



Prevention System Quality Index 2023

November 2023

Prevention System Quality Index 2023

Prepared by the Population Health and Prevention Unit, Ontario Health: Caroline Bravo, Hanna Dias, Huda Shah (co-lead), Maria Chu, Megan Nguyen, Nadia Pabani (co-lead), Naomi Schwartz, Penney Kirby, Stephanie Young and Vicki Lee. The Population Health and Prevention unit resides within the Population Health and Value Based Health Systems portfolio of Ontario Health.

Please contact prevention@ontariohealth.ca with questions or comments.

The section, “First Nation, Inuit, Métis and urban Indigenous (FNIMUI) health” was prepared in close collaboration with Alethea Kewayosh and Amanda Sheppard, Indigenous Cancer Care Unit, Ontario Health.

Analytic and/or technical assistance provided by Sahiba Saini and Michelle Cotterchio, Population Health and Prevention Unit, Ontario Health.

Copy editing by Jenny Lass, Cancer Control and Evidence Integration, Ontario Health. Knowledge transfer activities led by Penney Kirby, Population Health and Prevention Unit, Ontario Health.

The Prevention System Quality Index 2023 report and associated supplemental materials are available at ontariohealth.ca/psqi. If you need an alternative format, email Ontario Health Communications at info@ontariohealth.ca.

How to cite this publication: Ontario Health. Prevention System Quality Index 2023. Toronto: King’s Printer for Ontario; 2023.

© King’s Printer for Ontario, 2023.

ISSN 2369-050X Key title: Prevention system quality index (Online)

Permission to reproduce: Except as otherwise specifically noted, the information in this publication may be reproduced, in part or in whole and by any means, without charge or further permission from Ontario Health for non-commercial purposes, provided that due diligence is exercised in ensuring the accuracy of the information reproduced; that Ontario Health is identified as the source institution; and that the reproduction is not represented as an official version of the information reproduced, nor as having been made in affiliation with, or with the endorsement of, Ontario Health.

Acknowledgments

The authors would like to acknowledge the First Nations, Inuit, Métis and urban Indigenous (FNIMUI) peoples and their traditional land that the authors work and live on. As part of Ontario Health, the authors recognize and are committed to ensuring that all efforts to improve chronic disease prevention in Ontario must engage openly, respectfully and with reciprocity with FNIMUI leadership and communities to ensure that the needs of FNIMUI peoples are adequately addressed.

The authors would also like to thank the advisors, expert panel members and additional reviewers, who provided advice and comments on a previous version of this report.

The statements in this report do not necessarily reflect the opinions or perspectives of the advisory committee or expert panel members, or the organizations that they represent.

Prevention System Quality Index 2023 Advisory Committee

- Michelle Halligan, Canadian Partnership Against Cancer
- Daniel Harrington, Public Health Ontario
- Scott Leatherdale, University of Waterloo
- Amanda Sheppard, Ontario Health
- Lisa Simon, Simcoe Muskoka District Health Unit
- Brendan Smith, Public Health Ontario
- Susan Stewart, Kingston, Frontenac and Lennox & Addington Public Health

Prevention System Quality Index 2023 Expert Panel

- Michael Chaiton, Centre for Addiction and Mental Health
- Paul Demers, Ontario Health
- Norman Giesbrecht, Centre for Addiction and Mental Health
- Gillian Lim, Public Health Ontario
- Chris Markham, Ophea
- Elaina McIntyre, Public Health Ontario
- Jennifer McWhirter, University of Guelph
- Valerie Tarasuk, University of Toronto
- Thomas Tenkate, Toronto Metropolitan University
- Justin Thielman, Public Health Ontario

Additional reviewers

- Rudayna Bahubeshi, Ontario Health
- Patrice de Peiza, Ontario Health
- Lisa Ellison, Ontario Health
- Kate Jardine, Ontario Health
- Christine Meyer, Ontario Health
- Christine Navarro, Public Health Ontario
- Andrea Saunders, Public Health Ontario
- Sayna Leylachian, Ontario Health
- Hasan Sheikh, Ontario Health
- Christine Stogios, Ontario Health

Data sources

- Alcohol and Gaming Commission of Ontario
- Centre for Addiction and Mental Health
- Liquor Control Board of Ontario
- Ontario Ministry of Education
- Ontario Ministry of the Environment, Conservation and Parks
- Ontario Ministry of Health
- Public Health Ontario
- Statistics Canada
- Local housing corporations
- Municipal planning departments

Foreword

The Prevention System Quality Index (PSQI) series details Ontario's progress on policies and programs that can reduce the incidence of chronic disease risk factors and exposures in the population. The 2023 PSQI is the sixth report in this series and the first to expand beyond cancer to include other chronic diseases such as diabetes, cardiovascular diseases and chronic lower respiratory diseases.

Despite being largely preventable, chronic diseases are the leading cause of death in Ontario. Chronic disease prevention is the cornerstone of good health; it focuses on helping people be healthy, thriving community members. With Ontarians living longer than ever before and still feeling the impacts of the COVID-19 pandemic, the healthcare system is experiencing significant pressures and fiscal challenges. Chronic disease prevention has never been more critical to improving the quality of life of Ontarians and building a sustainable healthcare system.

Ontario Health works to implement programs to address disease prevention, early detection and intervention through our partners in primary care, Ontario Health teams and others. However, improving the health of all Ontarians cannot be limited to this. It requires an investment in system-level policies and programs that address chronic disease risk factors and the underlying social determinants of health, such as poverty, housing and food security. We must strive for health equity by tackling the root causes of health disparities that place a disproportionate burden of disease on certain populations such as First Nations, Inuit, Métis and urban Indigenous populations. This is why informing and championing evidence-based policies that make our communities, regions and province a healthier one will remain a key part of Ontario Health's work in chronic disease prevention.

There is much work to be done to achieve an Ontario where chronic diseases are no longer an inevitability and everyone has equal chance to thrive, contribute and fulfill their potential. As a provincial agency tasked with overseeing the healthcare system and advancing the quintuple aim in the population, Ontario Health has a significant role to play in addressing chronic disease prevention. We look forward to continuing work with you and all our partners to promote chronic disease prevention and shape a healthier Ontario that values and invests in the wellbeing of all of its members.

Dr. Sacha Bhatia

Senior Vice President, Population Health and Value-Based Health Systems
Ontario Health

Table of Contents

Key findings	9
Introduction	14
Social determinants of health	15
Income and income distribution	15
Household food insecurity	16
Housing	18
Racism	19
Opportunities to address the social determinants of health	20
First Nations, Inuit, Métis, and urban Indigenous health	21
First Nations, Inuit, Métis and urban Indigenous and the social determinants of health	21
First Nations, Inuit, Métis and urban Indigenous and health-related behaviours	22
Opportunities in First Nations, Inuit, Métis and urban Indigenous health	26
Commercial tobacco	27
Commercial tobacco smoking and chronic disease risk	27
Tobacco smoking in Ontario	27
Vaping and health	28
Policies and programs to reduce smoking	29
Opportunities to reduce tobacco smoking and exposure to second-hand smoke	38
Alcohol	39
Alcohol and chronic disease risk	39
Alcohol drinking in Ontario	39
Policies and programs to reduce alcohol drinking	41
Opportunities to reduce alcohol-related harms	45
Healthy eating	46
Foods and chronic disease risk	46
Healthy eating in Ontario	46
Policies and programs to improve healthy eating	47
Opportunities to increase healthy eating	49
Physical activity	50
Physical activity and chronic disease risk	50
Physical activity in Ontario	50
Policies and programs to increase physical activity	52
Opportunities to increase physical activity	55
Environmental exposures	56
Environmental exposures and chronic disease risk	56
Environmental exposures in Ontario	56
Policies and programs to reduce environmental exposures	56
Ultraviolet radiation	56
Radon	61
Fine particulate matter	61
Opportunities to reduce environmental carcinogens	64
Occupational exposures	65
Occupational exposures and chronic disease risk	65
Occupational exposures in Ontario	65
Policies and programs to reduce occupational exposures	65
Asbestos	66
Diesel engine exhaust	68

Radon	69
Crystalline silica	69
Opportunities to reduce occupational exposures.....	71
Infectious agents.....	72
Infectious agents and chronic disease risk.....	72
Policies and programs to reduce infections	72
HPV	72
Hepatitis B	75
Opportunities to reduce infections	76
Conclusion	77
References.....	78

Figures

Figure 1: Percentage of households that were food insecure, by level of food insecurity, Ontario, 2018–2020 combined	18
Figure 2: Percentage of adults (age 20 and older) reporting smoking daily or occasionally, by household income quintile, Ontario, 2017–2020 combined	28
Figure 3: Percentage of adults (age 20 and older) reporting past daily or occasional smoking who stopped smoking completely at least 1 year ago, by household income quintile, Ontario, 2017–2020 combined	36
Figure 4: Percentage of adults (age 20 and older) reporting past daily or occasional smoking who stopped smoking completely at least 1 year ago, by public health unit, Ontario, 2017–2020 combined	37
Figure 5: Percentage of adults (age 19 and older) reporting drinking more than 2 alcoholic drinks in the past week, by household income quintile, Ontario, 2017–2020 combined	40
Figure 6: Total number of alcohol outlets per 10,000 people (age 15 and older), by public health unit, Ontario, 2022	43
Figure 7: Percentage of adults (age 18 and older) who reported less than the recommended level of moderate-to-vigorous physical activity, by household income quintile, Ontario, 2016–2018	51
Figure 8: Percentage of publicly funded elementary and secondary schools in Ontario with at least 1 full or part-time specialist teacher assigned to teach health and physical education, 2017/18 to 2020/2021	54
Figure 9: Hierarchy of Controls	66
Figure 10: Up-to-date human papillomavirus vaccination coverage (%) in 12-year-old students in Ontario, 2016/17 to 2021/22, with catch-up for 2019/20 and 2020/21	74

Tables

Table 1: Commercial tobacco taxes as a percentage of average total retail price per carton of 200 cigarettes, by province or territory, 2022	30
Table 2: Smoke-free policies in local housing corporations, Ontario, 2022	33
Table 3: Strength of shade policies in the planning policy documents of local municipalities in Ontario with populations of 100,000 or more, 2022	59
Table 4: Annual average, daily maximum and 10-year change of ambient fine particulate matter (PM _{2.5}) concentrations (µg/m ³) in Ontario, by monitoring station, 2020	63

Key findings

The key findings below represent findings from published literature, as well as analyses undertaken by Ontario Health for this report. The indicators in PSQI 2023 show improvements in some domains (e.g., smoking rates in Ontario decreased from 2017 to 2020). However, there are still many opportunities to improve chronic disease prevention in Ontario such as ensuring tobacco taxes and minimum alcohol prices meet the level recommended by the World Health Organization. Working with partners to implement comprehensive strategies across sectors and multiple levels of government can help achieve broader improvements in chronic disease prevention in Ontario.



Social determinants of health

The conditions under which people are born, grow, live, work and age directly shape their health and are known as the social determinants of health (SDOH). Extensive research has demonstrated a strong link between the SDOH and chronic diseases. Low income, food insecurity, housing and systemic racism are explored in the PSQI 2023:

- Data from 2005 to 2012 show a greater prevalence of multimorbidity (including cancers, COPD, diabetes and heart disease) in the lowest income quintile compared to the highest income quintile in Ontario.
- Adults in Ontario who lived in households experiencing food insecurity had more than twice the risk of developing type 2 diabetes compared to food secure households.
- Poor-quality housing affects chronic disease risk through exposure to respiratory toxins due to cold and damp conditions, overcrowding and a reduced sense of wellbeing.
- Race-based data collected from June 2020 to April 2021 found that racialized populations had up to 7 times higher rates of COVID-19 infection than White Ontarians.



First Nations, Inuit, Métis, and urban Indigenous Health

Collectively, First Nation, Inuit, Métis and urban Indigenous peoples experience a greater impact on health and well-being from chronic diseases than all other populations living in Canada. This impact is a result of intergenerational trauma from colonialism and violent assimilation efforts including residential schools and Indian hospitals, combined with ongoing inequities in the SDOH.

First Nations people in Ontario

- The prevalence of type 2 diabetes is 3 to 5 times higher amongst First Nations people compared to non-First Nations in Ontario.
- First Nations people have a 2.5 times higher prevalence of cardiovascular disease (CVD) than non-First Nations people. CVD mortality is also disproportionately higher among First Nations people.
- In Ontario, the incidence of some common cancers, including lung, colorectal, kidney, cervical, and liver cancers, is higher amongst First Nations than other populations. First Nations women had higher incidence of all cancers combined than non-First Nations women.

Inuit people in Ontario

- Incidence rates for lung cancer in Inuit men and women living in the Canadian Arctic are the highest in the world.
- One study of cancer in the population living in Inuit Nunangat showed that Inuit are more likely to be diagnosed with lung and colorectal cancer than other Canadians, and less likely to be diagnosed with breast and prostate cancer.

Métis people in Ontario

- Compared to the general Ontario population, Métis people have a 1.6 times higher prevalence of chronic obstructive pulmonary disease.
- Métis people who had diagnosed congestive heart failure had more frequent hospitalizations and emergency department visits than non-Métis people in Ontario.

Urban Indigenous people in Ontario

- Healthcare services offered in urban areas are not consistently appropriate for First Nations, Inuit, Métis peoples, and studies have found that urban Indigenous populations have reservations about accessing healthcare services because of the risk of stigmatization and discrimination.



Commercial Tobacco

Smoking in Ontario

- During 2017–2020, 15.4 per cent of adults ages 20 and older in Ontario reported that they currently smoke commercial tobacco every day or occasionally.
- Smoking is more common in adults with lower household income and differs by immigration status and racial group.

Tobacco taxation in Ontario

- In 2022, the taxation rate in Ontario is 57.5 per cent of the average retail price. The World Health Organization recommends a relative tax of 75 per cent for effective tobacco control.
- Ontario has the third lowest taxation rate in Canada compared to all provinces and territories. This ranking has changed from 2018, when Ontario ranked fifth lowest.

Second-hand smoke exposure in Ontario

- During 2019–2020, 9.5 per cent of non-smoking adults ages 20 and older in Ontario reported second-hand smoke exposure in public, 6.4 percent in the workplace or at school, 2.3 percent at home and 2.3 percent in a private vehicle.

Smoke-free policies in Ontario

- As of October 2022, 32 out of 47 local housing corporations (68 per cent) had smoke-free policies that applied to all their properties.
- Ontario can build on local momentum by adopting a province-wide policy for all local housing corporations or use incentives to further encourage local implementation.

Smoking cessation in Ontario

- During 2017–2020, 54.1 percent of adults in Ontario age 20 and over who reported past daily or occasional smoking reported that they stopped smoking at least 1 year ago.
- Adults in lower income households were less likely to report long-term smoking cessation.



Alcohol

The 2023 *Canada's Guidance on Alcohol and Health* by the Canadian Centre on Substance Use and Addiction (CCSA) state that any consumption of alcohol is associated with risk and should be minimized. Currently, CCSA recommends 2 drinks per week or less to avoid alcohol-related consequences.

Alcohol drinking in Ontario

- During 2017–2020, 31.1 per cent of adults ages 19 and older reported drinking more than two drinks in the past week.
- Men (37.7 per cent) were more likely than women (24.8 per cent) to exceed the drinking guidelines, as well as people residing in rural areas (37.1 per cent) compared to urban (30.5 per cent), and people in the highest household income quintile compared to all other quintiles.

Minimum price of alcohol

- The gap between the recommended minimum price and highest retail price per standard drink has increased since 2013, with the largest difference occurring in 2022.
- No type of alcohol product (beer, wine, spirits) met the World Health Organization's recommended MUP of \$1.97 per standard drink (17.05 millilitres of alcohol) in 2022 dollars.

Alcohol availability in Ontario

- During the COVID-19 pandemic, several regulations in Ontario were amended to increase the availability of alcohol, including enabling liquor takeout and delivery with food from liquor licensed establishments, liquor sale and service on docked boats, reducing minimum liquor delivery fees and extending retail hours of sale to authorized grocery and alcohol stores.



Healthy eating

The COVID-19 pandemic has likely had an impact on dietary patterns of households in Ontario, including reported decreases in the number of servings of vegetables and fruit consumed, and increases in the sweet and salt food intake.

Healthy eating in Ontario

- From 2015 to 2017, 77.1 per cent of adults age 18 and older in Ontario reported that they ate fruits and vegetables fewer than five times a day.
- More adults in the lowest household income quintile in Ontario (82.0 per cent) reported inadequate fruit and vegetable consumption than adults in the highest household income quintile.

Food literacy in Ontario

- During their secondary school education in Ontario, less than a third of students who started Grade 9 in each of the school years from 2013/14 to 2016/17 earned one or more credits in courses that include a food literacy component.



Physical activity

Physical inactivity in Ontario

- During 2016–2018, 42.3 per cent of adults aged 18 and older in Ontario were not achieving the recommended 150 minutes of moderate-to-vigorous aerobic physical activity per week and 73.0 per cent of adolescents ages 12-17 in Ontario were not meeting the recommended 60 minutes of moderate to vigorous aerobic physical activity per day.
- Women (45.5 percent) were more likely than men (38.9 percent) to report inadequate aerobic physical activity, as well as people in lower income households. Physical inactivity also differed by immigration status and racial group.

Active transportation in Ontario

- During 2016–2018, 48.8 percent of adults in Ontario reported using active transportation in the previous week.
- People residing in urban areas (49.8 percent) were much more likely to report using active transportation than those in rural areas (38.6 percent).
- During 2016–2018, 78.5 percent of adolescents in Ontario reported using active transportation in the past week.
- More urban-dwelling (79.6 percent) than rural-dwelling (69.9 percent) adolescents reported using active transportation.

Physical education in Ontario

- In the 2020/21 school year, 21.6 percent of elementary schools and 15.1 percent of secondary schools reported having at least one full or part-time health and physical education (HPE) specialist teacher.
- Between 2017/18 to 2020/21 school years, the percentages of secondary schools with at least one specialist teacher show a decreasing trend.



Environmental exposures

Ultraviolet radiation

- The majority of melanoma cases in Ontario are a result of ultraviolet radiation (UVR) exposure.

SHADE POLICIES IN ONTARIO

- As of November 2022, all 28 local municipalities in Ontario with populations of 100,000 or more included a shade policy in their planning policy documents. Of these 28 municipalities, 4 had strong shade policies, which was an increase from three in 2018.

SUN PROTECTION IN ONTARIO

- During 2015–2016, 70.1 percent of adults age 18 and older and 62.9 percent of adolescents ages 12 to 17 in Ontario reported using one or more sun protection measure.

Radon

- Radon is an invisible and odourless radioactive gas that requires equipment to test for its presence. Harmful exposure for most people in Ontario occurs in occupational settings and in their homes.

Fine particulate matter

- Fine particulate matter (PM_{2.5}) is used as an indicator of air quality because it is one of the most concerning pollutants. Over 10 years (from 2011 to 2020), the PM_{2.5} annual mean concentrations in Ontario decreased by 17 per cent overall.





Occupational exposures

Asbestos

- Exposure to asbestos can cause chronic diseases such as asbestosis, mesothelioma and lung cancer. Data from 2016 suggest that 77,000 Ontario workers have been exposed to asbestos, an increase by 25,000 persons since 2006 (or 32 percent increase).

Diesel engine exhaust

- People who are frequently exposed to diesel engine exhaust, such as underground miners, farmers, truckers, delivery and courier drivers, bus drivers, transit operators, railway workers, heavy equipment mechanics and construction workers, have an increased risk of occupational lung diseases including lung cancer and COPD.
- In 2016, 327,000 Ontario workers were exposed to diesel engine exhaust. That is a 26,000 person increase from 2006 (or 8 percent increase) and was primarily accounted for by an increase in the number of workers in transportation and warehousing.



Infectious agents

School-based human papillomavirus (HPV) and hepatitis B

Both HPV and hepatitis B can be asymptomatic after infection and lead to life-threatening diseases. Early detection and routine vaccination programs are recommended.

- According to available data (January 2023) HPV and hepatitis B school-based vaccination coverage remained lower than prior to the pandemic.



Introduction

The Prevention System Quality Index (PSQI) 2023 is the sixth report of its kind from Ontario Health. The report features an examination of the social determinants of health and highlights First Nations, Inuit, Métis and urban Indigenous (FNIMUI) health. The report also includes an in-depth examination of seven chronic disease risk factors and exposure domains:

- Commercial tobacco;
- Alcohol;
- Healthy eating;
- Physical activity;
- Environmental exposures;
- Occupational exposures; and
- Infectious agents.

