K. Smokeless tobacco and cancer. Lancet Oncol. 2008 Jul;9(7):667–75.

48. Lee PN, Hamling J. Systematic review of the relation between smokeless tobacco and cancer in Europe and North America. BMC Med. 2009;7:36.

49. Smokeless tobacco and some tobacco-specific N-nitrosamines. IARC Monogr Eval Carcinog Risks Hum. 2007;89:1–592.

50. Gandini S, Botteri E, Iodice S, Boniol M, Lowenfels AB, Maisonneuve P, et al. Tobacco smoking and cancer: a meta-analysis. Int J Cancer. 2008 Jan 1;122(1):155–64.

51. Liang PS, Chen T-Y, Giovannucci E. Cigarette smoking and colorectal cancer incidence and mortality: systematic review and meta-analysis. Int. J. Cancer. 2009 May 15;124(10):2406–15.

52. Tsoi KKF, Pau CYY, Wu WKK, Chan FKL, Griffiths S, Sung JJY. Cigarette smoking and the risk of colorectal cancer: a meta-analysis of prospective cohort studies. Clin. Gastroenterol. Hepatol. 2009 Jun;7(6):682–688.e1–5.

53. Bosetti C, Gallus S, Garavello W, La Vecchia C. Smoking cessation and the risk of oesophageal cancer: An overview of published studies. Oral Oncol. 2006 Nov;42(10):957–64.

54. Hashibe M, Brennan P, Chuang S-C, Boccia S, Castellsague X, Chen C, et al. Interaction between tobacco and alcohol use and the risk of head and neck cancer: pooled analysis in the International Head and Neck Cancer Epidemiology Consortium. Cancer Epidemiol Biomarkers Prev. 2009 Feb;18(2):541–50.

55. Chuang S-C, Lee Y-CA, Hashibe M, Dai M, Zheng T, Boffetta P. Interaction between cigarette smoking and hepatitis B and C virus infection on the risk of liver cancer: a meta-analysis. Cancer Epidemiol Biomarkers Prev. 2010 May;19(5):1261–8.

56. US Department of Health and Human Services. How tobacco smoke causes disease: the biology and behavioral basis for smoking-attributable disease: a report of the Surgeon General [Internet]. Atlanta (GA): Centers for Disease Control and Prevention (US); 2010 [cited 2012 Mar 14]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21452462

57. Institute of Medicine of the National Academies, Committee on Second-hand Smoke Exposure and Acute Coronary Events. Second-hand smoke exposure and cardiovascular effects. Washington, DC: The National Academies Press; 2009.

58. National Cancer Institute. Cigars: health effects and trends [Internet]. Bethesda (MD): National Cancer Institute, US National Institutes of Health; 1998. Available from: http://cancercontrol.cancer.gov/tcrb/monographs/9/m9_complete.PDF

59. Erhardt L. Cigarette smoking: an undertreated risk factor for cardiovascular disease. Atherosclerosis. 2009 Jul;205(1):23–32.

60. Shah RS, Cole JW. Smoking and stroke: the more you smoke the more you stroke. Expert Rev Cardiovasc Ther. 2010 Jul;8(7):917–32.

61. He J, Vupputuri S, Allen K, Prerost MR, Hughes J, Whelton PK. Passive smoking and the risk of coronary heart disease—a meta-analysis of epidemiologic studies. N. Engl. J. Med. 1999 Mar 25;340(12):920–6.

62. Eisner MD, Anthonisen N, Coultas D, Kuenzli N, Perez-Padilla R, Postma D, et al. An official American Thoracic Society public policy statement: Novel risk factors and the global burden of chronic obstructive pulmonary disease. Am. J. Respir. Crit. Care Med. 2010 Sep 1;182(5):693–718.

63. Hylkema MN, Sterk PJ, de Boer WI, Postma DS. Tobacco use in relation to COPD and asthma. Eur. Respir. J. 2007 Mar;29(3):438–45.

64. McLeish AC, Zvolensky MJ. Asthma and cigarette smoking: a review of the empirical literature. J Asthma. 2010 May;47(4):345–61.

65. Langhammer A, Johnsen R, Holmen J, Gulsvik A, Bjermer L. Cigarette smoking gives more respiratory symptoms among women than among men. The Nord-Trondelag Health Study (HUNT). J Epidemiol Community Health. 2000 Dec;54(12):917–22.

66. Devereux G. ABC of chronic obstructive pulmonary disease. Definition, epidemiology, and risk factors. BMJ. 2006 May 13;332(7550):1142–4.

67. Thomson NC. The role of environmental tobacco smoke in the origins and progression of asthma. Curr Allergy Asthma Rep. 2007 Jul;7(4):303–9.

68. Iribarren C, Tekawa IS, Sidney S, Friedman GD. Effect of cigar smoking on the risk of cardiovascular disease, chronic obstructive pulmonary disease, and cancer in men. N. Engl. J. Med. 1999 Jun 10;340(23):1773–80.