The PSQI provides evidence and data that can help policy-makers, policy-influencers and program planners in governments, non-governmental organizations and local public health agencies implement policies and programs to prevent chronic diseases in Ontario. This report focuses on the four major chronic diseases categories of cancer, diabetes, cardiovascular diseases and chronic lower respiratory diseases such as chronic obstructive pulmonary disease. Chapters on each risk factor, exposure or equity-deserving population:

- Provide a brief overview of the risk factor, exposure or population group's link to chronic disease and burden in Ontario;
- Examine policies and programs that can reduce the prevalence of the risk factor or exposure, or improve outcomes for equity-deserving populations;
- Report on indicators of policy and program implementation if data for Ontario are available; and
- Highlight opportunities to reduce the risk factor or exposure or reduce the negative health impact on equity-deserving groups in Ontario.

A new section in the report builds on previous PSQI reports to look more closely at the social determinants of health. This section provides an overview of the health disparities that exist for different equity-deserving groups and provides best evidence on prevention efforts to address these inequities. In addition, equity stratifications were provided for indicators included in the report where feasible. This approach ensures that root causes of health disparities frame our conversations about chronic disease prevention and aligns with Ontario Health's commitment to addressing racism and discrimination and reducing inequities in the health system as outlined in Ontario Health's Equity, Inclusion, Diversity and Anti-Racism framework.

Previous PSQI reports provide detailed descriptions of the approach and evidence that informs the indicators in PSQI 2023 and can be referred to for further information. Some significant indicator findings are described in PSQI 2023 to highlight notable inequities, but all data can be found in the supplementary tables available online. Note that for indicators using Canadian Community Health Survey data, multiple survey years were combined to increase the sample size. The years of data presented for each indicator were the most recent consecutive years of data available at the time of writing this report (May 2023). More information can be found in the technical appendix available online.

Not all policies and programs that are described in each chapter have a corresponding indicator because data to monitor these policies and programs are not available in Ontario. Data that are available and used for the indicators in the report have limitations. Details on data limitations, indicator definitions and updated methodology are available online in the PSQI 2023: Technical Appendix.



Social determinants of health

The conditions under which people are born, grow, live, work and age directly shape their health and are known as the social determinants of health.^{1,2} An extensive body of research has demonstrated a strong link between the social determinants of health and chronic diseases, such as heart disease, diabetes and chronic obstructive pulmonary disease.³⁻⁶ The prevalence of these chronic diseases within and across different population groups is shaped by these social determinants of health, which are now understood as the underlying cause of health inequities.¹ The social determinants of health also influence the degree to which chronic diseases may be prevented at the population level and have an impact on each of the risk factors and exposures included in the PSQI.

The social determinants of health can increase chronic disease risk through some of the following examples:^{1,3-6}

- Insufficient resources and supports to maintain health, such as a lack of money to pay for healthy food, medications, or housing.
- Harmful or inadequate living or working conditions such as being unhoused, core housing need including mold in the home, and hazardous conditions in the workplace.
- Chronic stress that impairs physiological responses (e.g., increased blood pressure, cortisol and blood glucose levels).
- Discrimination based on social identities including race, gender, ability, and sexual orientation that can limit opportunities for employment or other social supports.
- Targeted marketing of commercial tobacco, alcohol and unhealthy foods towards specific communities.

This chapter will discuss certain social determinants of health in greater detail, but it is important to note that these do not act in isolation from one another and do not impact individuals the same.^{2,7} The concept of intersectionality describes how social categorizations like race, class or gender are interrelated and allow systems of discrimination and oppression to overlap and interact to produce complex health inequities that vary across individuals or groups.^{2,7-12} For example, due to systemic racism and social factors, Black individuals face a higher risk of developing heart disease than other racial groups, but Black women in particular face a higher risk than Black men.^{8,11,13,14} The intersectionality between race and gender can have a different impact on Black women than Black men.^{8,14} Moreover, the COVID-19 pandemic has exacerbated health inequities in the population arising from the social determinants of health, which underscores the need to change population-level data collection to understand how health systems and social services impact specific individuals with various intersectional identities.^{15,16}

Income and income distribution

Income, and how income is distributed across the population, is an important determinant of health that largely shapes other social determinants of health such as household food insecurity and housing.¹⁶ In Canada, socioeconomic status (SES including income, education, and occupation) is a broader concept used to understand the effects of low income and is found associated with multiple chronic diseases including chronic obstructive pulmonary disease, diabetes mellitus and heart disease.¹⁶ Some examples of how income is associated with chronic disease risk in Canada include:

- Adults in the lowest income quintile compared to the highest income quintile have 2.1 times higher prevalence of diabetes.¹⁷
- Adults in the lowest income group were 1.3 times more likely to have high blood pressure than the highest income group, which translated to 5 more people per 100 in the lowest income group as compared to the highest income group.¹⁷
- People from the lowest income groups are also hospitalized for chronic obstructive pulmonary disease three times more than those from the highest income group.¹⁸
- People with lower income were almost twice as likely to be diagnosed with lung cancer, more likely to be diagnosed at an advanced stage, and were less likely to survive than people with higher incomes.¹⁹

Canada experienced rapidly growing income inequality in the 1980s which has resulted in a stable divide between lower and upper incomes for the past 25 years.^{20,21} The COVID-19 pandemic has highlighted growing concerns over the impact of income inequality, with equity-deserving groups (e.g., precarious workers, those earning low incomes and recent immigrants) being most impacted by the COVID-19 pandemic due to loss of income from reduced employment.²⁰

Low income and chronic disease in Ontario

On average, 12.8 per cent of people in Ontario lived in poverty from 2015 to 2019 and did not have enough income to pay for a basic standard of living.²² Data from the Canadian Community Health Survey from 2005 to 2012 show a greater prevalence of multimorbidity (having two or more of long-term health conditions such as cancers, chronic obstructive pulmonary disease, diabetes and heart disease) in the lowest income quintile compared to the highest income quintile in Ontario.²³

A 2020 study found that low income was associated with a 1.4 times increase in the likelihood of being in the top five per cent of most costly healthcare users during the five years of the study period.²⁴ In addition, living below the poverty line in Ontario has been linked to being unhoused, poorer health outcomes, and experiences with the criminal justice system.²²

In 2020, temporary federal income supports paid during the first year of the COVID-19 pandemic contributed to a significant reduction in the poverty rate to 8.3 per cent in Ontario.^{25,26} Ontario has committed to a new Poverty Reduction Strategy (2020 to 2025) to continue progress on improving economic conditions for some of the equity-deserving populations who seek social justice and reparations including First Nation, Inuit, Métis and urban Indigenous, Black and other racialized groups, and recent immigrants.²⁷

Household food insecurity

Household food insecurity occurs when a household cannot afford to buy adequate food.²⁸ It is experienced along a spectrum of increasing severity, which ranges from concerns about running out of food (marginally food insecure), to not being able to afford balanced meals (moderately food insecure), to going hungry, missing meals or, in severe cases, not eating for whole days (severely food insecure) due to a lack of money for food.²⁹ In this report, unless otherwise specified, the term “food insecurity” refers to households classified as experiencing marginal, moderate or severe food insecurity over the past 12 months.²⁸ The prevalence of food insecure households is concerning because poorer diet quality and higher life stress are associated with an increased risk for poorer health.^{30,31} People living in food insecure households are more likely to have higher rates of multiple chronic diseases, such as type 2 diabetes and dyslipidemia.^{30,32} In addition, when faced with food insecurity, people living with chronic diseases have difficulty managing their conditions and preventing further complications.^{33,34-36}

In September 2022, the Canada Food Price Report calculated that food prices increased by 10.3 per cent from 2021 to 2022, the largest increase in 40 years.³⁷ In Ontario, over that same time, food prices increased by 10.4 per cent.³⁸ This price inflation can be attributed to ongoing issues as a result of the COVID-19 pandemic, such as supply chain disruptions and labour shortages as well as climate events, geopolitical tensions, high oil prices and the falling Canadian dollar.³⁷ During the COVID-19 pandemic, 41.6 per cent of Canadian households that faced job disruptions and had to rely on COVID-19 benefits were food insecure.²⁹

Policies related to ensuring the adequacy of minimum wage, social assistance and income tax have been shown to have a positive impact on household income and food insecurity among families with children.³⁹

- A one dollar increase in minimum wage was associated with a five per cent reduction in risk of experiencing household food insecurity.³⁹
- A \$1,000 increase in annual social assistance or welfare income was associated with a five per cent decrease in the risk of severe food insecurity.³⁹
- An increase in income tax for the lowest-income households was associated with a nine per cent increase in risk of food insecurity.³⁹

Food insecurity and chronic disease in Ontario

In Ontario in 2021, 67.2 per cent of households that relied on social assistance were food insecure and 20.6 per cent of children lived in food insecure households.²⁹ A study published in 2018 found that adults in Ontario who lived in households experiencing moderate or severe food insecurity had more than twice the risk of developing type 2 diabetes than adults who lived in food secure households.⁴⁰

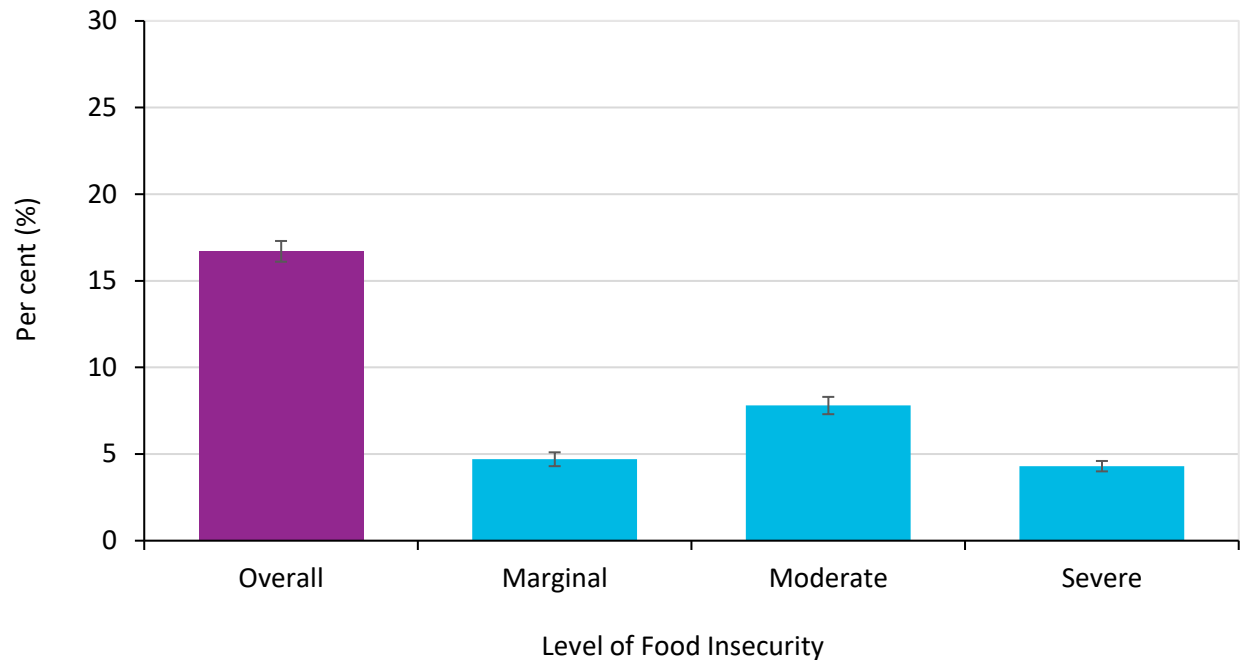
INDICATOR FINDINGS: HOUSEHOLD FOOD INSECURITY

This indicator looks at the percentage of households in Ontario reporting food insecurity in the 2018–2020 Canadian Income Survey years. The most recent data available at the time of writing this report were included (May 2023). In this report, household food insecurity prevalence estimates from the Canadian Income Survey are presented instead of data from the Canadian Community Health Survey as in previous reports. The Canadian Income Survey data are presented because they are timelier and yield a more population-representative estimate of food insecurity than the Canadian Community Health Survey data. As a result, the rates reported here are not comparable to previous reports.

- During the 2018 to 2020 survey years combined, 16.7 per cent of Ontario households experienced some level of food insecurity (Figure 1, Supplementary Table S1).
 - 4.7 per cent of households experienced marginal food insecurity, meaning they worried about running out of food, had limited food options or both (Figure 1, Supplementary Table S1).
 - 7.8 per cent of households experienced moderate food insecurity, meaning they reduced the quality or amount of food that they ate (Figure 1, Supplementary Table S1).
 - 4.3 per cent of households experienced severe food insecurity, meaning they missed meals or went one or more days without eating (Figure 1, Supplementary Table S1).
 - Reporting by public health unit showed that the overall prevalence of household food insecurity was as low as 12.6 per cent and as high as 25.9 per cent in different parts of Ontario (Supplementary Table S1).
- Household food insecurity rates remained relatively stable across the three-year period.
 - 17.1 per cent of households experienced some level of food insecurity in 2018, followed by 17.1 per cent in 2019, and 16.1 per cent in 2020.

The true prevalence of food insecurity is likely underestimated because the Canadian Income Survey does not include some populations that face a higher burden of food insecurity, such as on-reserve First Nations people and people experiencing homelessness.²⁹

Figure 1: Percentage of households that were food insecure, by level of food insecurity, Ontario, 2018–2020 combined



Sources: Canadian Income Survey, 2018–2020 (Statistics Canada).
Ontario Agency for Health Protection and Promotion (Public Health Ontario). Snapshots: household food insecurity snapshot [Internet]. Toronto, ON: King’s Printer for Ontario; c2023 [modified 2023 Mar 31; cited 2023 Apr 18]. Available from: <https://www.publichealthontario.ca/en/data-and-analysis/health-equity/household-food-insecurity>

Notes: “Overall” includes households experiencing marginal, moderate, and severe food insecurity. I—I represents 95% confidence intervals. Data are presented in Supplementary Table S1. Download supplementary tables at ontariohealth.ca/psqi.

Housing

Similar to income and other social determinants of health, a lack of affordable and adequate housing has a negative impact on chronic disease risk.⁴¹ Housing is impacted by several other social determinants of health including income, education, race and ethnicity, as well as public policies.⁴¹

Poor-quality housing affects chronic disease risk through exposure to respiratory toxins due to cold and damp conditions, overcrowding and a reduced sense of wellbeing.^{42,43} Physical and psychosocial aspects of well-being can be affected by the tenancy experience, quality of housing and neighbourhood supports.⁴¹ People from equity-deserving groups, such as people who are First Nation, Inuit, Métis and urban Indigenous, racialized, and 2SLGBTQIA+, can face additional barriers to adequate housing due to discrimination and systemic racism.⁴⁴⁻⁴⁶

The experience of homelessness, defined as a situation without stable, permanent, appropriate housing or the immediate ability to get it, is strongly associated with chronic diseases.⁴⁷ Although it is a challenge to collect data in the population experiencing homelessness, there is some evidence to suggest that health crises may lead to homelessness and that homelessness itself can worsen chronic disease prevalence and outcomes.⁴⁷ For example, diabetes and heart disease can be 3 to 6 times higher for those experiencing homelessness than the general population, and chronic obstructive pulmonary disease is considered one of the most prominent conditions experienced by those experiencing homelessness in Canada.⁴⁸

Housing and chronic disease in Ontario

In 2021, almost one in four people in Ontario were living in unaffordable housing, which is defined as spending 30 per cent or more of their household income on housing costs.⁴⁹ "Core housing need" refers to households living in homes that are unaffordable, crowded or in need of repair, as well as being unable to afford the median rent of alternative and satisfactory local housing.⁵⁰ In 2021, 12.1 per cent of people living in Ontario were in core housing need.⁵⁰ People in Ontario in unaffordable housing had a median household income of \$43,200, while households spending less than 30 per cent of income on housing costs had a median household income of \$110,000.⁵¹ In 2021, 11.3 per cent of racialized individuals reported living in unaffordable housing, a higher proportion than that reported in the total population.⁵²

Racism

Race is a social construct that was developed to categorize people by physical features and is not based in biology.⁵³ Racism is based on a false belief that certain races are superior to others and is a key determinant of health in Ontario.⁵⁴⁻⁵⁶ Overt forms of racism include abuse, exploitation and discrimination, but more pervasive forms of racism are sometimes subtle, embedded within the systems and structures that govern society, including education, employment, healthcare, judicial and social services.⁵⁷⁻⁵⁹ These more subtle forms of racism include adverse interpersonal interactions, exclusion from institutional decision-making processes, and internalized racism which results in self-doubt and low self-esteem.⁵⁷⁻⁶¹ Research has found that due to historical traumas of slavery and colonialism, Black and First Nations, Inuit, Métis and urban Indigenous populations are most likely to face racial discrimination in Canada.^{57,62-67} In this report, racialized populations refer to people who are non- FNIMUI and non-White (see the FNIMUI chapter for details of those populations' experiences).⁶⁷

Racial discrimination can impact health outcomes through the social determinants of health and poorer mental health, leading to increased predisposition to chronic disease risk factors.⁶⁹ For example, Black populations have a significantly higher odds of reporting cardiovascular disease than White populations.⁶⁸ Systemic racism can also reduce trust in the healthcare system and increase unmet healthcare needs for populations who have increased predispositions to poor health outcomes.^{70,71}

Racism in Ontario

The COVID-19 pandemic has highlighted disparities in social determinants of health between racialized groups and their White counterparts.¹⁶ Race-based data collected from June 2020 to April 2021 found that racialized populations had rates of COVID-19 infection that were up to seven times higher than White people in Ontario.¹⁶ Neighbourhoods in Ontario with the highest levels of diversity experienced the highest level of COVID-19 positivity rates.⁷²

A key barrier in understanding racial inequities in Ontario and their impact on health outcomes is the lack of race-based administrative health data.⁶² Ontario has developed an Anti-Racism Strategic Plan to

combat the rising incidence of anti-Indigenous, anti-Black, anti-Asian, Islamophobia and antisemitic discrimination in the province.⁷³ Continued efforts in racialized data transparency will be required to monitor progress of this plan.⁷⁴

Opportunities to address the social determinants of health

While specific policies to address the social determinants of health outlined above are out of scope for this report, health inequities can be most effectively addressed through structural change at the level of public policy and larger social shifts.⁷⁵ Shifting focus from downstream health determinants such as medical care and health behaviours, to more upstream health determinants such as the social determinants of health discussed above, offers an opportunity to address the root causes of health inequities and disease.⁷⁶



First Nations, Inuit, Métis, and urban Indigenous health

Indigenous populations in Canada include First Nations, Inuit and Métis (FNIM) peoples, who are constitutionally recognized peoples with treaty and inherent rights. Urban Indigenous identifies an increasing population of FNIM peoples who live in towns and cities, and may have different experiences and identities than FNIM who live outside of urban settings.⁷⁷ Collectively, First Nation, Inuit, Métis and urban Indigenous (FNIMUI) peoples experience a greater impact on health and well-being from chronic diseases than all other populations living in Canada.⁷⁸⁻⁸³ This impact is a result of intergenerational trauma from colonialism and violent assimilation efforts including residential schools and Indian hospitals,⁸⁴⁻⁸⁶ combined with ongoing inequities in the social determinants of health through systemic disadvantages in social, economic and political spheres.⁸⁷ A foundation on which systemic health inequities can be addressed in partnership with FNIMUI populations must begin with building trusting relationships to develop culturally safe practices that honours their beliefs and values.^{88,89} The 2015 Truth and Reconciliation Calls to Action aim to rectify the impact of colonialism and are an important guide to honour the distinct health needs of FNIMUI peoples.⁸⁹

First Nations, Inuit, Métis and urban Indigenous and the social determinants of health

Racism towards First Nations, Inuit, Métis and urban Indigenous people is directly rooted in colonialism and has been impacting FNIMUI health outcomes for generations.⁹⁰ Ontario's health care system was created based on colonial perspectives that disregard First Nations, Inuit, Métis and urban Indigenous beliefs about health and well-being.^{91,92} Without avenues to recognize traditional beliefs and FNIMUI identity, inequities are created in healthcare services for FNIMUI peoples across Ontario.^{91,92} Even when healthcare services are accessed by FNIMUI community members, they can experience being dismissed, disregarded, or ignored in emergency departments and left to suffer at the detriment of their health outcomes.^{91,92} A study published in the *Canadian Journal of Public Health* in 2020 found that from a sample of urban Indigenous people living in Toronto, almost one in three (28.5 per cent) reported experiencing discrimination by health care providers and 27.3 per cent reported unmet health needs.⁹³ Much work has to be done within and outside the healthcare system to ensure the good health and longevity of all First Nations, Inuit, Métis and urban Indigenous peoples living in Canada.

Historical and intergenerational traumas associated with colonialism have led to a loss in socioeconomic status among First Nations, Inuit, Métis and urban Indigenous populations that has impacted other social determinants of health.⁹⁴ In 2015, non- FNIMUI populations reported a median employment income that was almost double that of First Nations people living on reserve.⁹⁵ During the pandemic, a greater proportion of FNIMUI peoples experienced job loss and were financially impacted due to a lack of liquid assets or other sources of income.²⁹ Stress related to precarious or low income can have negative consequences on health, such as food insecurity.⁹⁶

In addition, historically racist practices of being forced to live in underdeveloped housing on reserves has led to poor housing status in First Nations communities.^{87,94} As mentioned in the previous section, housing is an integral part of health.^{97,98} In 2021, almost 20 per cent of FNIMUI peoples in Canada reported living in overcrowded housing that required major repairs.⁹⁶⁻⁹⁸ Although data shows that there have been some improvements since 2017, FNIMUI populations are still twice as likely to report living in overcrowded housing than non-First Nations, Inuit, Métis and urban Indigenous populations.⁹⁶⁻⁹⁸ In

January 2022, the Ontario government announced a \$10 million commitment in new annual funding to provide FNIMUI-led long-term housing solutions to FNIMUI peoples at risk of or currently experiencing homelessness.⁹⁹

FNIMUI peoples have nonetheless shown an ability to survive – and to thrive – in the face of overwhelming challenges. Personal, familial and community resilience, restoring and promoting FNIMUI identities, keeping cultures and languages alive and self-governance have all had positive impacts on FNIMUI peoples' health and well-being.^{100,101} For example, some research has found that cultural identity can help promote First Nations peoples' health in general, while participation in cultural activities for FNIMUI has been found to lower substance and alcohol abuse.^{100,101} FNIMUI peoples, therefore, take a wholistic approach to addressing health inequities resulting from the social determinants of health. This approach is based on the FNIMUI view of health and wellness, which is a balance of the four dimensions of health (physical, mental, emotional and spiritual) throughout the stages of life.¹⁰²

First Nations, Inuit, Métis and urban Indigenous and health-related behaviours

As a result of historic actions intended to subjugate Indigenous people and some continuing to this day, First Nations, Inuit, Métis and urban Indigenous people face a disproportionately high prevalence of several behavioural risk factors that increases their risk for chronic diseases.¹⁰³ For example, loss of traditional practices due to colonization have resulted in major dietary and activity changes that continue to impact FNIMUI peoples today.¹⁰⁴ The erosion of cultural practices and a decline in hunting and eating traditional foods has transitioned FNIMUI diets from healthy traditional whole foods to overly processed Western foods including sugar-sweetened beverages.¹⁰⁵ Access to healthy foods are also being impacted by the rising food prices during the pandemic and the limited availability of these foods, especially in northern Ontario regions.^{105,106}

The link between physical activity and traditional Indigenous culture is very strong. However, there are significant barriers to engaging in physical activity for many First Nations communities, such as lack of access to safe places to walk and play outdoors on reserve, lack of physical activity infrastructure and trained personnel, and the cost of equipment and transportation.¹⁰³ The impact of colonialism and cultural genocide have also caused intergenerational trauma in the form of addictions including high consumption of alcohol and smoking in urban Indigenous populations.^{107,108} Research finds that Indigenous youth are less likely to smoke when provided alternative health-promoting behaviours such as physical activity.¹⁰⁹

First Nations health

First Nations people living on reserves experience poor socioeconomic conditions that impact dietary availability.¹¹⁰ A study from 2021 found that almost half of First Nations households on reserves were considered food insecure, which can lead to nutrition-related chronic diseases such as obesity and type 2 diabetes.¹¹¹

Although physical activity levels are reportedly higher among First Nations youth than the general population, they still report higher obesity and diabetes rates.¹¹²⁻¹¹⁴ Preliminary data from First Nations youth and adults living on reserves found higher sedentary time and overweight and obesity levels, although more research is still needed for First Nations populations in and outside of urban centres.^{112,113} From 2007 to 2013, on-reserve First Nations women age 18 and older were significantly more likely to be physically inactive (73.5 per cent) than off-reserve First Nations women (50.3 per cent)

and non-Indigenous women (52.1 per cent).¹⁰³ On-reserve First Nations men were also significantly more likely to be physically inactive (56.1 per cent) than off-reserve First Nations men (40.2 per cent) and non-Indigenous men (46.6 per cent).¹⁰³ First Nations women on- and off-reserve and non-Indigenous women were significantly more likely to be physically inactive than men.¹⁰³ As a means of coping with intergenerational trauma and hopelessness, First Nations people in Ontario report higher use of alcohol and smoking.^{108,115,116}

INDICATOR FINDINGS: SMOKING, LONG-TERM SMOKING CESSATION AND ALCOHOL CONSUMPTION AMONG FIRST NATIONS ADULTS

These indicators measure the percentage of First Nations adults age 20 and older who reported smoking cigarettes every day or occasionally, past daily or occasional smoking and stopping smoking completely at least one year ago, as well as consuming more than two drinks in the past week. Canadian Community Health Survey data for the 2015 to 2020 survey years were combined.

- There were 39.7 per cent of First Nations adults who reported daily or occasional smoking, with 43.0 per cent of First Nations men and 35.6 per cent of First Nations women reporting current smoking (Supplementary Table S2).
- There were 32.4 per cent of First Nations adults who reported past daily or occasional smoking and reported that they stopped smoking at least one year ago. 30.0 per cent of First Nations men and 36.8 per cent of First Nations women reported long-term smoking cessation (Supplementary Table S2).
- There were 38.9 per cent of First Nations adults who reported drinking more than two alcoholic drinks in the past week, which included 44.5 per cent of First Nations men and 33.5 per cent of First Nations women (Supplementary Table S2).

FIRST NATIONS PEOPLE AND CHRONIC DISEASE IN ONTARIO

First Nations people living on reserves face greater disparities than non-FNIM people in the province.¹¹⁷ For example, the prevalence of type 2 diabetes is three to five times higher among First Nations people than non-First Nations people in Ontario.^{79,83} A 2020 study using a Diabetes Population Risk Tool estimated that from 2015 to 2025, First Nations adults living in First Nations communities in Ontario have a 9.6 per cent risk of developing type 2 diabetes.⁸⁸ The study corroborated findings that First Nations people experience a younger age of onset for diabetes than the general population.^{118,119}

Similarly, First Nations people have a 2.5 times higher prevalence of cardiovascular disease than non-First Nations people.¹²⁰ Cardiovascular disease mortality is also disproportionately higher, with some studies estimating a 30 per cent higher mortality in First Nations men and 76 per cent higher mortality in First Nations women than non-First Nations people.¹²⁰ Socioeconomic advantage and higher education level were significantly associated with lower cardiac risk factors for First Nations people, and higher risk was associated with difficulty accessing routine care and an inability to afford prescription medication.¹¹⁹ A recent rapid review in 2022 corroborated that First Nations people experience significant gaps in receiving cardiovascular disease care which can worsen disease outcomes.¹²⁰ Since a majority of First Nations communities in Ontario are located in Northern Ontario, which is a remote area with no year-round road access, there is a need to better allocate resources to reduce barriers and improve geographic access to care.^{118,121}

In Ontario, the incidence of some common cancers, including lung, colorectal, kidney, cervical and liver, is higher among First Nations people than other populations.⁷⁸ First Nations women had a higher incidence for all cancers combined than non-First Nations women.⁷⁸ The First Nations populations also had poorer cancer survival than the rest of Ontario.^{78,122} The lower survival for breast cancer in First

Nations women was found to be partly due to diagnosis at a later stage and a higher prevalence of comorbidities, particularly diabetes.¹²³

Inuit health

Inuit populations living in Canada, referred to as Inuit Nunangat, mostly reside in northern regions outside of Ontario.¹²⁴ There is little information on the prevalence of risk factors (e.g. physical activity, eating behaviours) and chronic disease burden among Inuit specifically in Ontario. There is information available on the social determinants of health for Inuit Nunangat in Ontario Health (Cancer Care Ontario)'s report [*Cancer Risk Factors and Screening Among Inuit in Ontario and other Canadian regions*](#). For example, due to less time spent on traditional activities, Inuit adults have reported a decline in physical activity and diet quality over the past 50 years.¹²⁵

INDICATOR FINDINGS: SMOKING, LONG-TERM SMOKING CESSATION AND ALCOHOL CONSUMPTION AMONG INUIT ADULTS

These indicators measure the percentage of Inuit adults age 20 and older who reported smoking cigarettes every day or occasionally, past daily or occasional smoking and stopping smoking completely at least one year ago, as well as consuming more than two drinks in the past week. Canadian Community Health Survey data for the 2015 to 2020 survey years were combined. These indicators must be interpreted with caution due to high sampling variability.

- There were 41.3 per cent of Inuit adults who reported daily or occasional smoking (Supplementary Table S3).
- There were 49.6 per cent of Inuit adults who reported past daily or occasional smoking and that reported they stopped smoking at least one year ago (Supplementary Table S3).
- There were 34.9 per cent of Inuit adults who reported drinking more than two alcoholic drinks in the past week (Supplementary Table S3).

INUIT PEOPLE AND CHRONIC DISEASE

The last national Inuit Health Survey in 2007 to 2008 indicated that Inuit rates of type 2 diabetes are comparable to the general Canadian population and is of growing concern.^{126,127} Since the 1970s, cardiovascular disease was thought to be rare among Inuit, but more recent studies have shown comparable rates of cardiovascular disease to the general Canadian population.¹²⁸ Research on cancer risk and outcomes among Inuit in Canada is mostly focused within Inuit Nunangat populations, which are Inuit populations living in Canada.¹²⁸ Incidence rates for lung cancer in Inuit men and women living in the Canadian Arctic are the highest in the world.¹²⁹ One study of cancer in the population living in Inuit Nunangat showed that Inuit are more likely to be diagnosed with lung and colorectal cancer than other populations in Canada, and less likely to be diagnosed with breast and prostate cancer.¹³⁰ There is an Inuit-owned and Inuit-determined survey of Inuit and well-being called Qanuippitaa? National Inuit Health Survey (QNIHS) that is currently underway and is likely to provide more insights into the experiences of this population in the coming years.¹³¹

There is little information on the prevalence of chronic disease burden among Inuit in Ontario.

Métis health

Métis people in Ontario are similarly weighted compared to non-Indigenous people in Ontario, but Métis adults are more likely to be obese.¹³² In addition, approximately 70 per cent of Métis adults in Ontario do not meet the recommended intake of fruits and vegetables per day.¹³² Almost half of all Métis adults in Ontario are inactive and just under 75 per cent are considered inactive.¹³² Métis adults with lower household incomes were significantly more likely to be physically inactive than Métis adults with higher household incomes (53.1 per cent in the lowest income quintile compared to 33.5 per cent

in the highest income quintile).¹⁰³ Métis adults with lower levels of education were also significantly more likely to be physically inactive than Métis adults with higher levels of education (58.3 per cent for adults with less than secondary school education compared to 40.3 per cent for those with a post-secondary degree).¹⁰³ Similar levels of physical inactivity were seen for Métis people living in the north and in the south of Ontario, and for men and women.¹⁰³

INDICATOR FINDINGS: SMOKING, LONG-TERM SMOKING CESSATION AND ALCOHOL CONSUMPTION AMONG MÉTIS ADULTS

These indicators measure the percentage of Métis adults age 20 and older who reported smoking cigarettes every day or occasionally, past daily or occasional smoking and stopping smoking completely at least one year ago, as well as consuming more than two drinks in the past week. Canadian Community Health Survey data for the 2015 to 2020 survey years were combined.

- There were 29.4 per cent of Métis adults who reported daily or occasional smoking (Supplementary Table S4).
- There were 42.2 per cent of Métis adults who reported past daily or occasional smoking and that they stopped smoking at least one year ago. This was reported by 39.9 per cent of Métis men and 44.2 per cent of Métis women (Supplementary Table S4).
- There were 38.4 per cent of Métis adults who reported drinking more than two alcoholic drinks in the past week. This was reported by 47 per cent of Métis men and 30.1 per cent of Métis women (Supplementary Table S4).

MÉTIS PEOPLE AND CHRONIC DISEASES

A study of cancer mortality across Canada found that from 1991 to 2001, Métis women had significantly higher rates of cancer death overall compared to non-Indigenous women.¹³³ Métis women also had significantly higher rates of death specifically for cancers of the lung and of the uterus, probably because Métis women get more cancers of the cervix.¹³³ The cancer death rates in Métis men were similar to the rates in non-Indigenous men.¹³³

MÉTIS PEOPLE AND CHRONIC DISEASES IN ONTARIO

Compared to the general Ontario population, Métis people have a 1.6 times higher prevalence of chronic obstructive pulmonary disease.^{81,132} It is believed that chronic obstructive pulmonary disease may disproportionately impact these communities due to higher rates of cigarette smoking and poor housing conditions.^{134,135} Métis adults also had prevalence rates for cardiovascular disease and associated outcomes (e.g., stroke, hypertension, congestive heart failure) that were 25 to 77 per cent higher than the prevalence rates in the general Ontario population.¹²⁰ In addition, Métis adults who were diagnosed with congestive heart failure had more frequent hospitalizations and emergency department visits than non-FNIM people in Ontario.¹³⁶ Diabetes rates in Métis people were 26 per cent higher than rates in the general Ontario population, and Métis people are more likely to be hospitalized and require emergency room visits.^{132,137} Métis people with diabetes are 86 per cent more likely to be hospitalized because of a heart attack or pre-heart attack than people with diabetes from the general Ontario population.¹³² Métis people in Ontario are less likely to receive care from a diabetes specialist and receive recommended eye care.¹³² Very little is known about cancer patterns in Métis populations in Ontario.

Urban Indigenous health

Urban Indigenous people are more likely to experience food insecurity, poverty and homelessness than First Nations, Inuit, Métis living in rural areas or on-reserve, or compared with non-FNIM people, which increases their risk for chronic diseases.^{77,97,98} In addition, urban Indigenous youth report higher smoking

and alcohol intake than non-FNIM youth in Canada, and the age of initiation is younger for urban Indigenous males.¹⁰⁸

INDICATOR FINDINGS: SMOKING, LONG-TERM SMOKING CESSATION AND ALCOHOL CONSUMPTION AMONG URBAN INDIGENOUS ADULTS

These indicators measure the percentage of urban Indigenous adults age 20 and older who reported smoking cigarettes every day or occasionally, past daily or occasional smoking and stopping smoking completely at least one year ago, as well as consuming more than two drinks in the past week. Canadian Community Health Survey data for the 2015 to 2020 survey years were combined.

- There were 36.6 per cent of urban Indigenous adults who reported daily or occasional smoking (Supplementary Table S5).
- There were 36.4 per cent of urban Indigenous adults who reported past daily or occasional smoking and that they stopped smoking at least one year ago (Supplementary Table S5).
- There were 38.7 per cent of urban Indigenous adults who reported drinking more than two alcoholic drinks in the past week. This was reported by 46.5 per cent of urban Indigenous men and 31.5 per cent of urban Indigenous women (Supplementary Table S5).

URBAN INDIGENEOUS PEOPLE AND CHRONIC DISEASE

Healthcare services offered in urban areas are not consistently appropriate for FNIM people, and studies have found that urban Indigenous people have reservations about accessing healthcare services because of the risk of stigmatization and discrimination.⁷⁷

There is little information on the prevalence of chronic diseases, as well as the prevalence of chronic disease risk factors in urban Indigenous people in Ontario.

Opportunities in First Nations, Inuit, Métis and urban Indigenous health

- Develop meaningful partnerships with FNIMUI communities and organizations to create population-based surveys and health indicators that are nation-distinct, representative, relevant, and culturally appropriate.
- Fund culturally relevant and co-developed policies and programs to address chronic diseases in FNIMUI populations.
- Improve cultural safety in Canada's healthcare system for FNIMUI peoples to reduce barriers to accessing care.
- Create safe places for physical activity; develop a strategy to promote equity in physical activity infrastructure for FNIMUI.
- Address the socio-economic barriers to health-promoting behaviour such as physical activity, eating healthy foods, and other social determinants of health for FNIMUI.
- Develop and implement a coordinated plan to prevent commercial tobacco and alcohol use among FNIMUI children and youth.
- Establish specialized, culturally appropriate community-initiated smoking cessation programs and services in FNIMUI communities such as the Canadian Cancer Society's Talk Tobacco program and the Indigenous Tobacco Program along with community-initiated tobacco control measures that respect FNIM rights.
- Ensure that culturally acceptable and relevant alcohol prevention and treatment programs are available for FNIMUI peoples.



Commercial tobacco

Commercial tobacco smoking and chronic disease risk

Smoking tobacco remains the leading cause of preventable and premature death in Canada, with people who smoke having a two to three times higher mortality rate than people who do not smoke.¹³⁸⁻¹⁴⁰ Smoking is also a risk factor for several chronic diseases, including at least 20 types of cancer.^{141,142} It is well-known as the leading cause of lung cancer in humans and accounts for 72 per cent of lung cancer cases in Canada.^{143,144} Smoking is also the leading cause of chronic obstructive pulmonary disease morbidity and mortality; it is estimated that people who smoke are four times more likely to develop chronic obstructive pulmonary disease than people who do not smoke.¹⁴⁵⁻¹⁴⁷ Moreover, tobacco smoking is a risk factor for cardiovascular diseases including atherosclerosis, coronary heart disease, ischemic heart disease, and stroke.¹⁴⁸ Evidence also suggests a link between smoking and type 2 diabetes, with people who smoke being at 30 to 40 per cent greater risk of developing diabetes than people who do not smoke.¹⁴⁸⁻¹⁵⁰

Tobacco smoking in Ontario

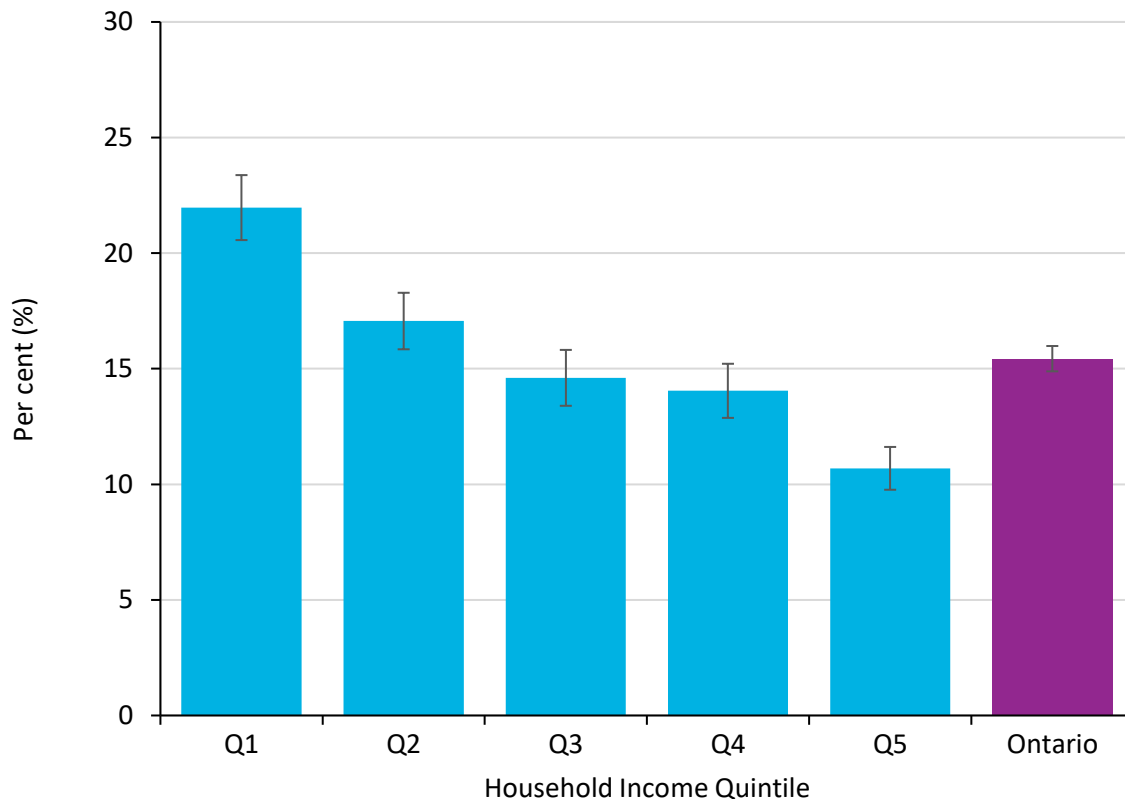
In Ontario, 17.0 per cent of deaths, 8.7 per cent of hospitalizations and 3.4 per cent of emergency department visits from all causes are attributable to smoking.¹⁵¹ In 2020, the economic burden of tobacco smoking in the province was an estimated \$7.0 billion in healthcare, lost productivity, criminal justice and other direct costs.¹⁵⁰ Due to decreasing smoking prevalence, economic costs associated with smoking are projected to decrease over the next two decades in Ontario.^{150,152} Despite this decrease, healthcare expenditures attributable to smoking will be approximately \$164 billion in total from 2003 to 2041 due to the long-lasting health effects even after people quit.¹⁵²

Indicator findings: cigarette smoking in adults

This indicator measures the percentage of adults ages 20 and older who reported smoking cigarettes every day or occasionally. It combines Canadian Community Health Survey data for the 2017 to 2020 survey years.