69. Willi C, Bodenmann P, Ghali WA, Faris PD, Cornuz J. Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. JAMA. 2007 Dec 12;298(22):2654–64.

70. Haire-Joshu D, Glasgow RE, Tibbs TL. Smoking and diabetes. Diabetes Care. 2004 Jan;27 Suppl 1:S74–75.

71. Baan R, Straif K, Grosse Y, Secretan B, El Ghissassi F, Bouvard V, et al. Carcinogenicity of alcoholic beverages. Lancet Oncol. 2007 Apr;8(4):292–3.

72. World Cancer Research Fund, American Institute for Cancer Research. Food, nutrition, physical activity, and the prevention of cancer: a global perspective. Second Expert report. Washington, DC: WCRF/AICR; 2007.

73. Bagnardi V, Blangiardo M, La Vecchia C, Corrao G. A meta-analysis of alcohol drinking and cancer risk. Br J Cancer. 2001 Nov 30;85(11):1700–5.

74. Corrao G, Bagnardi V, Zambon A, La Vecchia C. A meta-analysis of alcohol consumption and the risk of 15 diseases. Prev Med. 2004 May;38(5):613–9.

75. Tramacere I, Negri E, Bagnardi V, Garavello W, Rota M, Scotti L, et al. A meta-analysis of alcohol drinking and oral and pharyngeal cancers. Part 1: overall results and dose-risk relation. Oral Oncol. 2010 Jul;46(7):497–503.

76. Islami F, Fedirko V, Tramacere I, Bagnardi V, Jenab M, Scotti L, et al. Alcohol drinking and esophageal squamous cell carcinoma with focus on light-drinkers and never-smokers: a systematic review and meta-analysis. Int. J. Cancer. 2011 Nov 15;129(10):2473–84.

77. Islami F, Tramacere I, Rota M, Bagnardi V, Fedirko V, Scotti L, et al. Alcohol drinking and laryngeal cancer: overall and dose-risk relation—a systematic review and meta-analysis. Oral Oncol. 2010 Nov;46(11):802–10.

78. Hamajima N, Hirose K, Tajima K, Rohan T, Calle EE, Heath CW Jr, et al. Alcohol, tobacco and breast cancer—collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. Br. J. Cancer. 2002 Nov 18;87(11):1234–45.

79. Cho E, Smith-Warner SA, Ritz J, van den Brandt PA, Colditz GA, Folsom AR, et al. Alcohol intake and colorectal cancer: a pooled analysis of 8 cohort studies. Ann. Intern. Med. 2004 Apr 20;140(8):603–13.

80. Fedirko V, Tramacere I, Bagnardi V, Rota M, Scotti L, Islami F, et al. Alcohol drinking and colorectal cancer risk: an overall and dose-response meta-analysis of published studies. Ann. Oncol. 2011 Sep;22(9):1958–72.

81. Key J, Hodgson S, Omar RZ, Jensen TK, Thompson SG, Boobis AR, et al. Meta-analysis of studies of alcohol and breast cancer with consideration of the methodological issues. Cancer Causes Control. 2006 Aug;17(6):759–70.

82. World Cancer Research Fund, American Institute for Cancer Research. Continuous update project interim report summary. Food, nutrition, physical activity, and the prevention of colorectal cancer. [Internet]. London: WCRF International; 2011. Available from: http://www.wcrf.org/PDFs/Colorectal%20cancer%20report%20summary%20 2011.pdf

83. Druesne-Pecollo N, Tehard B, Mallet Y, Gerber M, Norat T, Hercberg S, et al. Alcohol and genetic polymorphisms: effect on risk of alcohol-related cancer. Lancet Oncol. 2009 Feb;10(2):173–80.

84. Boffetta P, Hashibe M. Alcohol and cancer. Lancet Oncol. 2006 Feb;7(2):149–56.

85. Oyesanmi O, Snyder D, Sullivan N, Reston J, Treadwell J, Schoelles K. Alcohol consumption and cancer risk [Internet]. Rockville, MD: Agency for Healthcare Research and Quality (US); 2010 [cited 2012 Mar 14]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK55953/

86. Klatsky AL. Alcohol and cardiovascular diseases. Expert Rev Cardiovasc Ther. 2009 May;7(5):499–506.

87. O'Keefe JH, Bybee KA, Lavie CJ. Alcohol and cardiovascular health: the razor-sharp double-edged sword. J Am Coll Cardiol. 2007 Sep 11;50(11):1009–14.

88. World Health Organization. Global status report on alcohol 2004. Geneva: World Health Organization Dept. of Mental Health and Substance Abuse; 2004.

89. Rehm J, Baliunas D, Borges GLG, Graham K, Irving H, Kehoe T, et al. The relation between different dimensions of alcohol consumption and burden of disease: an overview. Addiction. 2010 May;105(5):817–43.

90. Costanzo S, Di Castelnuovo A, Donati MB, Iacoviello L, de Gaetano G. Cardiovascular and overall mortality risk in relation to alcohol consumption in patients with cardiovascular disease. Circulation. 2010 May 4;121(17):1951–9.