- From 2017 to 2020, 15.4 per cent of adults ages 20 and older in Ontario reported that they currently smoke tobacco every day or occasionally (Supplementary Table S6).
- Current smoking is more common in men (18.8 per cent) than in women (12.2 per cent). It is also more common in adults living in rural areas (21.0 per cent) than adults living in urban areas (14.9 per cent) (Supplementary Table S6).
- Smoking is more common in adults with lower household income (Figure 2), and differs by immigration status and racial group (Supplementary Table S6).

Figure 2: Percentage of adults (age 20 and older) reporting smoking daily or occasionally, by household income quintile, Ontario, 2017–2020 combined



Source: Canadian Community Health Survey, 2017–2020 (Statistics Canada).
 Notes: I—I represents 95% confidence intervals. “Q1” represents the lowest household income quintile and “Q5” represents the highest. Data are presented in Supplementary Table S6. Download supplementary tables at ontariohealth.ca/psqi. Estimates are adjusted to the age distribution of the 2011 Canadian population.

The COVID-19 pandemic might have further exacerbated population disparities in smoking rates.¹⁵³⁻¹⁵⁷ Survey data from 2020 indicated that people with a high school education or less were almost three times more likely to smoke more during the COVID-19 pandemic.^{158,159} Another study found that enrollments in smoking cessation programs in Ontario decreased by 69 per cent the month following the start of the COVID-19 pandemic and visits were down by 42 per cent compared to the average of the same period in the two previous years.¹⁶⁰

Vaping and health

There is growing evidence that vaping and e-cigarettes with nicotine can help people quit cigarette use; however, the healthiest option remains quitting nicotine products altogether.^{161,162} There are also concerns about other direct health impacts from vaping, including a significant association with asthma and chronic obstructive pulmonary disease.¹⁶³ Further information on the risks of vaping and its use as a smoking cessation aid is available in [Vaping products including e-cigarettes](#).

Policies and programs to reduce smoking

Canada's Tobacco Strategy aims to reduce tobacco use to less than five per cent by 2035.¹⁶⁴ Without an equitable approach, addressing tobacco use can increase health inequities.¹⁶⁵⁻¹⁶⁷ Effective equity-based tobacco control policies involve price or taxation measures that can specifically target reducing use in lower socioeconomic status groups.¹⁶⁸⁻¹⁷⁰ The World Health Organization's evidence-based Framework Convention on Tobacco Control provides a foundation for all countries to manage tobacco control, which involves using six MPOWER measures to reduce total population-level tobacco use:¹⁷¹

M-monitoring tobacco use (i.e., keep prevention policies and programs accountable)

P-protect people from tobacco smoke (e.g., policies to increase smoke-free environments)

O-offer help to quit tobacco use (e.g., targeted programs for specific populations)

W-warn about the dangers of tobacco (e.g., warnings on cigarette packaging)

E-enforce bans on tobacco advertising, promotion, and sponsorship (e.g., regulation of tobacco product disclosures)

R-raise taxes on tobacco (i.e., price and tax measures can reduce the demand for tobacco)

In Ontario, the *Smoke-Free Ontario Act, 2017* has implemented some policies in line with the Framework Convention on Tobacco Control recommendations to reduce tobacco use in the province and protect people from the harms of second-hand smoke, although gaps in alignment with the Framework Convention on Tobacco Control remain in terms of tobacco availability and taxation.^{171,172}

Tobacco taxation

EVIDENCE FOR INCREASING TOBACCO TAXES

Increasing the price of commercial tobacco products is a cost-effective measure for reducing population-level consumption, especially for people from lower socioeconomic backgrounds.^{171,173} Recent longitudinal data from the United Kingdom and Australia confirmed that a commercial tobacco tax increase significantly reduced smoking prevalence among all socioeconomic status groups; however, consumption did rebound over time within the lower socioeconomic status group.¹⁷⁴⁻¹⁷⁶ This rebound in smoking prevalence suggests that a multilevel approach might be necessary to promote long-term smoking cessation among equity-deserving groups.¹⁷⁶ Evidence shows that tax increases should apply equally to all commercial tobacco products, to ensure that one commercial tobacco product is not replaced with another.¹⁷⁷ Adjusting for inflation to account for income growth and affordability is also important.^{173,177}

COMMERCIAL TOBACCO TAXES IN ONTARIO

Under the *Tobacco Tax Act and Regulations* in Ontario, tobacco products (i.e., cigarettes, cigars, fine cut and chewing tobacco) with the exception of raw leaf tobacco, are directly taxed to consumers, except for First Nations people.¹⁷⁸ All tobacco products sold in Ontario are also subject to federal taxes (HST) and excise duties that are annually adjusted on April 1 based on the Consumer Price Index.¹⁷⁹ The most recent federal tax increase (on April 1, 2023) on excise duties was 15.83 cents per cigarette.¹⁷⁹ The last provincial increase in excise tax remained the same since March 29, 2018, at 18.475 cents per cigarette.¹⁷⁹

INDICATOR FINDINGS: TAX AS A PERCENTAGE OF COMMERCIAL TOBACCO RETAIL PRICE

This indicator uses the annual average price at the provincial level for 2022 from Statistics Canada with data available for all provinces and three territories.

- The taxation rate in Ontario is 57.5 per cent of the average retail price (Table 1, Supplementary Table S7). The World Health Organization recommends a relative tax of 75 per cent on tobacco products (adjusted for inflation) for effective tobacco control.¹⁷¹
- In 2022, Ontario had the third lowest taxation rate in Canada compared to all provinces and territories (Table 1, Supplementary Table S7). This ranking changed since the previously reported 2018 data, which showed that Ontario ranked fifth lowest.
- Taxes would need to increase by \$101.20 per carton of 200 cigarettes from 2022 levels to make up 75 per cent of the retail price as recommended by the World Health Organization.

Table 1: Commercial tobacco taxes as a percentage of average total retail price per carton of 200 cigarettes, by province or territory, 2022

Province or territory	Pre-tax price (\$)	Total taxes (\$)	Average total retail price (\$)	Tax as a percentage of total retail price (%)
British Columbia	64.22	102.74	166.96	61.5%
Manitoba	62.16	108.02	170.18	63.5%
Nova Scotia	63.70	107.11	170.81	62.7%
Saskatchewan	53.98	103.38	157.36	65.7%
Quebec	52.77	65.21	117.98	55.3%
Newfoundland and Labrador	61.86	118.29	180.15	65.7%
Prince Edward Island	45.68	109.01	154.69	70.5%
New Brunswick	58.84	101.78	160.62	63.4%
Ontario	61.54	83.42	144.96	57.5%
Alberta	59.36	92.00	151.36	60.8%
Yukon	59.82	101.47	161.29	62.9%
Nunavut	87.16	98.64	185.80	53.1%
Northwest Territories	65.44	106.79	172.23	62.0%

Sources: Total taxes retrieved from provincial and territorial government websites for the tobacco taxes in effect or announced in 2022. Average Annual Retail Price (after tax) of Cigarette Cartons, custom report (Statistics Canada).

Notes: Data are presented in Supplementary Table S7. Download supplementary tables at ontariohealth.ca/psqi. Total retail price data represent a simple standardized unit price of cigarette cartons across geographies recorded by the Consumer Price Index. Users are advised to exercise caution when comparing to the official (weighted) average prices table released by Statistics Canada because the calculation methods are different. Average prices should not be used as a measure of pure price change through time because the product and outlet sample can vary from month to month.

Commercial tobacco availability

EVIDENCE FOR LIMITING TOBACCO AVAILABILITY

Research shows that living in an area with higher commercial tobacco retail density and lower proximity between commercial tobacco retailers was associated with a greater likelihood of smoking and relapsing on quit attempts.¹⁸⁰ A recent meta-analysis in 2021 found that lower levels of commercial tobacco retail

density (i.e., the number of retailers in a given area) and increasing proximity between commercial tobacco retailers is associated with a 2.5 per cent risk reduction in commercial tobacco use.¹⁸¹

Governments can implement policies to reduce the total number of locations selling commercial tobacco products in a given area, limit the types of stores that can sell commercial tobacco products or limit sales close to areas with a higher number of adolescents such as schools.¹⁸¹ Evidence indicates that reducing retailer density and proximity to schools may be particularly important in preventing commercial tobacco initiation and commercial tobacco use in children and adolescents.¹⁸¹⁻¹⁸³ Density and proximity reductions are also more effective for people with lower incomes than people with higher incomes.¹⁸¹ Policies reducing the number of commercial tobacco retailers might be effective as an equitable approach to reducing population levels of commercial tobacco use across all income groups.¹⁸¹

COMMERCIAL TOBACCO AVAILABILITY IN ONTARIO

A higher percentage of commercial tobacco retailers are concentrated in lower income areas in Ontario.^{184,185} A 2023 study found reduced cigarette costs in lower socioeconomic areas and on First Nations reserves.¹⁸⁴⁻¹⁸⁶ Therefore, efforts on a provincial level to reduce commercial tobacco retailers must also limit access to lower-cost cigarettes, while allowing First Nations communities to generate revenues through commercial tobacco taxation.¹⁸⁶ The Framework Convention on Tobacco Control recognizes the disproportionate harm caused by commercial tobacco on First Nations communities and recommends implementing measures to reduce commercial tobacco availability by working with First Nations leaders.¹⁸⁷⁻¹⁸⁹ Modelling suggests that restricting commercial tobacco availability to only 50 per cent of liquor stores could prove effective at reducing overall smoking prevalence and use among Indigenous people.^{187,190}

Second-hand smoke exposure

EVIDENCE FOR POLICIES AND PROGRAMS TO REDUCE SECOND-HAND SMOKE EXPOSURE

Inhalation of second-hand smoke can negatively impact the health of people who do not smoke.^{191,192} Exposure to second-hand smoke is associated with lung, breast, cervical and colorectal cancers.¹⁹³ Evidence also demonstrates a correlation between second-hand smoke and heart diseases, chronic obstructive pulmonary disease and stroke.^{191,193} Moreover, vulnerable populations such as infants can have an increased risk of sudden infant death syndrome and adolescents can have an increased risk of poor academic performance and lung cancer.^{191,193} The only proven strategy for reducing second-hand smoke is to eliminate it altogether using comprehensive smoke-free laws.¹⁹⁴ Although less information is known about exposure to second-hand cannabis smoke, similar toxic chemicals in tobacco and cannabis products might also result in cannabis smoke deteriorating health.¹⁹⁵⁻¹⁹⁷

POLICIES AND PROGRAMS TO REDUCE SECOND-HAND SMOKE EXPOSURE IN ONTARIO

In Ontario, smoking is largely banned in indoor public places and some outdoors spaces, but there is no legislative ban on smoking in private residences, such as apartment buildings, condos and co-ops in multi-unit buildings.^{198,199} Social housing in Ontario is primarily multi-unit housing, such as apartment buildings. Similar to patterns of smoking, equity-deserving populations, including people with lower socioeconomic status, are more likely to be exposed to due to living conditions such as social housing. A 2020 study found that people in Canada reported the highest level of second-hand smoke exposure within multi-unit housing compared to those from the United Kingdom and the United States.^{200,201}

INDICATOR FINDINGS: SECOND-HAND SMOKE EXPOSURE IN ADULTS

This indicator measures the percentage of non-smoking adults age 20 and older who reported exposure to second-hand smoke every day or almost every day, by location of exposure. It combines Canadian Community Health Survey data for the 2019 to 2020 survey years.

- From 2019 to 2020, non-smoking adults in Ontario age 20 and older reported second-hand smoke exposure more often in public (9.5 per cent) than in the workplace or at school (6.4 per cent), at home (2.3 per cent), or in a car or other private vehicle (2.3 per cent) (Supplementary Table S8).

INDICATOR FINDINGS: SECOND-HAND SMOKE EXPOSURE IN ADOLESCENTS

This indicator measures the percentage of non-smoking adolescents ages 12 to 19 who reported exposure to second-hand smoke every day or almost every day, by location of exposure. It combines Canadian Community Health Survey data for the 2019 to 2020 survey years.

- From 2019 to 2020, non-smoking adolescents in Ontario ages 12 to 19 reported second-hand smoke exposure more often in public (14.0 per cent) than in the workplace or at school (8.9 per cent), at home (6.4 per cent), or in a car or other private vehicle (3.3 per cent) (Supplementary Table S9).

INDICATOR FINDINGS: SMOKE-FREE POLICIES IN SOCIAL HOUSING

This indicator looks at the number of social housing providers or local housing corporations in Ontario that have implemented smoke-free policies across all of their properties.

There are examples of jurisdictions that have implemented a comprehensive ban on smoking across all social housing. The Yukon Housing Corporation and Saskatchewan Housing Corporation have implemented territorial/provincial smoke-free policies across all their properties.^{202,203} The U.S. Department of Housing and Urban Development implemented a smoke-free policy across all federally subsidized social housing in 2018.²⁰⁴

- As of October 2022, 32 out of 47 local housing corporations (68 per cent) had smoke-free policies that applied to all of their properties (Table 2, Supplementary Table S10). Some local housing corporations noted they have implemented a smoke-free policy for designated buildings or new builds.
- Three local housing corporations have introduced smoke-free policies since January 1, 2020.
- Ontario can build on local momentum by adopting a province-wide policy for all local housing corporations or can use incentives to further encourage local implementation.

Table 2: Smoke-free policies in local housing corporations, Ontario, 2022

Smoke-free policy	Local housing corporation
The local housing corporation has implemented a smoke-free policy for all properties	Algoma District Services Administration Board, Housing Services Bruce County Housing Corporation Chatham-Kent Housing Services City of Cornwall, Housing Services Division CityHousing Hamilton Cochrane District Social Services Administration Board County of Wellington Housing Services District Municipality of Muskoka Social Housing District of Timiskaming Social Services Administration Board Dufferin County Housing Corporation Durham Regional Local Housing Corporation Grey County and Owen Sound Housing Corporation Hastings Local Housing Corporation Housing York Inc. Huron County Housing Corporation Kenora District Services Board Lanark County Housing Corporation Manitoulin-Sudbury District Services Board, Community Housing Northumberland County Housing Corporation Ottawa Community Housing Corporation Peel Housing Corporation operating as Peel Living* Perth & Stratford Housing Corporation Prescott-Russell Housing Services Prince Edward-Lennox & Addington Housing Corporation Rainy River District Social Services Administration Board Renfrew County Housing Corporation Sault Ste. Marie Housing Corporation Simcoe County Housing Corporation* The District of Thunder Bay Social Services Administration Board The United Counties of Leeds and Grenville, Social Housing Dept. Waterloo Region Housing Windsor Essex Community Housing Corporation
The local housing corporate has NOT implemented a smoke-free policy for all properties	Brant and Brantford Local Housing Corporation* County of Lambton District of Nipissing Social Services Administration Board, Social Housing* District of Parry Sound Social Services Administration Board* Greater Sudbury Housing Corporation Haldimand-Norfolk Housing Corporation Halton Community Housing Corporation Kawartha Lakes Haliburton Housing Corporation Kingston and Frontenac Housing Corporation London & Middlesex Community Housing* Niagara Regional Housing Oxford County Housing Corporation* Peterborough Housing Corporation St. Thomas and Elgin County Housing Corporation* Toronto Community Housing Corporation

Sources: Local housing corporations

Notes: Details about the smoke-free policies are presented in Supplementary Table S10. Download supplementary tables at ontariohealth.ca/psqi. The presence of a smoke-free policy at each local housing corporation was determined by reviewing their websites and contacting the corporation to verify what was found.

* The information is from the corporation's website only; the corporation did not verify or confirm the information.

Smoking cessation

EVIDENCE FOR SMOKING CESSATION INTERVENTIONS

Nicotine addiction and dependence is considered a chronic illness due to multiple relapses occurring after quit-attempts.²⁰⁵ Clinical guidelines recommend nicotine replacement therapy as the first-line of treatment for smoking cessation along with prescription medications (i.e., bupropion and varenicline).²⁰⁵ Although evidence-based therapies are proven to be effective in helping people quit smoking, challenges can exist depending on someone's readiness to quit, severity of nicotine dependence and withdrawal symptoms.²⁰⁵

By 2022, 87 per cent of cancer centres across Canada were offering supports for smoking cessation.²⁰⁶ A national toll-free line provides access to a quit coach and access to free supports from trained professionals are available at the provincial level as well.²⁰⁶ Health Canada has also developed smoking cessation clinical practice guidelines for numerous diverse populations, including:²⁰⁷

- Indigenous Peoples
- Hospital-based populations
- People with mental health conditions and other addictions
- People who are pregnant and breastfeeding
- Youth (children and adolescents)
- General population-level approaches

SMOKING CESSATION PROGRAMS IN ONTARIO

Ontario offers many types of support for quit attempts, along with targeted approaches for certain populations, including:²⁰⁸⁻²¹⁰

- Individual counselling options through a family physician
- Ontario Pharmacy Smoking Cessation Program (restricted to beneficiaries of the Ontario Drug Benefit program)
- Health 811 for supports in quitting smoking
- Canadian Cancer Society's Smoker's Helpline
- Break it Off, a free mobile app for youth and adolescents
- Centre for Addiction and Mental Health nicotine clinics and treatment programs
- University Health Network (Princess Margaret Cancer Centre, Toronto General Hospital, Toronto Western Hospital) Smoking Cessation Program
- Lakehead University Smoking Cessation Program
- University of Ottawa Heart Institute Smoking Cessation Program
- Indigenous Tobacco Program

INDICATOR FINDINGS: QUIT ATTEMPTS

This indicator measures the percentage of adults age 25 and older who reported current daily or occasional smoking or smoking in the past month and smoking over 100 cigarettes in their lifetimes, and who reported making one or more serious attempts to quit smoking in the past 12 months. A "serious

attempt” is classified as quitting for at least 24 hours. This indicator includes 2022 data from the Centre for Addiction and Mental Health, prepared by Public Health Ontario.

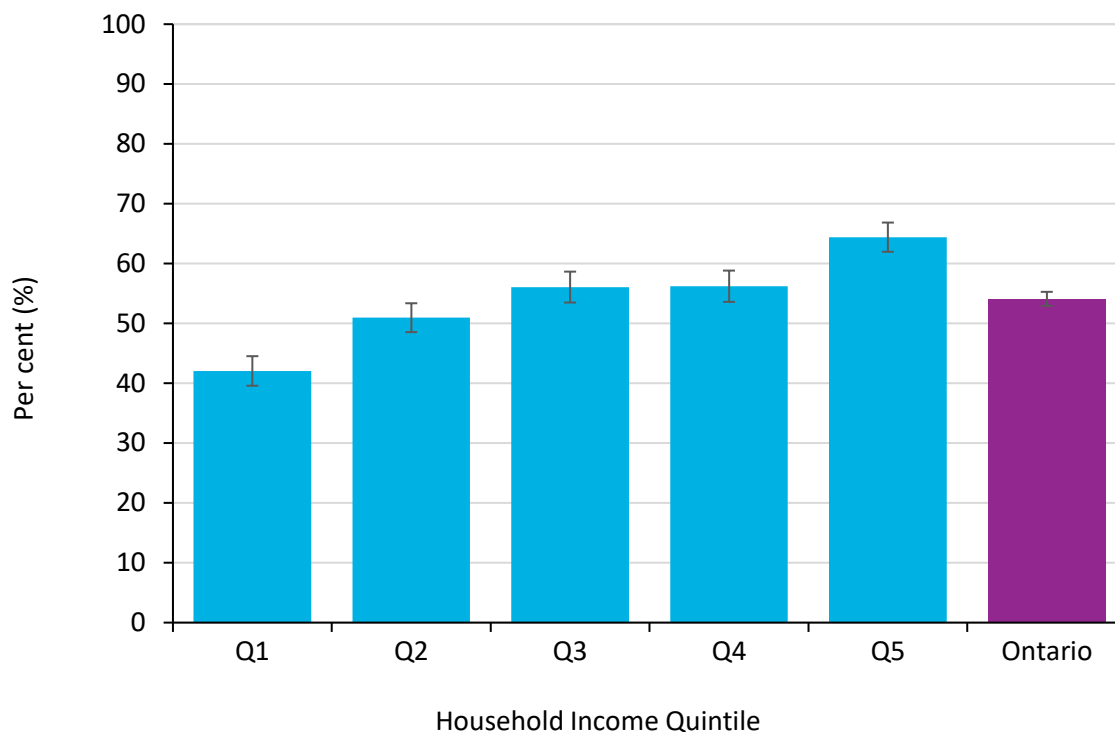
- In 2022, 47.8 per cent of adults in Ontario who smoke made one or more serious attempts to quit smoking in the past 12 months (Supplementary Table S11). Additional analyses by age, sex, income, rural or urban residence, immigration status and racial group are available in Supplementary Table S11.

INDICATOR FINDINGS: LONG-TERM SMOKING CESSATION

This indicator, also known as the quit ratio, measures the percentage of adults age 20 and older reporting past daily or occasional smoking, who stopped smoking completely at least one year ago. It combines Canadian Community Health Survey data for the 2017 to 2020 survey years.

- From 2017 to 2020, 54.1 per cent of adults in Ontario age 20 and over who reported past daily or occasional smoking reported that they stopped smoking at least one year ago (Supplementary Table S12).
- Adults in lower income households were less likely to report long-term smoking cessation (Figure 3, Supplementary Table S12).
- An analysis by public health unit showed that the prevalence of long-term smoking cessation was as low as 46.9 per cent and as high as 62.8 per cent in different parts of Ontario (Figure 4, Supplementary Table S13).

Figure 3: Percentage of adults (age 20 and older) reporting past daily or occasional smoking who stopped smoking completely at least 1 year ago, by household income quintile, Ontario, 2017–2020 combined



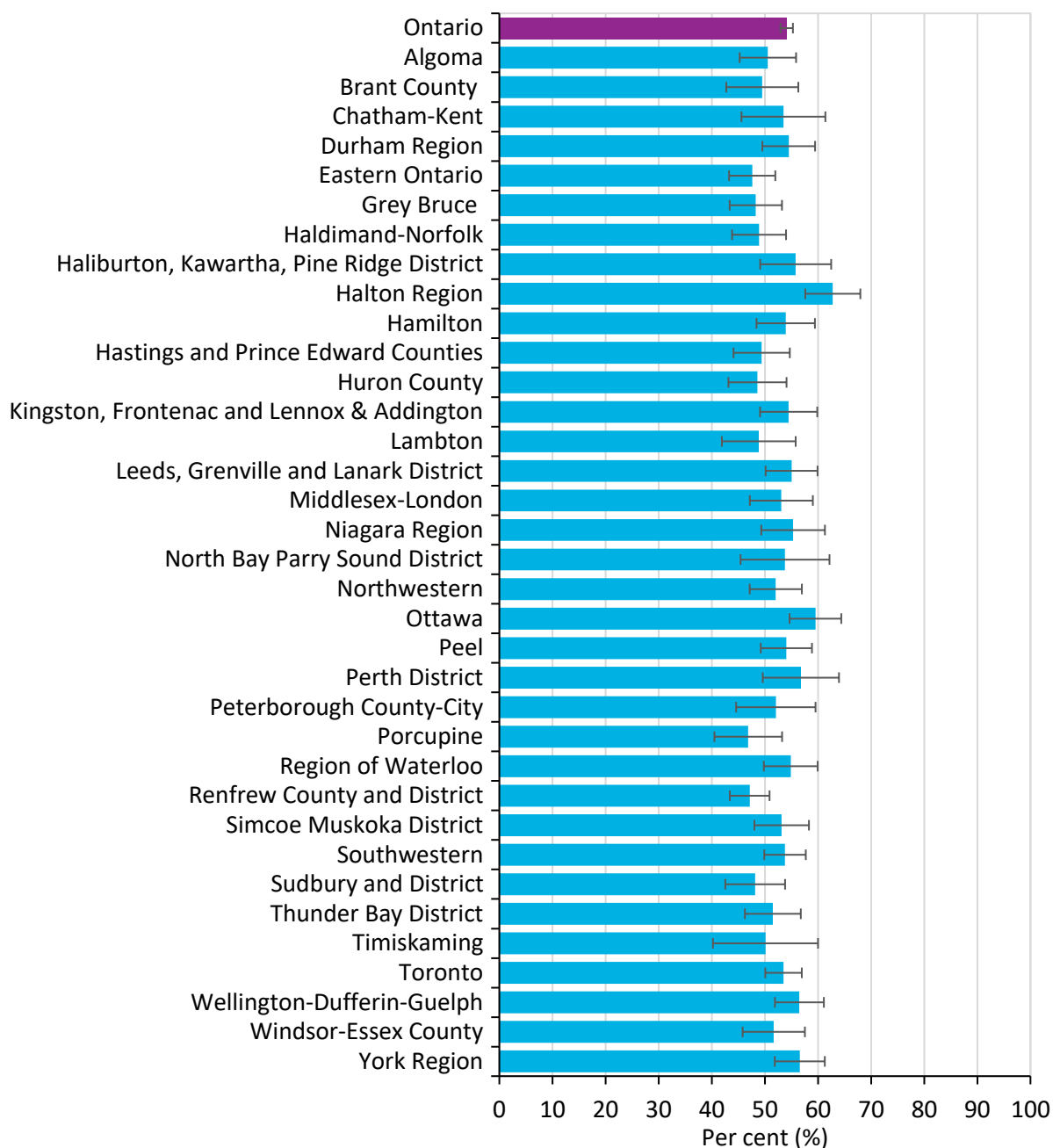
Source:

Canadian Community Health Survey, 2017–2020 (Statistics Canada).

Notes:

I—I represents 95% confidence intervals. “Q1” represents the lowest household income quintile and “Q5” represents the highest. Data are presented in Supplementary Table S12. Download supplementary tables at ontariohealth.ca/psqi. Estimates are adjusted to the age distribution of the 2011 Canadian population.

Figure 4: Percentage of adults (age 20 and older) reporting past daily or occasional smoking who stopped smoking completely at least 1 year ago, by public health unit, Ontario, 2017–2020 combined



Source: Canadian Community Health Survey, 2017–2020 (Statistics Canada).

Notes: I—I represents 95% confidence intervals. Data are presented in Supplementary Table S13. Download supplementary tables at ontariohealth.ca/psqi. Estimates are adjusted to the age distribution of the 2011 Canadian population.

Opportunities to reduce tobacco smoking and exposure to second-hand smoke

- Increase tobacco prices through taxation so that taxes make up at least 75 per cent of the retail price.
- Implement policies that reduce the availability of tobacco retail in Ontario.
- Implement policies that reduce the density and proximity of tobacco retailers.
- Increase the number of social and other multi-unit housing properties that have smoke-free policies.
- Expand funding for smoking cessation programs to ensure free access to counselling supports and pharmacotherapy, especially for equity-deserving populations.



Alcohol

Alcohol and chronic disease risk

Evidence supports an association between drinking alcohol and chronic disease risk.^{211,212} Alcoholic beverages are classified as carcinogenic by the International Agency for Research on Cancer, and consumption even at low intakes increases the risk of developing cancers of the oral cavity, pharynx, larynx, esophagus, colorectum, liver and female breast.^{143,213-216} Evidence also suggests that alcohol consumption is a risk factor for cardiovascular disease including hypertension, cardiomyopathy, atrial fibrillation and stroke; however, the relationship is complex and differs according to the amount of alcohol consumed.²¹⁷ Recent research has demonstrated that any level of alcohol consumption is harmful for overall health,²¹⁷⁻²²⁰ challenging earlier findings of protective effects for cardiovascular disease and diabetes with low-level alcohol intake.^{151,221-225}

The 2023 *Canada's Guidance on Alcohol and Health* by the Canadian Centre on Substance Use and Addiction states that any consumption of alcohol is associated with risk and should be minimized.²²⁶ In healthy individuals, a harm-reduction approach states that two standard drinks or less per week will result in low to negligible risk of alcohol-related harms, and this risk increases to moderate and beyond for people having three or more drinks per week.²²⁶

Alcohol drinking in Ontario

In an average year in Ontario, 4.3 per cent of deaths, 3.7 per cent of emergency department visits, and 2.1 per cent of hospitalizations from all causes are attributable to alcohol consumption.¹⁵¹ Data suggests that the burden of alcohol-related harms is higher in people with lower income, even though their consumption levels are lower.^{227,228} For example, people in the lowest neighbourhood income quintile had more than double the rate of emergency department visits due to alcohol compared to people in the highest income quintile.^{227,228}

In 2020, the overall costs in Ontario associated with alcohol use were the highest at \$7.1 billion compared to other recreational substances including tobacco (\$4.1 billion) and opioids (\$2.7 billion).^{226,229}

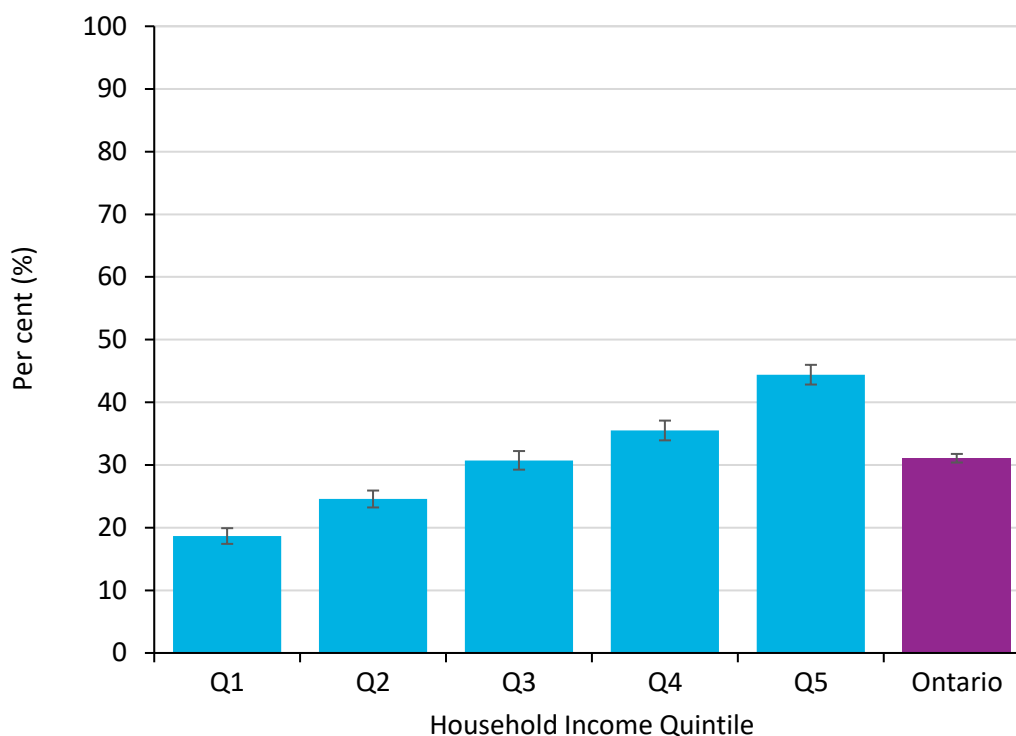
Indicator findings: alcohol drinking in adults

This indicator measures the percentage of adults age 19 and older who reported drinking more than two alcoholic drinks in the past week. It combines Canadian Community Health Survey data for the 2017 to 2020 survey years.

- From 2017 to 2020, 31.1 per cent of adults age 19 and older reported drinking more than two alcoholic drinks in the past week, thereby exceeding the low-risk threshold for alcohol-related harms as per CCSA's *Canada's Guidance on Alcohol and Health* (Supplementary Table S14).
- Men (37.7 per cent) were more likely than women (24.8 per cent) to exceed the alcohol drinking guidelines, as well as people living in rural areas (37.1 per cent) compared to people living in urban areas (30.5 per cent) (Supplementary Table S14).
- People in the highest household income quintile were more likely to exceed the alcohol drinking guidelines than people in all other household income quintiles (Figure 5, Supplementary Table S14).

- Alcohol drinking also differed by racial group and immigration status (Supplementary Table S14).

Figure 5: Percentage of adults (age 19 and older) reporting drinking more than 2 alcoholic drinks in the past week, by household income quintile, Ontario, 2017–2020 combined



Source: Canadian Community Health Survey, 2017–2020 (Statistics Canada).

Notes: I—I represents 95% confidence intervals. “Q1” represents the lowest household income quintile and “Q5” represents the highest. Data are presented in Supplementary Table S14. Download supplementary tables at ontariohealth.ca/psqi. Estimates are adjusted to the age distribution of the 2011 Canadian population.

The prevalence of alcohol drinking is subject to the limitations of self-reported data, as are the other indicators presented in this report that rely on data from the Canadian Community Health Survey, and is likely underreported.²³⁰ While the findings in this report showed that people in the highest household income quintile were more likely to exceed the alcohol drinking guidelines than those in lower household income quintiles, studies have found that individuals with low socioeconomic status (SES) experience disproportionately more alcohol-attributable harm than those with higher SES, despite similar or lower levels alcohol use.²³¹

Since the start of the COVID-19 pandemic, alcohol drinking behaviours may have shifted in Ontario.²³² Statistics Canada’s National Canadian Perspectives Survey Series reported in March 2021 that there was an increase in binge drinking (defined as five or more drinks per occasion), with Ontario reporting a 30 per cent increase—the highest of all provinces.^{232,233} Similar findings were reported by the CCSA from their May 2020 poll, which found that nearly 10 per cent of Canadians reported drinking more often in

May than in April 2020.²³⁴ Reasons for the increased drinking were reported due to lack of a regular schedule, boredom and stress.²³⁴

Policies and programs to reduce alcohol drinking

The World Health Organization's Global Alcohol Action Plan 2022–2030 highlights reducing the harmful use of alcohol as a public health priority.^{235,236} The most cost-effective alcohol policy options include those related to alcohol pricing (e.g., increasing taxes on alcoholic drinks), alcohol availability (e.g. restricting the physical availability of alcohol retail) and enforcing bans on alcohol advertising across various media.^{235,237,238} Due to the impact of heavy drinking on gender-based violence and in strengthening existing inequities, reducing global alcohol consumption also aligns with several of the United Nation's 2030 Sustainable Development Goals on ending poverty, achieving gender equality and promoting peace and justice.^{235,238-241}

Alcohol pricing

EVIDENCE FOR INCREASING THE PRICE OF ALCOHOL

A 2020 Canadian study found that alcohol excise taxes adjusted for inflation are more effective than taxes per volume alone in reducing alcohol-related deaths and hospitalizations.²⁴² Minimum unit pricing is linked to alcohol strength (percentage of alcohol) which is higher for stronger drink products.²⁴² Modelling that includes additional measures such as minimum unit pricing (e.g. \$1.75 per standard drink) was shown to reduce alcohol-related harms while increasing federal revenues.²⁴² Minimum pricing policies are in place in 10 out of 13 provinces in Canada; however, these are not as effective as minimum unit price policies that adjust for inflation.²⁴²

ALCOHOL PRICING IN ONTARIO

In 2021, Ontario reduced wholesale alcohol prices to support businesses that were impacted by the COVID-19 pandemic, including restaurants and bars.²⁴³ This change allowed businesses that serve alcohol to save 20 per cent more compared to retail prices.²⁴³ This also means the price of spirits consumed at licensed establishments is now reduced.²⁴³ In addition, the basic beer tax increase that was scheduled for March 1, 2022 was delayed to 2023 to support beer brewers.²⁴³

INDICATOR FINDINGS: MINIMUM PRICE OF ALCOHOL

The minimum unit price indicator provides data from the Liquor Control Board of Ontario (LCBO) for almost a decade (2013 to 2022). The indicator shows that the cost of beer, especially beer that is less than six per cent alcohol by volume, is significantly below the recommended minimum price to reduce population-level alcohol consumption.

- Based on the prices set by the LCBO on March 1, 2022, the minimum prices for alcohol (per standard drink) sold in retail stores off-premises in Ontario ranged from \$1.06 (e.g. beer that was five per cent alcohol by volume) to \$1.63 (e.g. spirits that were 40 per cent alcohol by volume) (Supplementary Table S15).
- No type of alcohol product (beer, wine, spirits) met the World Health Organization's recommended minimum unit price of \$1.97 per standard drink (17.05 milliliters of alcohol) in 2022 dollars.
- The gap between the recommended minimum price and the actual retail price per standard drink increased since 2013, with the largest difference occurring in 2022, which means, alcohol prices are increasingly lower than the what the World Health Organization recommends.

Alcohol availability

EVIDENCE FOR LIMITING ALCOHOL AVAILABILITY

Evidence finds higher alcohol consumption with higher availability of alcohol retail outlets.²⁴⁴ A 2022 study demonstrated that higher alcohol retail density in an area was associated with higher alcohol consumption, and the number of drinks consumed per day were reduced the farther someone lived from retail outlets.²⁴⁴ Effective regulations at reducing alcohol consumption should include better licensing of on-premise (bars and restaurants) and off-premise (liquor stores and grocery stores) alcohol sales and time limits for alcohol retail sales.²⁴⁵

During the COVID-19 pandemic, several regulations in Ontario have been amended to increase the availability of alcohol, including enabling liquor takeout and delivery with food from liquor licensed establishments, allowing liquor sale and service on docked boats, reducing minimum liquor delivery fees and extending retail hours of sale to authorized grocery and alcohol stores.²⁴⁶ Researchers found alcohol sales increased by more than \$250 million in the first quarter of the COVID-19 pandemic compared to the same period pre-pandemic.²⁴⁷ In fact, 2021 saw the largest increase in annual alcohol sales in over a decade.²⁴⁸

INDICATOR FINDINGS: PRIVATE ALCOHOL RETAIL STORES

This indicator measures the percentage of alcohol retail stores (i.e., off-premises alcohol outlets, which are stores where customers purchase alcohol to consume elsewhere) that are privately owned in Ontario, by public health unit. It includes 2022 data from various sources.

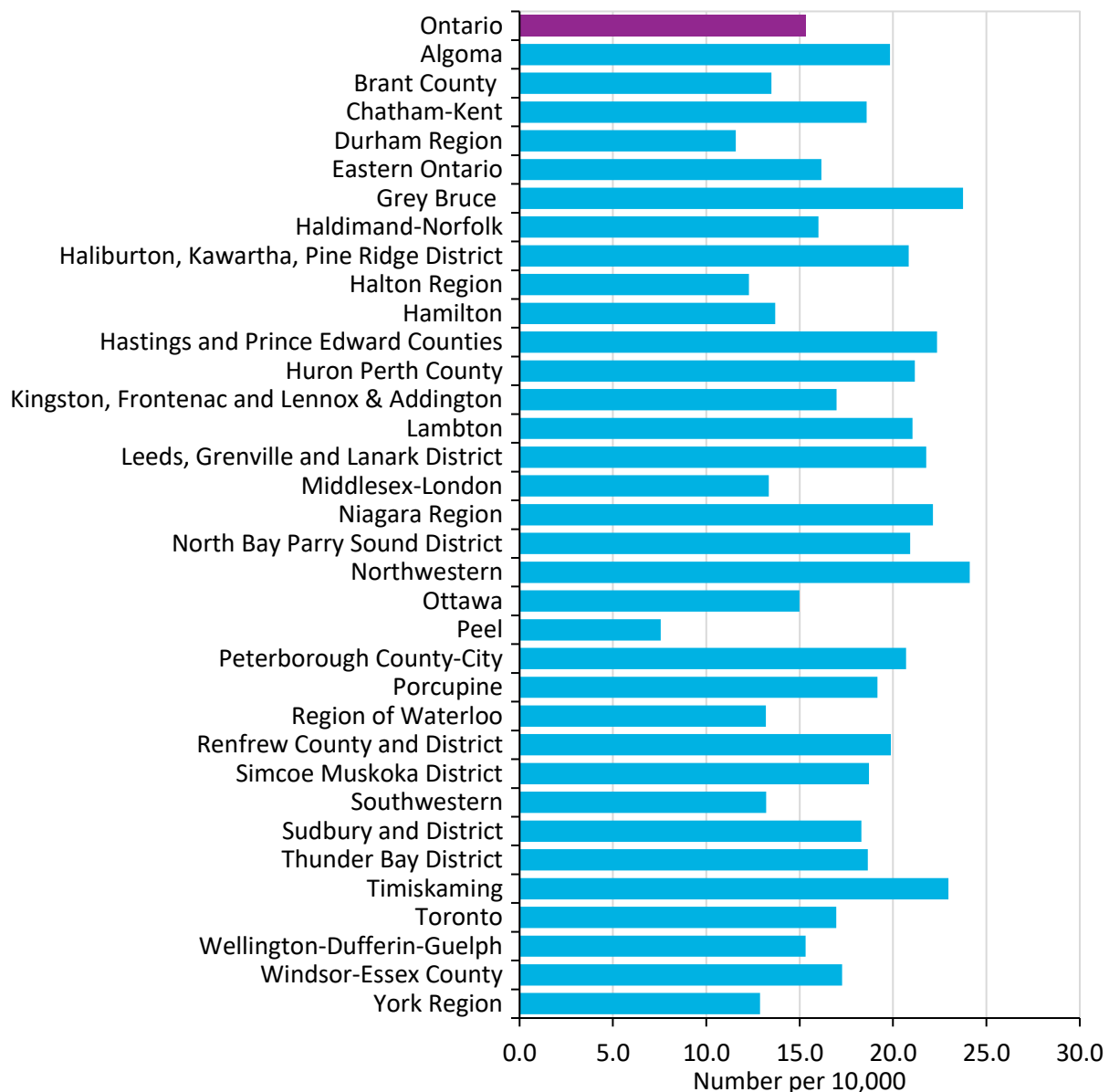
- In 2022, 74.7 per cent of alcohol retail stores in Ontario were privately owned (Supplementary Table S16), which is 4.6 per cent less than in 2019 (79.3 per cent privately owned, from Prevention System Quality Index 2020 data) and 1.2 per cent less than in 2015 (75.9 per cent privately owned, from Prevention System Quality Index 2016 data).
- An analysis by public health unit showed that the percentage of privately-owned alcohol retail stores was as low as 46.2 per cent and as high as 83.1 per cent in different parts of Ontario (Supplementary Table S16).