91. Djoussé L, Gaziano JM. Alcohol consumption and heart failure: a systematic review. Curr Atheroscler Rep. 2008 Apr;10(2):117–20.

92. Corrao G, Rubbiati L, Bagnardi V, Zambon A, Poikolainen K. Alcohol and coronary heart disease: a meta-analysis. Addiction. 2000 Oct;95(10):1505–23.

93. Roerecke M, Rehm J. Irregular heavy drinking occasions and risk of ischemic heart disease: a systematic review and meta-analysis. Am J Epidemiol. 2010 Mar 15;171(6):633–44.

94. Reynolds K, Lewis B, Nolen JDL, Kinney GL, Sathya B, He J, et al. Alcohol consumption and risk of stroke: a meta-analysis. JAMA. 2003 Feb 5;289(5):579–88.

95. Kamholz SL. Wine, spirits and the lung: good, bad or indifferent? Trans. Am. Clin. Climatol. Assoc. 2006;117:129–145; discussion 145.

96. Boé DM, Vandivier RW, Burnham EL, Moss M. Alcohol abuse and pulmonary disease. J. Leukoc. Biol. 2009 Nov;86(5):1097–104.

97. Sisson JH. Alcohol and airways function in health and disease. Alcohol. 2007 Aug;41(5):293–307.

98. Howard AA, Arnsten JH, Gourevitch MN. Effect of alcohol consumption on diabetes mellitus: a systematic review. Ann. Intern. Med. 2004 Feb 3;140(3):211–9.

99. Pietraszek A, Gregersen S, Hermansen K. Alcohol and type 2 diabetes. A review. Nutr Metab Cardiovasc Dis. 2010 Jun;20(5):366–75.

100. Koppes LLJ, Dekker JM, Hendriks HFJ, Bouter LM, Heine RJ. Moderate alcohol consumption lowers the risk of type 2 diabetes: a meta-analysis of prospective observational studies. Diabetes Care. 2005 Mar;28(3):719–25.

101. Baliunas DO, Taylor BJ, Irving H, Roerecke M, Patra J, Mohapatra S, et al. Alcohol as a risk factor for type 2 diabetes: A systematic review and meta-analysis. Diabetes Care. 2009 Nov;32(11):2123–32.

102. Friedenreich CM, Neilson HK, Lynch BM. State of the epidemiological evidence on physical activity and cancer prevention. Eur J Cancer. 2010 Sep;46(14):2593–604.

103. Wolin KY, Yan Y, Colditz GA, Lee I-M. Physical activity and colon cancer prevention: a meta-analysis. Br J Cancer. 2009 Feb 24;100(4):611–6.

104. Huxley RR, Ansary-Moghaddam A, Clifton P, Czernichow S, Parr CL, Woodward M. The impact of dietary and lifestyle risk factors on risk of colorectal cancer: a quantitative overview of the epidemiological evidence. Int. J. Cancer. 2009 Jul 1;125(1):171–80.

105. Harriss DJ, Atkinson G, Batterham A, George K, Cable NT, Reilly T, et al. Lifestyle factors and colorectal cancer risk (2): a systematic review and meta-analysis of associations with leisure-time physical activity. Colorectal Dis. 2009 Sep;11(7):689–701.

106. Voskuil DW, Monninkhof EM, Elias SG, Vlems FA, van Leeuwen FE. Physical activity and endometrial cancer risk, a systematic review of current evidence. Cancer Epidemiol. Biomarkers Prev. 2007 Apr;16(4):639–48.

107. Cust AE, Armstrong BK, Friedenreich CM, Slimani N, Bauman A. Physical activity and endometrial cancer risk: a review of the current evidence, biologic mechanisms and the quality of physical activity assessment methods. Cancer Causes Control. 2007 Apr;18(3):243–58.

108. Moore SC, Gierach GL, Schatzkin A, Matthews CE. Physical activity, sedentary behaviours, and the prevention of endometrial cancer. Br. J. Cancer. 2010 Sep 28;103(7):933–8.

109. United States. Surgeon General, United States. Department of Health and Human Services. Physical activity and health : a report of the Surgeon General. Atlanta (GA): US Department of Health and Human Services; 1996.

110. Physical activity and cardiovascular health. NIH Consensus Development Panel on Physical Activity and Cardiovascular Health. JAMA. 1996 Jul 17;276(3):241–6.

111. Lee I-M. Physical activity and cardiac protection. Curr Sports Med Rep. 2010 Aug;9(4):214–9.

112. Wang Y, Hu G. Individual and joint associations of obesity and physical activity on the risk of heart failure. Congest Heart Fail. 2010 Dec;16(6):292–9.

113. Warburton DE, Charlesworth S, Ivey A, Nettlefold L, Bredin SS. A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. Int J Behav Nutr Phys Act. 2010;7:39.