INDICATOR FINDINGS: ALCOHOL OUTLET DENSITY

This indicator measures the number of on- and off-premises alcohol outlets per 10,000 population (age 15 and older) in Ontario, by public health unit. It includes 2022 data from various sources.

- In 2022, the total density of alcohol outlets (on- and off-premises) in Ontario was 15.3 per 10,000 population (age 15 and older) (Figure 6, Supplementary Table S17). An analysis by public health unit showed that alcohol outlet density was as low as 7.6 per 10,000 population and as high as 24.1 per 10,000 population in different parts of Ontario (Figure 6, Supplementary Table S17).
- The density of on-premises alcohol outlets (i.e., locations where customers purchase alcohol to consume on-site, such as restaurants and bars) in Ontario was 13.2 per 10,000 population (age 15 and older) (Supplementary Table S17).
- The density of off-premises alcohol outlets (i.e., retail stores where customers purchase alcohol to consume elsewhere, such as the LCBO) in Ontario was 2.1 per 10,000 population (age 15 and older) (Supplementary Table S17).

Figure 6: Total number of alcohol outlets per 10,000 people (age 15 and older), by public health unit, Ontario, 2022



Sources: The Beer Store, Alcohol and Gaming Commission of Ontario, Liquor Control Board of Ontario. Population estimates, Ministry of Finance, 2022 (Statistics Canada).

Notes: The total number of alcohol outlets is the sum of the number of on-premises and off-premises alcohol outlets. On-premises alcohol outlets refer to establishments where customers buy alcohol to consume on site (e.g., restaurants and bars). Off-premises alcohol outlets refer to stores where customers buy alcohol to consume elsewhere. Data are presented in Supplementary Table S17. Download supplementary tables at ontariohealth.ca/psqi.

Alcohol marketing, promotion and advertising

EVIDENCE FOR REGULATING ALCOHOL MARKETING, PROMOTION AND ADVERTISING

Alcohol companies often use sophisticated online marketing to target young adults and heavy drinkers.²⁴⁹ In their *Reducing the Harm from Alcohol by Regulating Cross-border Alcohol Marketing 2022* report, the World Health Organization discusses the concerns of digital marketing and how regulations will need to align globally to address a transnational audiences.²⁴⁹ Evidence suggests that alcohol companies that successfully market products to youth might promote alcohol drinking behaviours.²⁵⁰

Advertising alcohol to minors in Ontario is prohibited on traditional media outlets such as television, radio and print; however, online social media platforms are relatively new outlets where alcohol-related advertising might not be as well controlled.²⁵⁰ Sweden and Finland have banned alcohol advertising on social media platforms and enforce this regulation through active monitoring.²⁴⁹⁻²⁵¹ Both of these countries have subsequently found a reduction in underage drinking compared to the rest of Europe.²⁴⁹⁻²⁵¹ Alcohol advertising, coupled with greater availability at a reduced price, might increase ease of access for youth and young adults who are at a greater risk of suffering negative consequences through alcohol consumption.^{250,252,253}

EVIDENCE FOR ALCOHOL LABELLING

Another tool against alcohol marketing and promotion includes alcohol label warnings.²⁵⁴ These strategies are effective when used in tandem with other regulations on alcohol marketing.^{249,254} A 2022 rapid review of alcohol labelling found that warnings of alcohol-related health risks, such as risk of developing cancer, increases user awareness of the harms of alcohol and might reduce intention to overconsume.²⁵⁵ In the Yukon territory, alcohol labelling with warnings of breast and colon cancer were piloted in,^{254,256} however, threats of litigation by alcohol companies resulted in the pilot being cancelled after four weeks.²⁵⁴ Nevertheless, researchers were still able to determine that increased awareness of alcohol as a carcinogen reduced consumption and made consumers more supportive of other policy measures to reduce alcohol consumption.^{255,257,258}

Treating moderate-risk and high-risk alcohol drinking

EVIDENCE FOR TREATING MODERATE RISK AND HIGH-RISK ALCOHOL DRINKING

As reported by the Canadian Institute for Health Information, hospitalizations due to alcohol increased during the COVID-19 pandemic in Ontario.²⁵⁹ A 2021 study found that hospital emergency department visits due to alcohol were more prevalent among people living in rural areas and low-income neighbourhoods.²⁶⁰

Alcohol use disorder can place a great burden on the healthcare system because it has detrimental effects on physical, social and economic well-being.²⁶¹ In January 2021, the federal Minister of Health announced funding for developing the first *National Guideline for the Clinical Management of High-Risk Drinking and Alcohol Use Disorder*.²⁶² This evidence-based guideline will allow healthcare professionals to identify and treat harmful drinking along with resources tailored to specific populations, such as pregnant and Indigenous people.²⁶² Systematic screening for problematic alcohol use should reach at-risk populations in addition to people experiencing alcohol use disorder.^{261,263} Moreover, medications used to treat alcohol use disorder are often paid for out-of-pocket or through private insurance plans, which may pose barriers for people with lower incomes.²⁶³ System-level policies should ensure public funding of medications such as naltrexone and acamprosate, which are effective tools for treating severe alcohol use disorder.²⁶³ Other effective interventions for improving the treatment of alcohol use disorder include increasing access to counselling alongside drug treatment, immediate triaging to alcohol programs and addressing the social determinants of health.²⁶³

TREATING MODERATE RISK AND HIGH-RISK ALCOHOL DRINKING IN ONTARIO

In 2018, approximately 17.6 per cent of people older than age 12 in Ontario reported heavy alcohol consumption at least once a month in that year.^{261,264} There was a slight decrease in reporting of heavy drinking in 2020, where 15 per cent of people above age 12 reported consuming four or more drinks for females and five or more drinks for males per occasion at least once a month in the past year.²⁶⁵ Although data in Ontario are lacking for youth ages 12 to 17, Statistics Canada numbers suggest a slight increase in heavy drinking among youth ages 12 to 17 and young adults (ages 18 to 34) from 2020 to 2021.^{264,265} Often people with alcohol use disorder have experienced childhood trauma or comorbid mental health issues.^{261,266,267} To address these mental health issues, Ontario is building a new mental health and addictions system called the *Roadmap to Wellness* that will help to coordinate services and provide long-term management and support.^{261,267}

Opportunities to reduce alcohol-related harms

- Increase minimum unit pricing for alcohol to align with the World Health Organization's recommendations.
- Support policies that reduce alcohol availability, including examining regulations relaxed during the pandemic.
- Support and enforce alcohol regulations on social media platforms that promote alcoholic products to youth.
- Support mandated and enhanced alcohol warning labels on products to increase consumer awareness and minimize overconsumption.
- Reduce barriers to medications addressing alcohol use disorder.



Healthy eating

Foods and chronic disease risk

Healthy eating is associated with a decreased risk of developing chronic diseases:

- Consumption of whole grains, low fat dairy products and foods high in dietary fibre likely lowers the risk of developing colorectal cancer^{268,269}, while diets high in processed or red meats have been found to increase its risk.²⁶⁹
- Non-starchy vegetables and fruit likely reduce the risk of upper respiratory and digestive tract cancers.²⁷⁰
- Diets high in fruit, vegetables and whole grains reduce the risk of developing cardiometabolic diseases.²⁷¹ Additionally, reducing salt intake can contribute to a 20 per cent risk reduction of stroke and heart disease.²⁷²
- Low fat dairy consumption can decrease the risk of type 2 diabetes, while sugar sweetened drinks can increase its risk.²⁷³⁻²⁷⁶
- Higher intakes of vegetables, fruits and dietary fiber are associated with a decreased risk of developing chronic obstructive pulmonary disease, while consumption of processed and red meats, desserts, and refined grains may increase risk.²⁷⁷⁻²⁸⁰

Healthy eating recommendations

Canada's 2019 Food Guide and the World Cancer Research Fund emphasize the following healthy eating guidelines:

- Choose foods that have whole grains, beans and legumes most often.^{281,282}
- Eat five servings of a variety of non-starchy fruits and vegetables every day.²⁸²
- Reduce red meat consumption to three portions per week.^{281,283}
- Choose more healthy unsaturated fats from foods such as nuts, seeds, avocados and fatty fish.²⁸¹
- Limit sugar sweetened drinks and instead drink water or unsweetened drinks.^{281,284}
- Reduce intake of processed foods high in fat, starches, and added sugars.^{281,285}

The PSQI 2020 report included an examination of healthy food procurement and community food programs; however due to limited new information in this area, this content has not been included in the 2023 report.

Healthy eating in Ontario

Indicator findings: healthy eating in Ontario

This indicator measures the percentage of adults (age 18 and older) and adolescents (ages 12 to 17) reporting eating fruits and vegetables fewer than five times per day. It combines Canadian Community Health Survey data for the 2015 to 2017 survey years.

- From 2015 to 2017, 77.1 per cent of adults age 18 and older in Ontario reported that they ate fruits and vegetables fewer than five times a day (Supplementary Table S18).
 - More adults in the lowest household income quintile in Ontario (82.0 per cent) reported inadequate fruit and vegetable consumption than adults in the highest household income quintile (74.7 per cent) (Supplementary Table S18).

- More men (83.0 per cent) also reported inadequate fruit and vegetable consumption than women (71.5 per cent) (Supplementary Table S18).
- From 2015 to 2017, 79.4 per cent of adolescents ages 12 to 17 in Ontario reported eating fruits and vegetables fewer than five times a day (Supplementary Table S19).
 - Similar to adults, more adolescents in the lowest household income quintile in Ontario (82.7 per cent) reported inadequate fruit and vegetable consumption than those in the highest income quintile (72.8 per cent) (Supplementary Table S19).

The COVID-19 pandemic has likely had an impact on dietary patterns of households in Ontario. One study found that from April 24, 2020, to July 13, 2020, the prevalence of adults in Ontario who reported consuming five or more servings of fruits and vegetables decreased from pre-pandemic reported data.²⁸⁶ Another Ontario study completed from May to August 2020 found that 54 per cent of respondents reported that their dietary patterns had changed, the most common being an increase in sweet and/or salty snack intake.²⁸⁷

In Ontario, unhealthy eating accounts for an estimated \$1.9 billion in direct healthcare costs annually, and \$3.7 billion in indirect costs, totaling to \$5.6 billion.¹⁵⁰ Of the total economic burden, \$1.8 billion can be attributed to inadequate fruit and vegetable consumption (\$584 million in direct costs and \$1.2 billion in indirect costs).¹⁵⁰

People in Ontario who experience food insecurity face multiple barriers to healthy eating, which were explored in the ‘Social determinants of health’ section of this report.

Policies and programs to improve healthy eating

The Ontario Food and Nutrition Strategy, developed by multi-sectoral partners, remains a relevant guide on promoting healthy food access, healthy food systems, and improving food literacy in the province.²⁸⁸ The policies in this report will focus on recommendations from the strategy related to food literacy and food environment.

Food literacy

EVIDENCE FOR INCREASING FOOD LITERACY

A number of connected factors shape food literacy, which includes knowledge of different foods and nutrition, the ability to make healthy food choices, the ability to prepare food (i.e., food skills) and the confidence to purchase and prepare food.²⁸⁹ Greater food literacy can promote better decision-making in choosing nutritious food options and a recent systematic review found that hands-on learning skills (including cooking, taste-testing and gardening) helped to improve healthy eating outcomes among children.^{290,291} Increasing food literacy has gained wide support in Canada with more initiatives like implementing front-of-package food labels to easily identify unhealthy options.²⁹² There is also some evidence that Canadians might have become more food literate during the pandemic, which may be a result of some adults having more time for cooking and gardening.²⁹³

FOOD LITERACY PROGRAMS IN ONTARIO

In October 2020, Bill 216, the *Food Literacy for Students Act* passed second reading.²⁹⁴ This bill aims to amend the *Education Act* to include experiential food literacy and healthy eating as part of the school curriculum for Ontario students in Grades 1 to 12.²⁹⁴ It has yet to pass final reading and the vote to become law. In addition, Ontario’s Ministry of Education updated the September 2022 curriculum for Grades 1 to 8 to include information on agriculture, climate change and biodiversity within food

systems.²⁹⁵ For people in Ontario of all ages, there are food literacy programs offered through local public health agencies, community health centres and community-based organizations.²⁹⁶

INDICATOR FINDINGS: FOOD LITERACY DEVELOPMENT IN SECONDARY SCHOOLS

- During their secondary school education in Ontario, less than a third of students who started Grade 9 in each of the school years from 2013/14 to 2016/17 earned one or more credits in courses that include a food literacy component (Supplementary Table S20).
- The proportion of students that earned one or more credits was similar among each of the four cohorts of students who started Grade 9 from 2013/14 to 2016/17 (Supplementary Table S20).
- None of the courses considered for this indicator are required, and they may not be offered at every school.

Food environment

The consumer food environment influences what people eat.²⁹⁷ Some policies that can improve the food environment include:

- Increasing the availability of healthy food retail stores and services;^{297,298}
- Improving healthy eating prompts through mandatory nutrition labelling standards and restricting food advertising;²⁹⁹ and
- Improving the affordability of food by using tools that influence prices, such as taxes and subsidies.^{288,297-299}

EVIDENCE FOR INCREASING HEALTHY FOOD AVAILABILITY AND CURRENT POLICIES

Healthy food stores

Research shows that poor access to healthy foods in our built environment can contribute to poorer diet quality which worsens chronic disease outcomes.^{300,301} A new dataset has been developed by Statistics Canada to identify urban neighbourhood retail food environments.³⁰¹ This dataset will help identify neighbourhoods with poor access to healthy food stores and help to target interventions in areas with less healthy options.³⁰¹ One of the limitations of these food environment indicators is they are only useful in urban areas.³⁰² More information needs to be collected about rural and remote northern communities, which often suffer much higher rates of diet-related chronic diseases.^{303,304} In addition, Ontario does not have any financial incentives or zoning policies that influence the location of supermarkets and fast food restaurants. These types of policies could increase healthy food stores in neighbourhoods.²⁹⁸

EVIDENCE FOR SHIFTING ENVIRONMENTAL CUES AND CURRENT POLICIES

Menu and food labelling

Health Canada's 2021 commitment to its healthy eating strategy includes improving the food environment to make the healthier choice, the easier choice for consumers.²⁹² The strategies includes initiatives to increase adherence to Canada's latest Food Guide by helping consumers easily identify foods high in sugars, sodium and saturated fats.²⁹² In July 2022, new regulations required manufacturers to add front-of-package nutrition labelling by January 1, 2026, to better inform consumers about the food they are buying.²⁹²

Food and beverage advertising

Studies have demonstrated an association between exposure to unhealthy food and beverage marketing to children and poor dietary intake.³⁰⁵ The majority of this food marketing exposure happens through television, digital media, product packaging and in schools and other places children congregate (e.g., sports centre, recreation centres).³⁰⁵ The vast majority (over 80 per cent) of advertisements to

adolescents living in Ontario promote unhealthy foods (i.e., foods that are nutrient poor and energy dense).³⁰⁵⁻³⁰⁷ To mitigate this influence, Health Canada has proposed new plans to restrict advertising to children under the age of 13 for food products high in sugar, salt and saturated fats.³⁰⁸ Health Canada is working to advance these plans, including stakeholder engagement in 2023.³⁰⁸ There are currently no restrictions on food and beverage advertising in Ontario.

Evidence for using economic tools and current policies

Sugar-sweetened beverages are a major source of sugar in the Canadian diet and higher intakes are found for those experiencing low income or food insecurity.^{309,310} Data from 2015 on sugar-sweetened beverage consumption projected an increase in prevalence of the following diseases over the next 25 years in Canada if consumption is not reduced: type 2 diabetes, cancer, heart disease, chronic kidney disease and stroke.³¹⁰ However, a 20 per cent tax on sugar-sweetened beverages, as recommended by the World Health Organization, is estimated to reduce intake by approximately 20 per cent and prevent 449,732 cases of obesity in Canada.^{310,311} In September, 2022, Newfoundland and Labrador became the first province in Canada to tax sugar-sweetened beverages.³¹² The policy introduced a tax of 20 cents per litre on sugar-sweetened beverages including sweetened fruit juice.³¹² There are currently no taxation policies on sugar-sweetened beverages in Ontario.

Opportunities to increase healthy eating

- Implement tax incentives and re-zoning strategies to influence the location of supermarkets and fast-food restaurants.
- Pass Bill 216, the *Food Literacy for Students Act*.
- Modify the Ontario secondary school curriculum to require at least one credit with a food literacy component.
- Ban marketing of unhealthy food and drinks to children.
- Implement a provincial tax on sugary drinks in Ontario (e.g. WHO's recommended 20 per cent).
- Reduce food insecurity by implementing provincial poverty reduction policies, including increasing the minimum wage and income supports.



Physical activity

Physical activity and chronic disease risk

Physical inactivity is associated with the development of various cancers, cardiovascular diseases, respiratory diseases, and type 2 diabetes in a dose-response fashion, which means higher levels of physical activity are associated with lower risk.³¹³⁻³¹⁶ In particular, there is strong epidemiological evidence to suggest that being physically active decreases one's risk of developing cancers of the colon, breast, endometrium, esophagus, stomach, bladder and kidney.^{315,317} Physical inactivity is also a leading risk factor for cardiovascular disease such as coronary heart disease, stroke and hypertension.^{316,318} Furthermore, inactivity is a modifiable risk factor for type 2 diabetes and engaging in regular exercise may prevent or delay its development.^{319,320}

Physical activity recommendations

The 2020 Canadian 24-Hour Movement Guidelines recommend 150 minutes or more per week for adults and 60 minutes or more of moderate to vigorous aerobic physical activity per day for children and adolescents (ages five to 17).³²¹ In addition, muscle strengthening exercises are recommended twice a week for adults and three days a week for adolescents.³²¹ The guidelines emphasize that light activity, including standing up, is better than being sedentary.^{321,322} This is aligned with the World Health Organization's recommendation that any activity is better than none, and to gradually build up to following the national physical activity guidelines.³²³ To prevent the onset of chronic diseases, a variety of physical activity types are recommended, including moderate aerobic activity (e.g., walking, biking, dancing), strength training (e.g., free weight training, body weight) and vigorous aerobic activity (e.g., running, sports).³²⁴

The PSQI 2020 report included an examination of community programs; however due to limited new information in this area during the pandemic, community program content has not been included in the 2023 report. Expert consensus continues to recommend implementing physical activity policies in school communities that promote movement-based learning and limit sedentary homework time.³²⁵ For example, the World Health Organization's Comprehensive School Health approach focuses on promoting health and learning, engaging the school community at all levels to promote a healthy environment, and providing multiple opportunities to respect an individual's dignity.³²⁶

Physical activity in Ontario

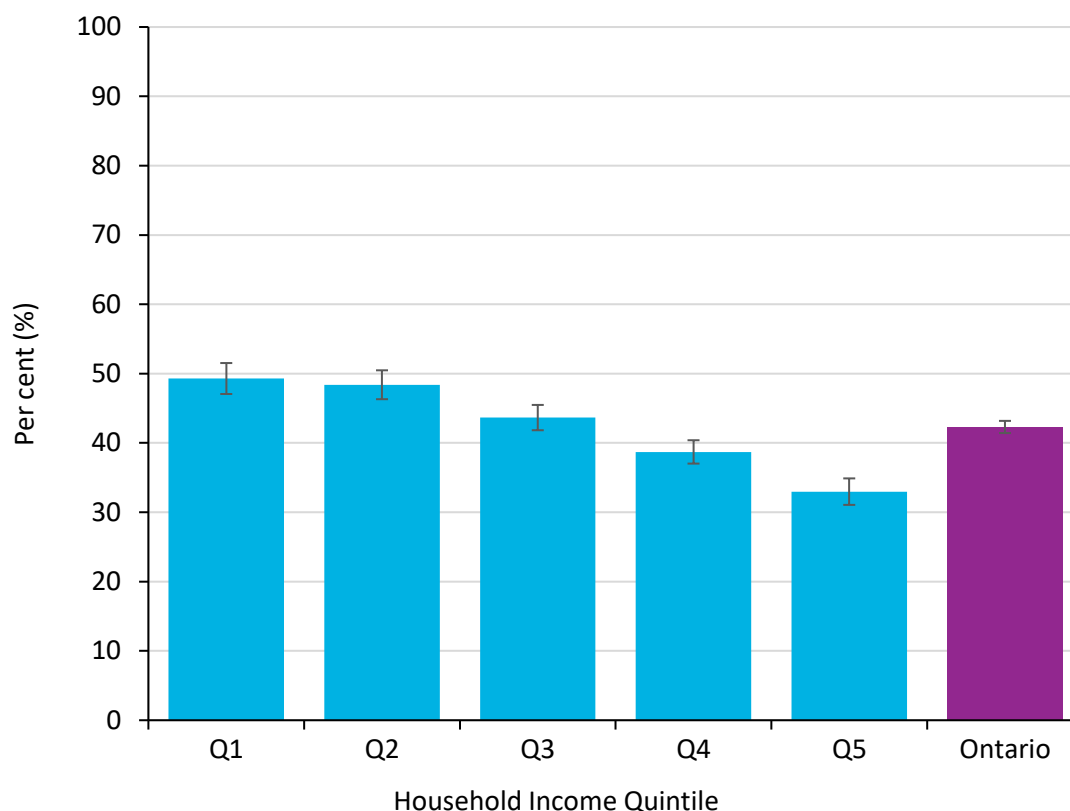
Indicator findings: physical inactivity

This indicator measures the percentage of adults (age 18 and older) and adolescents (ages 12 to 17) who reported less than the recommended level of moderate-to-vigorous physical activity. It combines Canadian Community Health Survey data for the 2016 to 2018 survey years.

- From 2016 to 2018, 42.3 per cent of adults age 18 and older in Ontario were not achieving the recommended 150 minutes of moderate-to-vigorous physical activity per week (Supplementary Table S21).

- More women (45.5 per cent) than men (38.9 per cent) reported inadequate physical activity, and people in lower income households were more likely to report physical inactivity (not meeting recommendations) (Figure 7, Supplementary Table S21).
- Physical inactivity also differed by immigration status and racial group (Supplementary Table S21).
- During the same period, 73.0 per cent of adolescents ages 12 to 17 in Ontario were not meeting the recommended 60 minutes of moderate to vigorous physical activity per day (Supplementary Table S22).
 - More adolescent females (78.3 per cent) than males (68.1 per cent) reported inadequate physical activity levels, as well as those in the lowest household income quintile compared to the highest (Supplementary Table S22).

Figure 7: Percentage of adults (age 18 and older) who reported less than the recommended level of moderate-to-vigorous physical activity, by household income quintile, Ontario, 2016–2018



Source: Canadian Community Health Survey, 2016–2018 (Statistics Canada).

Notes: I—I represents 95% confidence intervals. “Q1” represents the lowest household income quintile and “Q5” represents the highest. Data are presented in Supplementary Table S21. Download supplementary tables at ontariohealth.ca/psqi. Estimates are adjusted to the age distribution of the 2011 Canadian population.

The COVID-19 pandemic has impacted physical activity levels of adolescents (ages 12 to 17) across Canada.³²⁷ In December 2020, a 14 per cent drop was reported in a representative sample of adolescents

who met the recommended activity guidelines compared to adolescents from the 2018 Canadian Community Health Survey.³²⁷ Adolescents living in Ontario had the highest physical activity decline from 2018 to 2020 compared to Quebec, British Columbia, the Prairies and the Atlantic provinces.³²⁷ Adolescents living in urban areas reported a higher decrease in physical activity levels than their rural counterparts.³²⁷ Conversely, adults ages 18-64 had no changes in physical activity levels from 2018 to 2020.³²⁷ Since the pandemic, physical inactivity has disproportionately affected youth from certain people including people who are FNIMUI, racialized, immigrants and have disabilities.³²⁸ These populations are also at a greater risk of developing chronic diseases such as type 2 diabetes and obesity.³²⁸

The economic burden of physical inactivity in Ontario is estimated to total \$2.6 billion annually, with \$980 million in direct health care costs and \$1.65 billion in indirect costs.¹⁵⁰

Policies and programs to increase physical activity

Individual physical activity levels are related to many factors, including the surrounding built environment, the social environment and policies that impact land use.^{329,330}

Active transportation

EVIDENCE FOR INCREASING ACTIVE TRANSPORTATION

Active transportation is human-powered travel, such as walking and bicycling, to move between destinations.³³¹ People who use active transportation report higher levels of overall physical activity.³³¹⁻³³⁴ A study based on respondents to the Canadian Health Measure survey from 2007 to 2011 found that people in Canada who lived in walkable urban neighbourhoods were substantially more physically active.³³⁵ Features in the built environment that increase active transportation include schools, workplaces, stores and other destinations that are within walking or biking distance of homes; roads, sidewalks and bike lanes that connect to these destinations and that are safe and easy to navigate; and access to public transportation.^{334,336} To support active transport nationally, Canada launched and committed \$400 million in funding to a 2021 National Active Transportation Strategy.³³⁷ This new initiative will expand safe environments for active transportation to promote movement behaviours.³³⁷

INDICATOR FINDINGS: ACTIVE TRANSPORTATION USE IN ADULTS AND ADOLESCENTS

This indicator measures the percentage of adults (age 18 and older) and adolescents (ages 12 to 17) reporting that they used active transportation (e.g., walking or cycling to get to places) in the previous week. It combines Canadian Community Health Survey data for the 2016 to 2018 survey years.

- From 2016 to 2018, 48.8 per cent of adults in Ontario reported using active transportation in the previous week (Supplementary Table S23). People living in urban areas (49.8 per cent) were much more likely to report using active transportation than those in rural areas (38.6 per cent) (Supplementary Table S23).
- From 2016 to 2018, 78.5 per cent of adolescents in Ontario reported using active transportation in the past week (Supplementary Table S24). More urban-dwelling (79.6 per cent) than rural-dwelling (69.9 per cent) adolescents reported using active transportation (Supplementary Table S24).

In 2022, Ontario released four regional transportation plans (Eastern Ontario, Southwestern Ontario, Northern Ontario, and the Greater Golden Horseshoe) to improve transportation networks that will add active transportation choices and improve public transit options.³³⁸ In Eastern Ontario, plans to expand

cycling routes along highways and within regional park trails are already underway.³³⁸ In major cities such as Toronto and Ottawa, provincial regulations were enacted January 2020 for a five year pilot project that allows e-scooters on public roads.³³⁸ Though not a form of active transportation itself, a 2021 review found that e-scooters might be useful in decreasing car dependence and can complement other modes of active transportation, such as walking.³³⁹

Physical activity in schools

EVIDENCE FOR INCREASING PHYSICAL ACTIVITY IN SCHOOLS

Physical education classes offered in public schools may increase overall physical activity in children and adolescents.³⁴⁰⁻³⁴² There is an opportunity to improve physical activity literacy development in children with interventions that address physical and psychosocial factors that promote movement behaviours.³⁴¹

PHYSICAL ACTIVITY IN ONTARIO SCHOOLS

Ontario's Daily Physical Activity policy ensures that elementary school children have at least 20 minutes of moderate-to-vigorous activity during each school day.³⁴³ A 2022 study found that only 23 per cent of Ontario elementary teachers were meeting this mandate.³⁴⁴ Among the identified barriers to implementation was inadequate physical activity training.³⁴⁴ In addition, hiring physical education specialists who have training in physical activity can improve the quality of physical education classes and increase the time students spend being physically active during class time.³⁴⁵ A number of national and provincial organizations and bodies, including the Ontario Society of Physical Activity Promoters in Public Health and Ontario's Chief Medical Officer of Health, have recommended that physical education specialist deliver health and physical education in Ontario schools.^{346,347}

School closures during the pandemic disproportionately affected movement behaviours and promoted sedentary activities in children and adolescents.³⁴⁸ The 2022 ParticipACTION Report Card on Physical Activity for Children and Youth gave an overall grade of "D" for children and youth physical activity levels in Canada as only 28 per cent of children and youth met the Canadian 24-hour Movement Guidelines.³⁴⁸ Only 17.5 per cent of children met the guidelines during the peak of the pandemic and the percentage of youth meeting the guidelines decreased from 51 per cent before the pandemic to 37 per cent after.³⁴⁸ Based on the percentage of schools with active policies and programming that provide opportunities for physical activity, the 2022 ParticipACTION Report Card gave Canadian schools an overall grade of "B-", which is lower than the "B" that was received in 2016.³⁴⁸

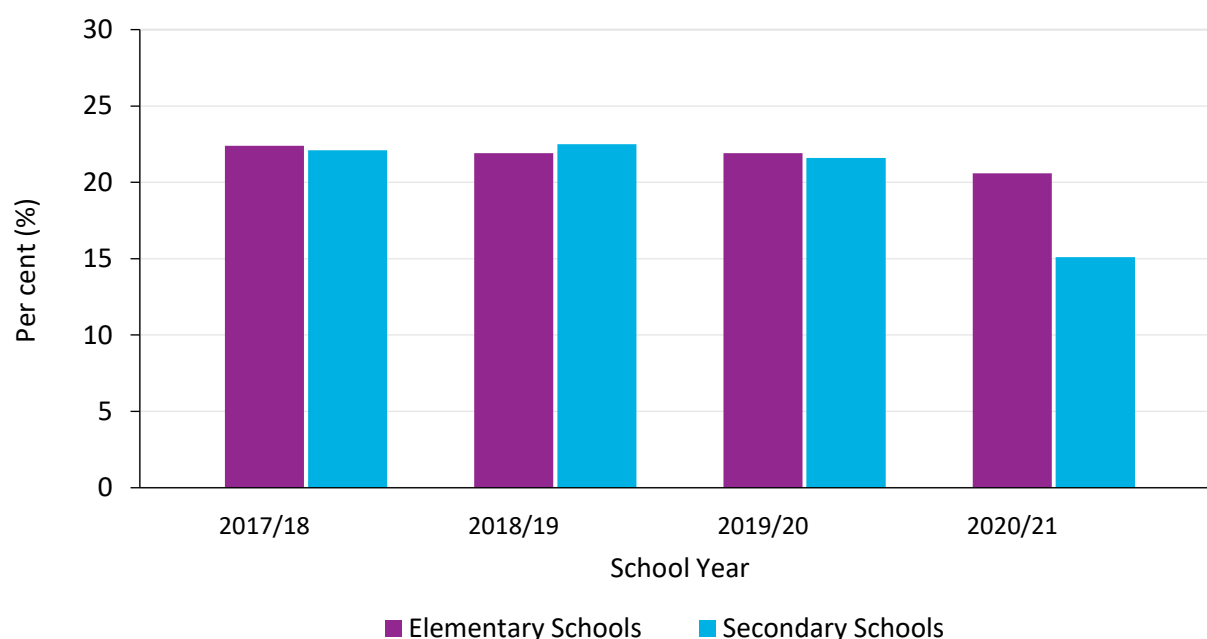
The currently available data provided a limited picture of physical activity in schools and of students. More data needs to be collected to assess physical literacy levels, especially among youth who come from communities that experience systemic discrimination.³⁴⁸

INDICATOR FINDINGS: HEALTH AND PHYSICAL EDUCATION SPECIALIST TEACHERS IN SCHOOLS

This indicator measures the percentage of publicly funded elementary and secondary schools in Ontario with at least one full- or part-time health and physical education specialist teacher from the 2017/18 to 2020/21 school years. It uses data from the Ontario School Information System.

- In the 2020/21 school year, 20.6 per cent of elementary schools and 15.1 per cent of secondary schools reported having at least one full- or part-time health and physical education specialist teacher (Figure 8, Supplementary Table S25).
- For the 2017/18 to 2020/21 school years, the percentages of secondary schools with at least one specialist teacher show a decreasing trend (Supplementary Table S25). However, the decrease is not statistically significant across the four years.
- In the 2020/21 school year, the ratio of students (in schools with a health and physical education specialist teacher) to one full-time equivalent health and physical education specialist teacher was 232 for elementary schools and 769 for secondary schools (Supplementary table S26).

Figure 8: Percentage of publicly funded elementary and secondary schools in Ontario with at least 1 full or part-time specialist teacher assigned to teach health and physical education, 2017/18 to 2020/2021



Source: Ontario School Information System, 2017/18 to 2020/21 (Ministry of Education)

Notes: Data are presented in Supplementary Table S25. Download supplementary tables at ontariohealth.ca/psqi. Full time means ≥ 1.0 full-time equivalent (FTE). Note that ≥ 1.0 FTE does not necessarily mean there are one or more full-time specialist teachers because two or more part-time specialist teachers may account for ≥ 1.0 FTE. Part time means >0 and <1.0 FTE.

INDICATOR FINDINGS: ENROLMENT IN HEALTH AND PHYSICAL EDUCATION

Physical activity has been shown to decrease throughout adolescence.³⁴⁹ Requiring a health and physical education credit in each grade could be one way to help improve physical activity levels. This indicator measures the percentage of students in publicly funded secondary schools who earned one or more health and physical education credits, by grade, in Ontario from the 2017/18 to 2020/21 school years. It uses data from the Ontario School Information System.

- In the 2020/21 school year, 84.2 per cent of Ontario students in Grade 9 earned the one mandatory health and physical education credit (Supplementary Table S27).
- Enrolment in health and physical education courses tends to decrease in higher grades. In the 2020/21 school year, 28.6 per cent of students in Grade 12 earned a health and physical education credit (Supplementary Table S27).

Opportunities to increase physical activity

- Support implementing physical activity policies in school communities (e.g., through the World Health Organization's Health Promoting Schools or Comprehensive School Health).
- Continue to develop infrastructure, policies and plans in municipalities to support active transportation.
- Increase access to health and physical education specialists in schools across the province.
- Require health and physical education credits in every grade of secondary school.
- Implement policies that make organized and informal sport and recreation activities accessible to people with low incomes.



Environmental exposures

Environmental exposures and chronic disease risk

Environmental exposures are contaminants, pollutants or hazards that people are exposed to in their daily lives. These exposures can contribute to increased risk of several chronic diseases. This section focuses on solar ultraviolet radiation, radon in indoor air, and fine particulate matter (PM_{2.5}) found in outdoor air pollution. All three exposures are classified by the International Agency for Research on Cancer as human carcinogens, with radon and PM_{2.5} being confirmed causes of lung cancer and ultraviolet radiation being a confirmed cause of skin cancer, including melanoma.³⁵⁰⁻³⁵² PM_{2.5} is also associated with chronic obstructive pulmonary disease, heart disease and type 2 diabetes.³⁵²⁻³⁵⁴ All of these pollutants have no known safe level of exposure and the risk of chronic disease increases with the level of exposure.^{350,352,355}

The PSQI 2020 report included an examination of policies and programs to reduce ultraviolet radiation exposure for children, youth and outdoor workers, as well as through tanning bed use; however, due to limited new information in this area, this content has not been included in the 2023 report.

Environmental exposures in Ontario

It has been forecasted that over 90 per cent of the environmental burden of cancer in Ontario results from exposures to solar ultraviolet radiation, PM_{2.5} and radon.³⁵⁶

Policies and programs to reduce environmental exposures

This section reports on policies and programs that can help to control exposure to solar ultraviolet radiation, radon in indoor air and fine particulate matter (PM_{2.5}) for people living in Ontario. All three exposures are harmful to people at high levels and require multi-level approaches at the city, municipal and provincial level to be effectively managed.

Ultraviolet radiation

Implementing multiple policies or programs in two or more settings (e.g., schools, child care settings) in a community, city or region can help to reduce ultraviolet radiation exposure.³⁵⁷ Interventions for reducing ultraviolet radiation exposure include establishing policies to create shade areas^{357,358} and a combination of sun safety policies and educational programs in various settings (e.g., schools, workplaces).^{357,359-361} In addition, mass media campaigns to improve sun safety knowledge, attitudes and behaviours are often part of initiatives associated with reduced ultraviolet radiation exposure.³⁵⁷

Ultraviolet radiation and chronic disease risk in Ontario

The majority of melanoma cases in Ontario are a result of ultraviolet radiation exposure, and in 2022, there were an estimated 4,724 cases of melanoma and 568 melanoma related deaths, making it the sixth most commonly diagnosed cancer and seventeenth leading cause of cancer death in Ontario.³⁶² While melanoma skin cancer is the most deadly type of skin cancer, the most common types of skin cancers are non-melanomas such as basal and squamous cell carcinomas.³⁵¹ While there are limited data for non-melanoma cancer incidence, previous estimates prediction as many as 12 times more non-melanoma than melanoma skin cancers in Ontario.³⁵⁶ Children and adolescents are especially vulnerable

to ultraviolet radiation exposure because ultraviolet radiation damage during this time leads to a higher risk for skin cancer later in life.³⁶³ In addition to solar ultraviolet radiation exposure, people are also exposed to ultraviolet radiation through artificial means such as tanning beds.³⁶³ During the COVID-19 pandemic when there were restrictions on outdoor behaviours, there was a decrease in the amount of time children and youth spent in outdoor play.³⁶⁴ While this may have had negative consequences on other health aspects of children and youth, it likely reduced their exposure to ultraviolet radiation.³⁶⁴ However, once some of the restrictions were lifted, time spent outdoors may have increased. For example, Ontario Parks reported a record number of visitors during the summer of 2020.³⁶⁵

Shade

EVIDENCE FOR INCREASING SHADE

Built structures and dense tree canopies can provide shade and protect people from ultraviolet radiation exposure, among many other healthy co-benefits (e.g., improved ecosystems, cooling air).^{358,366} Shade can protect from ultraviolet radiation exposure more reliably than sunscreen.³⁶⁶ Policies focusing on shade can help increase the availability of effective shade structures and trees in places where people spend time outdoors, such as public parks, bus stops, children's play areas and routes taken for active transportation.³⁵⁸ In addition, shade availability is often inequitably distributed, with less shade in neighbourhoods with lower socioeconomic status.³⁶⁷

Assessing the availability of shade in lower socioeconomic areas is important for evaluating the implementation of shade policies over time; however, data are not available for assessing implementation across the province. The first published study evaluating shade coverage at public playgrounds in Canada found that around two-thirds of playgrounds assessed had no shade coverage.³⁶⁸

SHADE POLICIES IN ONTARIO

Ontario's Provincial Policy Statement provides provincial direction on key land use planning issues, including protecting public health and safety.³⁶⁹ It directs municipalities to include specific features in the built environment, but does not provide direction on protection from ultraviolet radiation exposure or increasing shade.³⁶⁹ The Provincial Policy Statement is updated periodically, which provides an opportunity to promote shade and protection from ultraviolet radiation exposure.

Municipalities in Ontario have planning policy documents, such as official plans and urban design guidelines for municipally and privately owned sites. These documents must incorporate and can build upon policies found in the Provincial Policy Statement.³⁶⁹ These documents also guide the evaluation of designs for new developments and renewal projects that may contain statements on shade. Statements on shade in planning policy documents can help increase shade in new developments and renewal projects.

INDICATOR FINDINGS: SHADE POLICIES IN LOCAL MUNICIPALITIES

In this indicator, statements on shade in planning policy documents are called shade policies. This indicator examines the shade policies of local municipalities with populations of 100,000 or more (as of the 2021 census). Regional municipalities were excluded so that local municipalities were not counted more than once. As of November 2022, all 28 local municipalities in Ontario with populations of 100,000 or more included a shade policy in their planning policy documents. In the planning policy documents of those 28 local municipalities (Table 3, Supplementary Table S28):

- 4 local municipalities stated that shade should be provided for a broad range of municipally and privately owned sites (called strong shade policies). The number of municipalities with strong shade policies increased from 3 in 2018.

- 20 local municipalities did not have strong shade policies, but stated in their planning policy documents that shade should be provided for only a few types of municipally or privately owned sites (called moderate shade policies).
- 4 local municipalities stated that shade should be considered, but is not required, for 1 or more types of municipally or privately owned sites (called limited shade policies).

Periodic updates to official plans and design guidelines provide an opportunity for local municipalities in Ontario to increase the strength of their shade policies. Collaboration between public health specialists and planners may increase awareness of health concerns in planning. Supplementary Table S28 provides the detailed findings for this indicator by municipality.

Table 3: Strength of shade policies in the planning policy documents of local municipalities in Ontario with populations of 100,000 or more, 2022

Strength of shade policies	November 2022
Strong shade policies	Ajax Kingston* Kitchener Waterloo
Moderate shade policies	Barrie Burlington* Cambridge Clarington† Greater Sudbury Guelph Hamilton London Markham Milton Oakville Oshawa Ottawa Richmond Hill St. Catharines Thunder Bay Toronto Vaughan Whitby Windsor
Limited shade policies	Brampton Brantford† Chatham-Kent Mississauga
Shade policies not included	None

Sources: Municipal planning policy documents (e.g., official plans, urban design guidelines, site plan control bylaws) posted on the web or in additional documents sent by email from the municipality for each of the 28 Ontario local municipalities with populations of 100,000 or greater.