114. Sattelmair J, Pertman J, Ding EL, Kohl HW 3rd, Haskell W, Lee I-M. Dose response between physical activity and risk of coronary heart disease: a meta-analysis. Circulation. 2011 Aug 16;124(7):789–95.

115. ten Hacken NHT. Physical inactivity and obesity: relation to asthma and chronic obstructive pulmonary disease? Proc Am Thorac Soc. 2009 Dec;6(8):663–7.

116. Rasmussen F, Lambrechtsen J, Siersted HC, Hansen HS, Hansen NC. Low physical fitness in childhood is associated with the development of asthma in young adulthood: the Odense schoolchild study. Eur. Respir. J. 2000 Nov;16(5):866–70.

117. Sin DD, Sutherland ER. Obesity and the lung: 4. Obesity and asthma. Thorax. 2008 Nov;63(11):1018–23.

118. Sanz C, Gautier J-F, Hanaire H. Physical exercise for the prevention and treatment of type 2 diabetes. Diabetes Metab. 2010 Nov;36(5):346–51.

119. Gill JMR, Cooper AR. Physical activity and prevention of type 2 diabetes mellitus. Sports Med. 2008;38(10):807–24.

120. Freedman ND, Park Y, Subar AF, Hollenbeck AR, Leitzmann MF, Schatzkin A, et al. Fruit and vegetable intake and head and neck cancer risk in a large United States prospective cohort study. Int. J. Cancer. 2008 May 15;122(10):2330–6.

121. Boeing H, Dietrich T, Hoffmann K, Pischon T, Ferrari P, Lahmann PH, et al. Intake of fruits and vegetables and risk of cancer of the upper aero-digestive tract: the prospective EPIC-study. Cancer Causes Control. 2006 Sep;17(7):957–69.

122. Chan AT, Giovannucci EL. Primary prevention of colorectal cancer. Gastroenterology. 2010 Jun;138(6):2029–2043.e10.

123. Tsugane S, Sasazuki S. Diet and the risk of gastric cancer: review of epidemiological evidence. Gastric Cancer. 2007;10(2):75–83.

124. Key TJ. Fruit and vegetables and cancer risk. Br. J. Cancer. 2011 Jan 4;104(1):6–11.

125. Wang X-Q, Terry P-D, Yan H. Review of salt consumption and stomach cancer risk: epidemiological and biological evidence. World J. Gastroenterol. 2009 May 14;15(18):2204–13.

126. Getz GS, Reardon CA. Nutrition and cardiovascular disease. Arterioscler. Thromb. Vasc. Biol. 2007 Dec;27(12):2499–506.

127. He FJ, MacGregor GA. Effect of modest salt reduction on blood pressure: a meta-analysis of randomized trials. Implications for public health. J Hum Hypertens. 2002 Nov;16(11):761–70.

128. Mozaffarian D, Aro A, Willett WC. Health effects of trans-fatty acids: experimental and observational evidence. Eur J Clin Nutr. 2009 May;63 Suppl 2:S5–21.

129. Dauchet L, Amouyel P, Dallongeville J. Fruits, vegetables and coronary heart disease. Nat Rev Cardiol. 2009 Sep;6(9):599–608.

130. Pereira MA, O'Reilly E, Augustsson K, Fraser GE, Goldbourt U, Heitmann BL, et al. Dietary fiber and risk of coronary heart disease: a pooled analysis of cohort studies. Arch Intern Med. 2004 Feb 23;164(4):370–6.

131. Malik VS, Popkin BM, Bray GA, Després J-P, Hu FB. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. Circulation. 2010 Mar 23;121(11):1356–64.

132. Ferder L, Ferder MD, Inserra F. The role of high-fructose corn syrup in metabolic syndrome and hypertension. Curr. Hypertens. Rep. 2010 Apr;12(2):105–12.

133. McKeever TM, Britton J. Diet and asthma. Am. J. Respir. Crit. Care Med. 2004 Oct 1;170(7):725–9.

134. Allan K, Devereux G. Diet and asthma: nutrition implications from prevention to treatment. J Am Diet Assoc. 2011 Feb;111(2):258–68.

135. Hooper R, Heinrich J, Omenaas E, Sausenthaler S, Garcia-Larsen V, Bakolis I, et al. Dietary patterns and risk of asthma: results from three countries in European Community Respiratory Health Survey-II. Br. J. Nutr. 2010 May;103(9):1354–65.

136. Delgado J, Barranco P, Quirce S. Obesity and asthma. J Investig Allergol Clin Immunol. 2008;18(6):420–5.

137. Parillo M, Riccardi G. Diet composition and the risk of type 2 diabetes: epidemiological and clinical evidence. Br. J. Nutr. 2004 Jul;92(1):7–19.

138. Hamer M, Chida Y. Intake of fruit, vegetables, and antioxidants and risk of type 2 diabetes: systematic review and meta-analysis. J. Hypertens. 2007 Dec;25(12):2361–9.

139. Bolin K, Borgman B, Gip C, Wilson K. Current and future avoidable cost of smoking—estimates for Sweden 2007. Health Policy. 2011 Nov;103(1):83–91.

140. Scarborough P, Bhatnagar P, Wickramasinghe KK, Allender S, Foster C, Rayner M. The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: an update to 2006-07 NHS costs. J Public Health. 2011 Dec;33(4):527–35.

141. Allender S, Balakrishnan R, Scarborough P, Webster P, Rayner M. The burden of smoking-related ill health in the UK. Tob Control. 2009 Aug;18(4):262–7.

142. Rehm J, Gnam W, Popova S, Baliunas D, Brochu S, Fischer B, et al. The costs of alcohol, illegal drugs, and tobacco in Canada, 2002. J Stud Alcohol Drugs. 2007 Nov;68(6):886–95.

143. Callum C, Boyle S, Sandford A. Estimating the cost of smoking to the NHS in England and the impact of declining prevalence. Health Econ Policy Law. 2011 Oct;6(4):489–508.

144. Mohapatra S, Patra J, Popova S, Duhig A, Rehm J. Social cost of heavy drinking and alcohol dependence in high-income countries. Int J Public Health. 2010 Jun;55(3):149–57.

145. Balakrishnan R, Allender S, Scarborough P, Webster P, Rayner M. The burden of alcohol-related ill health in the United Kingdom. J Public Health (Oxf). 2009 Sep;31(3):366–73.

146. Konnopka A, König H-H. The health and economic consequences of moderate alcohol consumption in Germany 2002. Value Health. 2009 Apr;12(2):253–61.

147. Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. Lancet. 2009 Jun 27;373(9682):2223–33.

148. Thavorncharoensap M, Teerawattananon Y, Yothasamut J, Lertpitakpong C, Chaikledkaew U. The economic impact of alcohol consumption: a systematic review. Subst Abuse Treat Prev Policy. 2009;4:20.

149. Jarl J, Johansson P, Eriksson A, Eriksson M, Gerdtham U-G, Hemström O, et al. The societal cost of alcohol consumption: an estimation of the economic and human cost including health effects in Sweden, 2002. Eur J Health Econ. 2008 Nov;9(4):351–60.

150. Rehm J, Patra J, Gnam WH, Sarnocinska-Hart A, Popova S. Avoidable cost of alcohol abuse in Canada. Eur Addict Res. 2011;17(2):72–9.

151. Katzmarzyk PT, Janssen I. The economic costs associated with physical inactivity and obesity in Canada: an update. Can J Appl Physiol. 2004 Feb;29(1):90–115.

152. Ontario, Ministry of Health and Long-Term Care. Health Equity Impact Assessment (HEIA) [Internet]. Toronto: Queen's Printer for Ontario; 2008. Available from: http://www.health.gov.on.ca/en/pro/programs/heia/

153. Main C, Thomas S, Ogilvie D, Stirk L, Petticrew M, Whitehead M, et al. Population tobacco control interventions and their effects on social inequalities in smoking: placing an equity lens on existing systematic reviews. BMC Public Health. 2008;8:178.

154. Botello-Harbaum MT, Haynie DL, Iannotti RJ, Wang J, Gase L, Simons-Morton B. Tobacco control policy and adolescent cigarette smoking status in the United States. Nicotine Tob Res. 2009 Jul;11(7):875–85.

155. Leverett M, Ashe M, Gerard S, Jenson J, Woollery T. Tobacco use: the impact of prices. J Law Med Ethics. 2002;30(3 Suppl):88–95.

156. Jha P, Chaloupka FJ. Curbing the epidemic: governments and the economics of tobacco control. [Internet]. Washington (DC): The World Bank; 1999 [cited 2012 Jan 31]. Available from: http://www.usaid.gov/policy/ads/200/tobacco.pdf

157. Townsend J. Price and consumption of tobacco. Br Med Bull. 1996;52(1):132–42.

158. Luk R, Cohen JE, Ferrence R. Contraband cigarettes in Ontario [Internet]. Toronto: Ontario Tobacco Research Unit, Special report series; 2007. Available from: http://www.otru.org/pdf/special/special_nov_2007.pdf

159. Copeland L, Robertson R, Elton R. What happens when GPs proactively prescribe NRT patches in a disadvantaged community. Scott Med J. 2005 May;50(2):64–8.

160. Health Canada. "Certain circumstances" issues in equity and responsiveness in access to health care in Canada [Internet]. Ottawa: Health Canada; 2001. Available from: http://www.hc-sc.gc.ca/hcs-sss/pubs/acces/2001-certain-equit-acces/index-eng.php#p1d1a0

161. Nettle D. Why are there social gradients in preventative health behavior? A perspective from behavioral ecology. PLoS ONE. 2010;5(10):e13371.

162. Edwards R, McElduff P, Jenner D, Heller RF, Langley J. Smoking, smoking cessation, and use of smoking cessation aids and support services in South Derbyshire, England. Public Health. 2007 May;121(5):321–32.

163. Ferguson J, Bauld L, Chesterman J, Judge K. The English smoking treatment services: one-year outcomes. Addiction. 2005 Apr;100 Suppl 2:59–69.

164. Judge K, Bauld L, Chesterman J, Ferguson J. The English smoking treatment services: short-term outcomes. Addiction. 2005 Apr;100 Suppl 2:46–58.

165. Wiltshire S, Bancroft A, Parry O, Amos A. "I came back here and started smoking again": perceptions and experiences of quitting among disadvantaged smokers. Health Educ Res. 2003 Jun;18(3):292–303.

166. Roddy E, Antoniak M, Britton J, Molyneux A, Lewis S. Barriers and motivators to gaining access to smoking cessation services amongst deprived smokers—a qualitative study. BMC Health Serv Res. 2006;6:147.

167. Barnett R, Pearce J, Moon G. Community inequality and smoking cessation in New Zealand, 1981-2006. Soc Sci Med. 2009 Mar;68(5):876–84.

168. Rohan S. Opportunities for co-operative health provision in rural, remote, and northern Aboriginal communities. Ottawa: Canadian Co-operative Association; 2003.

169. Niederdeppe J, Farrelly MC, Nonnemaker J, Davis KC, Wagner L. Socioeconomic variation in recall and perceived effectiveness of campaign advertisements to promote smoking cessation. Soc Sci Med. 2011 Mar;72(5):773–80.

170. Niederdeppe J, Kuang X, Crock B, Skelton A. Media campaigns to promote smoking cessation among socioeconomically disadvantaged populations: what do we know, what do we need to learn, and what should we do now? Soc Sci Med. 2008 Nov;67(9):1343–55.

171. Durkin SJ, Biener L, Wakefield MA. Effects of different types of antismoking ads on reducing disparities in smoking cessation among socioeconomic subgroups. Am J Public Health. 2009 Dec;99(12):2217–23.

172. Bala M, Strzeszynski L, Cahill K. Mass media interventions for smoking cessation in adults. Cochrane Database Syst Rev. 2008;(1):CD004704.

173. Richardson AK, Green M, Xiao H, Sokol N, Vallone D. Evidence for truth®: the young adult response to a youth-focused anti-smoking media campaign. Am J Prev Med. 2010 Dec;39(6):500–6.

174. Sutfin EL, Szykman LR, Moore MC. Adolescents' responses to anti-tobacco advertising: exploring the role of adolescents' smoking status and advertisement theme. J Health Commun. 2008 Aug;13(5):480–500.

175. Klein JD, Havens CG, Carlson EJ. Evaluation of an adolescent smoking-cessation media campaign: GottaQuit.com. Pediatrics. 2005 Oct;116(4):950–6.

176. Farrelly MC, Niederdeppe J, Yarsevich J. Youth tobacco prevention mass media campaigns: past, present, and future directions. Tob Control. 2003 Jun;12 Suppl 1:i35–47.

177. Stead M, Gordon R, Angus K, McDermott L. A systematic review of social marketing effectiveness. Health Education. 2007 Feb 27;107(2):126–91.

178. Thomas S, Fayter D, Misso K, Ogilvie D, Petticrew M, Sowden A, et al. Population tobacco control interventions and their effects on social inequalities in smoking: systematic review. Tob Control. 2008 Aug;17(4):230–7.

179. Giskes K, Kunst AE, Ariza C, Benach J, Borrell C, Helmert U, et al. Applying an equity lens to tobacco-control policies and their uptake in six Western-European countries. J Public Health Policy. 2007 Jul;28(2):261–80.

180. World Health Organization. Framework for alcohol policy in the WHO European Region [Internet]. Copenhagen: WHO Regional Office for Europe; 2006. Available from: http://www.euro.who.int/__data/assets/pdf_file/0007/79396/E88335.pdf

181. Stockwell T, Leng J, Sturge J. Alcohol pricing and public health in Canada: Issues and opportunities [Internet]. Victoria, BC: Centre for Addictions Research of BC; 2006. Available from: http://www.carbc.ca/Portals/0/PropertyAgent/558/Files/8/AlcPricing.pdf

182. Berke EM, Tanski SE, Demidenko E, Alford-Teaster J, Shi X, Sargent JD. Alcohol retail density and demographic predictors of health disparities: a geographic analysis. Am J Public Health. 2010 Oct;100(10):1967–71.

183. Stockwell T, Zhao J, Macdonald S, Pakula B, Gruenewald P, Holder H. Changes in per capita alcohol sales during the partial privatization of British Columbia's retail alcohol monopoly 2003-2008: a multi-level local area analysis. Addiction. 2009 Nov;104(11):1827–36.

184. Stockwell T, Zhao J, Macdonald S, Vallance K, Gruenewald P, Ponicki W, et al. Impact on alcohol-related mortality of a rapid rise in the density of private liquor outlets in British Columbia: a local area multi-level analysis. Addiction. 2011 Apr;106(4):768–76.

185. Jernigan D. The extent of global alcohol marketing and its impact on youth. Contemp Drug Probl. 2010;37:57–89.

186. Morgenstern M, Isensee B, Sargent JD, Hanewinkel R. Exposure to alcohol advertising and teen drinking. Prev Med. 2011 Feb 1;52(2):146–51.

187. Marsh JC, Cao D, D'Aunno T. Gender differences in the impact of comprehensive services in substance abuse treatment. J Subst Abuse Treat. 2004 Dec;27(4):289–300.

188. Brady KT, Grice DE, Dustan L, Randall C. Gender differences in substance use disorders. Am J Psychiatry. 1993 Nov;150(11):1707–11.

189. Greenfield SF, Brooks AJ, Gordon SM, Green CA, Kropp F, McHugh RK, et al. Substance abuse treatment entry, retention, and outcome in women: a review of the literature. Drug Alcohol Depend. 2007 Jan 5;86(1):1–21.

190. Pate RR, Ward DS, Saunders RP, Felton G, Dishman RK, Dowda M. Promotion of physical activity among high-school girls: a randomized controlled trial. Am J Public Health. 2005 Sep;95(9):1582–7.

191. Ward DS, Saunders R, Felton GM, Williams E, Epping JN, Pate RR. Implementation of a school environment intervention to increase physical activity in high school girls. Health Educ Res. 2006 Dec;21(6):896–910.

192. Felton G, Saunders RP, Ward DS, Dishman RK, Dowda M, Pate RR. Promoting physical activity in girls: a case study of one school's success. J Sch Health. 2005 Feb;75(2):57–62.

193. Bonhauser M, Fernandez G, Püschel K, Yañez F, Montero J, Thompson B, et al. Improving physical fitness and emotional well-being in adolescents of low socioeconomic status in Chile: results of a school-based controlled trial. Health Promot Int. 2005 Jun;20(2):113–22.

194. Naylor PJ, Scott J, Drummond J, Bridgewater L, McKay HA, Panagiotopoulos C. Implementing a whole school physical activity and healthy eating model in rural and remote First Nations schools: a process evaluation of Action Schools! BC. Rural Remote Health. 2010;10(1296):online.

195. Sit CHP, McManus A, McKenzie TL, Lian J. Physical activity levels of children in special schools. Prev Med. 2007 Dec;45(6):424–31.

196. Dobbins M, De Corby K, Robeson P, Husson H, Tirilis D. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. Cochrane Database Syst Rev. 2009;(1):CD007651.

197. Poland B, Frolich KL, Cargo M. Context as a fundamental dimension of health promotion program evaluation. In: Potvin L, McQueen D, editors. Health promotion evaluation practices in the Americas: values and research. New York: Springer; 2008. p. 299.

198. Gordon-Larsen P, Nelson MC, Page P, Popkin BM. Inequality in the built environment underlies key health disparities in physical activity and obesity. Pediatrics. 2006 Feb;117(2):417–24.

199. Estabrooks PA, Lee RE, Gyurcsik NC. Resources for physical activity participation: does availability and accessibility differ by neighborhood socioeconomic status? Ann Behav Med. 2003;25(2):100–4.

200. Powell LM, Slater S, Chaloupka FJ, Harper D. Availability of physical activity-related facilities and neighborhood demographic and socioeconomic characteristics: a national study. Am J Public Health. 2006 Sep;96(9):1676–80.

201. Grant TL, Edwards N, Sveistrup H, Andrew C, Egan M. Inequitable walking conditions among older people: examining the interrelationship of neighbourhood socio-economic status and urban form using a comparative case study. BMC Public Health. 2010;10:677.

202. Davison KK, Lawson CT. Do attributes in the physical environment influence children's physical activity? A review of the literature. Int J Behav Nutr Phys Act. 2006;3:19.

203. Eyler AA, Brownson RC, Bacak SJ, Housemann RA. The epidemiology of walking for physical activity in the United States. Med Sci Sports Exerc. 2003 Sep;35(9):1529–36.

204. Siegel PZ, Brackbill RM, Heath GW. The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. Am J Public Health. 1995 May;85(5):706–10.

205. Molnar BE, Gortmaker SL, Bull FC, Buka SL. Unsafe to play? Neighborhood disorder and lack of safety predict reduced physical activity among urban children and adolescents. Am J Health Promot. 2004 Jun;18(5):378–86.

206. Bauman A, Bellew B, Vita P, Brown W, Owen N. Getting Australia active: towards better practice for the promotion of physical activity. Interventions to increase participation in physical activity in specific settings. Melbourne: National Public Health Partnership; 2002.

207. Bauman A, Bellew B, Vita P, Brown W, Owen N. Getting Australia active: towards better practice for the promotion of physical activity. Promoting physical activity in worksites. Melbourne: National Public Health Partnership; 2002.

208. Chapman LS. Guidelines for health promotion in worksite settings. Am J Health Promot. 2004 Apr;18(4):6–9.

209. Dishman RK, Oldenburg B, O'Neal H, Shephard RJ. Worksite physical activity interventions. Am J Prev Med. 1998 Nov;15(4):344–61.

210. Macintyre S, Chalmers I, Horton R, Smith R. Using evidence to inform health policy: case study. BMJ. 2001 Jan 27;322(7280):222–5.

211. Rice W. Health promotion through an equity lens [Internet]. Toronto: Wellesley Institute; 2011. Available from: http://www.wellesleyinstitute.com/health-care-reform/health-promotion-through-an-equity-lens/

212. Wrieden WL, Anderson AS, Longbottom PJ, Valentine K, Stead M, Caraher M, et al. The impact of a community-based food skills intervention on cooking confidence, food preparation methods and dietary choices - an exploratory trial. Public Health Nutr. 2007 Feb;10(2):203–11.

213. Patterson RE, Kristal AR, White E. Do beliefs, knowledge, and perceived norms about diet and cancer predict dietary change? Am J Public Health. 1996 Oct;86(10):1394–400.

214. Kennedy L, Ling M. Nutrition education for low-income groups – is there a role? In: Köhler BM, Feichtinger E, Barlosius E, editors. Poverty and food in welfare societies. Berlin: Ed. Sigma; 1997.

215. Rothman RL, Housam R, Weiss H, Davis D, Gregory R, Gebretsadik T, et al. Patient understanding of food labels: the role of literacy and numeracy. Am J Prev Med. 2006 Nov;31(5):391–8.

216. Viswanathan M, Hastak M, Gau R. Understanding and facilitating the usage of nutritional labels by low-literate consumers. J Public Policy Mark. 2009;28(2):135.

217. Cowburn G, Stockley L. Consumer understanding and use of nutrition labelling: a systematic review. Public Health Nutr. 2005 Feb;8(1):21–8.

218. Miller LMS, Gibson TN, Applegate EA. Predictors of nutrition information comprehension in adulthood. Patient Educ Couns. 2010 Jul;80(1):107–12.

219. Keon WJ, Pepin L. A healthy, productive Canada: a determinant of health approach. Final report of the Senate Subcommittee on Population Health of the Standing Senate Committee on Social Affairs, Science and Technology. Ottawa: The Senate of Canada; 2009 Jun.

220. Keon WJ, Pepin L. Population health policy: international perspectives. First report of the Subcommittee on Population Health of the Standing Senate Committee on Social Affairs, Science and Technology. Ottawa: The Senate of Canada; 2008 Feb.

221. Smylie J. The health of Aboriginal people. In: Raphael D, editor. Social determinants of health: Canadian perspectives. 2nd ed. 2nd ed. Toronto: Canadian Scholars Press; 2009. p. 280–302.

222. Theis B, Raut R, Irving H, Marrett LD. Interprovincial physical activity rankings vary with activity domain. Am J Epidemiol. 2011 Jun;173(suppl 11):S1–S316.

223. LeBlanc AGW, Janssen I. Difference between self-reported and accelerometer measured moderate-to-vigorous physical activity in youth. Pediatr Exerc Sci. 2010 Nov;22(4):523–34.

224. Ontario Risk and Behaviour Surveillance System Advisory Committee, Ontario Agency for Health Protection and Promotion. Moving risk and behaviour surveillance forward in Ontario: a proposal and recommendations. Toronto: Queen's Printer for Ontario; 2011. Available from: http://www.oahpp.ca/resources/projects/orbss/documents/Moving%20Risk%20and%20Behaviour%20Surveillance%20Forward%20in%20Ontario-%20ORBSS%20May%2030,2011.pdf

225. Butt P, Beirness D, Cesa F, Gliksman L, Paradis C, Stockwell T. Alcohol and health in Canada: A summary of evidence and guidelines for low-risk drinking. Ottawa, ON: Canadian Centre on Substance Abuse; 2011.

226. National Obesity Observatory - Association of Public Health Observatories. Physical activity surveillance in England: what is measured and where are the gaps? [Internet]. National Health Service (UK); 2011. Available from: http://www.noo.org.uk/uploads/doc510_2_NOO_Physical_activity_surveillance.pdf

227. Probert AW, Tremblay MS, Gorber SC. Desk potatoes: the importance of occupational physical activity on health. Can J Public Health. 2008 Aug;99(4):311–8.

228. World Health Organization Regional Office for Europe. Review of physical activity surveillance data sources in European Union Member States [Internet]. Geneva: WHO Press; 2010. Available from: http://www.euro.who.int/__data/assets/pdf_file/0005/148784/e95584.pdf

229. Centers for Disease Control and Prevention. Physical Activity Resources for Health Professionals: Data and Statistics | DNPAO | CDC [Internet]. [cited 2012 Mar 14]. Available from: http://www.cdc.gov/physicalactivity/professionals/data/index.html

230. Health Canada. Improving cooking and food preparation skills: a synthesis of the evidence to inform program and policy development [Internet]. Ottawa: Health Canada; 2010. Available from: http://www.hc-sc.gc.ca/fn-an/nutrition/child-enfant/cfps-acc-synthes-eng.php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