Note: The shade policies assessed and information about whether they were verified by the municipality can be found in Supplementary Table S28. Download supplementary tables at ontariohealth.ca/psqi.

*Shade policy of the municipality improved from the 2019 to 2022 reviews.

†Brantford and Clarington were added to the 2022 indicator because their populations rose over 100,000 in the 2021 census.

UV avoidance and protection

EVIDENCE FOR INCREASING UV AVOIDANCE AND PROTECTION

The national recommendations to reduce personal ultraviolet radiation exposure state that Canadians should use shade, clothing, hats, protective eyewear and sunscreen with a sun protection factor of 30 or higher to protect themselves and that they should avoid using tanning beds.³⁷⁰ To best support these behaviours in high-risk settings, there needs to be comprehensive educational programs linked with sun safety policies in childcare centres, schools, recreation centres and workplaces.³⁵⁹ These policies and programs can include reducing time outdoors during peak sun hours, ensuring access to shade in outdoor settings and teaching sun safety practices.^{359,360,371}

UV AVOIDANCE AND PROTECTION POLICIES IN ONTARIO

In Ontario, there is currently no provincial legislation mandating that schools or childcare centres have ultraviolet radiation exposure reduction policies.³⁷² Local public health agencies in Ontario are mandated to assist schools and school boards with health needs, which may include reducing ultraviolet radiation exposure if it is identified as a priority.^{198,373} The Canadian Cancer Society's SunSense program is a national sun safety program that supports elementary schools in protecting students and staff from harmful ultraviolet radiation exposure.³⁷⁴

The *Occupational Health and Safety Act* in Ontario requires employers to take reasonable safety measures to protect workers from workplace hazards.³⁷⁵ The Ministry of Labour, Immigration, Training and Skills Development identifies ultraviolet radiation as a hazard and it provides guidelines on ways to limit solar ultraviolet radiation exposure.³⁷⁵ Sun Safety at Work Canada provides resources to help small and large workplaces develop and implement sun safety programs.³⁷⁶

INDICATOR FINDINGS: SUN PROTECTION USE IN ADULTS AND ADOLESCENTS

This indicator measures the percentage of adults age 18 and older and adolescents ages 12 to 17 who reported using one or more sun protection measures. These measures included spending less than 30 minutes in the sun or spending more than 30 minutes in the sun *and* using one or more alternative measures such as seeking shade, wearing a hat or long clothing and/or using sunscreen of sun protection factor 30+. This indicator combines Canadian Community Health Survey data for the 2015 to 2016 survey years.

- From 2015 to 2016, 70.1 per cent of adults in Ontario age 18 and older reported using one or more sun protection measure (Supplementary Table S29). It was more common for women (75.6 per cent) than men (64.2 per cent) to report using sun protection (Supplementary Table S29).
- During this time period, 62.9 per cent of adolescents ages 12 to 17 also reported using at least one method of sun protection with more adolescent girls (68.5 per cent) than boys (57.4 per cent) reporting using at least one method of sun protection (Supplementary Table S29).

INDICATOR FINDINGS: ADULTS THAT REPORT SUNBURNS IN THE PAST YEAR

This indicator measures the percentage of adults age 18 and older who reported having had a sunburn in the past 12 months. It combines Canadian Community Health Survey data for the 2015 to 2016 survey years.

- From 2015 to 2016, 31.2 per cent of adults in Ontario age 18 and older reported experiencing a sunburn within the past 12 months (Supplementary Table S30).
- Sunburns were more common in men (34.1 per cent) than women (28.6 per cent), and for people living in rural areas (43.6 per cent) compared to urban (30.0 per cent) (Supplementary Table S30).

INDICATOR FINDINGS: ADULTS THAT REPORTED ONE OR MORE SUNBURN IN THE PAST YEAR, WHO REPORTED USING ONE OR MORE SUN PROTECTION MEASURE

This indicator measures the percentage of adults age 18 and older who reporting one or more sunburns in the past 12 months, who reported using one or more sun protection measures. It combines Canadian Community Health Survey data for the 2015 to 2016 survey years.

- Of the adults who reported using sun protection, 64.7 per cent of them reported experiencing sunburn, with women (69.4 per cent) more likely to report experiencing sunburn than men (60.6 per cent) from 2015 to 2016 (Supplementary Table S31).

Radon

Radon is a radioactive gas produced by the breakdown of naturally occurring uranium in soil and rocks.³⁵⁰ Radon is invisible, odourless and requires equipment to test for its presence.^{350,377} It can reach harmful levels inside homes and other buildings, especially in basements and on lower floors if a foundation is not fully sealed from the ground and the gas is not directed outdoors.^{377,378} Outside of occupational settings, most people in Ontario experience their highest radon exposures in their homes.³⁷⁹

Evidence for policies and programs

The World Health Organization recommends that national programs promote testing for radon to homeowners, reducing radon levels when they are found to be high and implementing building codes to minimize radon levels.³⁷⁷ Programs may include financial aid or incentives that encourage home and business owners to take steps to reduce the levels of radon indoors.³⁷⁷ Installing an exhaust system in the foundation is a common way to direct radon outdoors.³⁵⁰

The World Health Organization recommends using 100 Bq/m³ as a guideline for identifying when changes to a home should be made to reduce its radon levels.³⁷⁷ In areas where keeping average levels under 100 Bq/m³ is challenging, such as in areas where there are high levels of uranium in the ground, the guideline should be no higher than 300 Bq/m³.³⁷⁷ The current Canadian guideline for radon is 200 Bq/m³.³⁵⁰ The Cross-Canada Survey of Radon Concentrations in Homes found that in Ontario, a population-weighted estimate of 4.6 per cent of homes exceeded the 200 Bq/m³ guideline, although this estimate has not been updated since the 2012 report.³⁷⁹

Radon policies and programs in Ontario

The Ontario Building Code requires that new homes include a soil gas barrier and a heat recovery ventilator to prevent and limit radon from entering indoor air.³⁸⁰ For older homes, Ontario does not offer free or subsidized radon home testing kits, or subsidies or incentives for renovations if radon is found to be high in a home.³⁸⁰

Fine particulate matter

Fine particulate matter (PM_{2.5}) refers to any solid particles or liquid droplets that measure 2.5 micrometres (or microns) in diameter or smaller.³⁸¹ PM_{2.5} is used as an indicator of air quality because it is one of the most concerning pollutants.³⁸² Major contributors of PM_{2.5} include motor vehicles, power plants, industrial facilities, residential fireplaces, wood stoves, agricultural burning and forest fires.³⁸³ A significant contribution also comes from transboundary flow of air pollution across the USA border into Ontario (ranging from approximately 25 per cent to 87 per cent contribution to PM_{2.5} concentrations across the province).³⁸⁴

Fine particulate matter and chronic disease in Ontario

PM_{2.5} remains in the air longer than larger particles and can be breathed into the lungs and enter the blood system.³⁸¹ The *Ontario Population Health and Environment Cohort (ONPHEC)* study showed that for every 10 µg/m³ increase in exposure to PM_{2.5}, there was a 11 per cent increase in diabetes incidence, a 43 per cent increase in deaths from ischaemic heart disease, and a 64 per cent increase in acute myocardial infarction-related deaths.³⁸³ Fortunately, overall air quality in Ontario has been improving over time, with PM_{2.5} concentrations having decreased by 20 per cent from 2009 to 2019.³⁸⁴

Evidence for policies and programs

The World Health Organization states that policies to reduce exposure to fine particulate matter should target lowering emissions in transportation, industry, waste management and energy use and generation.³⁵⁵ It has set an air quality guideline value for PM_{2.5} at an annual average of 10 µg/m³.³⁸⁵ The Canadian Ambient Air Quality Standard for PM_{2.5} set an annual average of 8.8 µg/m³ and a 24-hour maximum of 27 µg/m³ effective in 2020.³⁸⁶ These two limits work together to protect people from harmful health effects from long- and short-term fine particle exposures.³⁸⁷

Indicator findings: PM_{2.5} concentrations in outdoor air

This indicator looks at the annual average, daily maximum and 10-year change of ambient fine particulate matter (PM_{2.5}) concentrations in Ontario that are measured by outdoor air monitoring stations. Data were collected by the Ministry of the Environment, Conservation and Parks through the Ontario Continuous Ambient Air Monitoring Network consisting of 38 monitoring stations and were presented in the Air Quality in Ontario 2020 Report.

- Over 10 years (from 2011 to 2020), the PM_{2.5} annual mean concentrations in Ontario decreased by 17 per cent overall.³⁸⁴
- In 2020, 14 out of 38 air monitoring stations in Ontario measured above the 24-hour PM_{2.5} Ambient Air Quality Criteria of 27 µg/m³ on at least one occasion (Table 4, Supplementary Table S32).³⁸⁴
- There were no exceedances of Ontario's annual Ambient Air Quality Criteria in 2020.³⁸⁴

Table 4: Annual average, daily maximum and 10-year change of ambient fine particulate matter (PM_{2.5}) concentrations (µg/m³) in Ontario, by monitoring station, 2020

Monitoring station	2020 annual average	24-hour max	Number of times above 24-hour Ambient Air Quality Criteria	Change in yearly average over 10 years (%)
Barrie	6.8	29.38	1	-4.5
Belleville	6.3	21.58	0	-6.6
Brampton	6.7	25.17	0	-17.3*
Brantford	6.7	26.25	0	-18.7*
Burlington	6.4	24.50	0	-28.7*
Chatham	6.7	21.79	0	-20*
Cornwall	6.0	23.79	0	-22.5*
Dorset	4.5	16.13	0	-19.5*
Grand Bend	4.8	15.46	0	-42.7*
Guelph	6.9	30.96	2	-12.6*
Hamilton Downtown	8.1	33.00	1	-24*
Hamilton Mountain	7.1	25.54	0	-21.8*
Hamilton West	7.8	31.38	1	-21.5*
Kingston	5.6	17.42	0	-31.1*
Kitchener	6.6	29.42	1	-20.8*
London	6.5	28.38	1	-27.7*
Milton**	7.1	31.67	1	-16.2*
Mississauga	6.6	28.67	1	-18.1*
Newmarket	5.9	25.83	0	-21.1*
North Bay	4.6	17.63	0	-17.7*
Oakville	6.3	25.13	0	-18.1*
Oshawa	6.2	21.00	0	-20.3*
Ottawa Downtown	6.0	27.33	1	-13.6*
Parry Sound	4.4	18.29	0	-32.7*
Petawawa	4.2	12.21	0	-22.8*
Peterborough	5.6	18.58	0	-19.5*
Port Stanley	6.5	22.29	0	-18.4*
Sarnia	7.1	23.13	0	-36.1*
Sault Ste. Marie	4.5	16.67	0	-18.6*
St. Catharines	6.3	21.75	0	-22.7*
Sudbury	5.1	19.83	0	2.3
Thunder Bay	5.5	15.42	0	-16.6*
Tiverton	4.8	15.83	0	-21.9*
Toronto Downtown	7.6	28.88	2	N/A
Toronto East	6.7	26.50	0	-17.4*

Toronto North	6.4	27.13	1	-29.5*
Toronto West	6.9	28.46	1	-24.9*
Windsor Downtown	7.1	28.54	1	-25.6*
Windsor West	8.8	31.92	3	-14*

Source: Air Quality in Ontario, 2020 (Ministry of the Environment, Conservation and Parks)

Notes: Data are presented in Supplementary Table S32. Download supplementary tables at ontariohealth.ca/psqi. Bolded values exceed 8.8 µg/m³ annual average or 27 µg/m³ 24 hour maximum, the PM_{2.5} reference levels set by the Canadian Ambient Air Quality Standards, effective in 2020.
N/A: Monitoring station was relocated in 2019, therefore, unable to make a 10-year comparison between the two locations.
* Significant Sen's Slope (significant trend detected).
** Milton monitoring station was added to the region since the PSQI 2020 report.

Fine particulate policies and programs in Ontario

Many policies and programs have likely contributed to improved air quality in Ontario, including the efforts of the Ministry of Environment, Conservation and Parks to regulate industrial and commercial air contaminants, limit emissions from trucks and busses and better understand the flow of pollutants from the United States into Ontario.

Opportunities to reduce environmental carcinogens

- Provide guidance on protection from ultraviolet radiation exposure and shade provision in the Provincial Policy Statement.
- Strengthen municipal shade policies and monitor the implementation and impact of these policies.
- Develop targeted ultraviolet radiation and shade policies and invest in programs for outdoor workers, schools, recreation centres, and children and youth in childcare and summer camps.
- Monitor radon concentrations in Ontario homes and workplaces in conjunction with an educational campaign to build awareness of need to monitor.
- Promote radon testing and reduction, which may include financial aid and incentives to home and business owners when high concentrations are found.
- Consider setting the Canadian radon guideline at 100 Bq/m³.
- Amend the Ontario Building Code to require measures that reduce or prevent radon in new construction and renovations.
- Continue to reduce PM_{2.5} emissions from transportation, industry, and energy use and generation.



Occupational exposures

Occupational exposures and chronic disease risk

The primary way many workers are exposed to toxic substances in the workplace is through inhalation.³⁸⁸ While there are many occupational exposures that can lead to harms, this chapter focuses on four toxic substances – asbestos, diesel exhaust, radon and crystalline silica – which contribute to an increased risk of developing chronic lung conditions.³⁸⁸ Some of the occupational lung diseases caused by one or more of these exposures include lung cancer, chronic obstructive pulmonary disease, asbestosis, mesothelioma and silicosis.^{351,388-390}

The PSQI 2020 report included an examination of nickel and formaldehyde; however due to limited new information on these hazards, this content has not been included in the 2023 report.

Occupational exposures in Ontario

The lung conditions discussed here are often diagnosed years after exposure, which makes them challenging to identify as an occupational disease.³⁸⁸ Additionally, lung cancer and chronic obstructive pulmonary disease have multiple causes and many people believe they are solely caused by cigarette smoke, even though workplace hazards can be contributing factors.³⁸⁸

The Occupational Cancer Research Centre (OCRC) recently developed the Occupational Disease Surveillance System (ODSS), which can identify patterns and trends in work-related diseases in Ontario.³⁸⁸ Some of the research presented in this section on the high-risk groups comes from the OCRC's 2022 *Chronic Respiratory Disease Report*, which was based on data from the ODSS.³⁸⁸

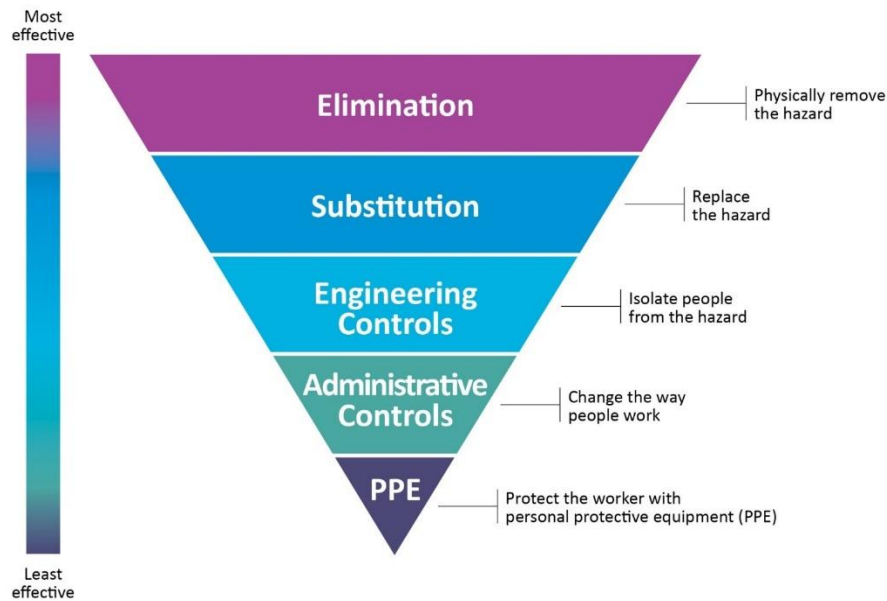
The Ontario Ministry of Labour, Immigration, Training and Skills Development has developed a five-year occupational health and safety strategy called Prevention Works (2021 to 2026).³⁹¹ The strategy, among other things, aims to reduce or eliminate hazard exposures that pose the greatest risk for disease development.³⁹¹ Some of its objectives are to build and use latest evidence, improve occupational health and safety knowledge and practices, and support workplaces to adhere to occupational health and safety roles and responsibilities.³⁹²

Policies and programs to reduce occupational exposures

The Hierarchy of Controls (Figure 9) is a widely recognized occupational health and safety framework for protecting workers from workplace hazards.³⁹³ The framework identifies the most to least effective controls for hazards, which are:

- Removing the hazard (elimination);
- Replacing the hazard with a safer substitute (substitution);
- Creating physical separations between workers and the hazard (engineering controls);
- Changing the way people work to limit exposure to the hazard (administrative controls); and
- Using personal protective equipment (PPE) when working with the hazard.

Figure 9: Hierarchy of Controls



Source: Available for public use without permission from [cdc.gov/niosh/topics/hierarchy/](https://www.cdc.gov/niosh/topics/hierarchy/)

Ontario's *Occupational Health and Safety Act* regulates exposure limits for chemical substances.³⁹⁴ It also requires employers to find out whether these substances are present on a work site.³⁹⁴ When present, regulations that require employers to follow a specific set of measures and procedures that protect workers from these substances.³⁹⁴

Asbestos

Asbestos is a term for six fibrous minerals that are found in some rocks and soil.³⁹⁵ Because of its durability and heat resistance, asbestos was widely used in building materials, and in industrial and consumer products.³⁹⁵ When asbestos or materials containing asbestos are disturbed or damaged, the fibres can be released into the air and breathed into lungs, leading to chronic diseases in people who are exposed.³⁹⁵

In December 2018, asbestos was banned in Canada.³⁹⁶ Asbestos and products that contain asbestos can no longer be manufactured, sold, imported, exported or used in Canada, with some exceptions.³⁹⁶ While Canada's ban will be helpful in limiting asbestos exposure in the future, it is unlikely to reduce asbestos-related respiratory diseases among current construction workers involved in building repair and remediation, or among maintenance and custodial workers responsible for older buildings where exposure to existing asbestos-containing materials still exists.³⁹⁷

In 2021, the CSA Group released their report, *Asbestos Management in Canada: Assessing the Need for a National Standard*, which aimed to explore gaps and best practices in asbestos management and determine the need for developing a national standard.³⁹⁸ It found a relatively robust regulatory framework for asbestos; however, gaps and inconsistencies remain in how asbestos is managed in Canada.³⁹⁸ The first is that legislative responsibility and oversight is divided between federal, provincial, territorial and municipal authorities.³⁹⁸ This division can create challenges in compliance for employers

and consultants working in different jurisdictions, as well as in enforcement for regulators.³⁹⁸ There are also differences in definitions of asbestos and asbestos-containing materials.³⁹⁸ These differences make it challenging to identify and document asbestos, assess for risk, select control measures to mitigate risk, and adequately manage asbestos and its safe disposal.³⁹⁸ In addition, there are different approaches across the country in how workers exposed to asbestos are trained and in the competency of workers engaged in asbestos management.³⁹⁸

Asbestos and chronic diseases in Ontario

Exposure to asbestos can cause chronic diseases such as asbestosis, mesothelioma, lung cancer and chronic obstructive pulmonary disease.^{399,400} Asbestosis involves scarring and stiffening of lung tissue that leads to difficulty breathing, coughing and shortness of breath.³⁸⁸ Mesothelioma is a rare and aggressive form of cancer that affects the lining of the chest or abdominal cavity.⁴⁰¹ Asbestosis, as the name implies, is caused by asbestos exposure and mesothelioma is primarily caused by asbestos exposure, while lung cancer and chronic obstructive pulmonary disease can be caused by multiple workplace exposures.³⁸⁸

As a result of the lengthy latency period between exposure and disease onset, asbestos-related diseases are often associated with exposures that occurred 10 to 40 years ago.⁴⁰² This long latency makes it difficult to connect these diseases to their occupational exposures and to get compensation.⁴⁰²

Estimates based on 2016 census data suggest that 77,000 Ontario workers have been exposed to asbestos.⁴⁰² The largest occupational group exposed to asbestos are those in construction, followed by public administration, educational services and hospitals.⁴⁰²

Results from the Occupational Disease Surveillance System (ODSS) show that Ontario workers with a high likelihood of asbestos exposure have increased risks for several chronic respiratory diseases.³⁸⁸ For example, workers from Ontario's historical asbestos mining industry showed over 20 times the risk of asbestosis and over 200 times the risk of mesothelioma compared to other workers.^{388,403} These workers also showed an increased risk of lung cancer.⁴⁰⁴ Insulators, who may have been exposed in the past when installing or removing asbestos-containing insulation, have over 30 times the risk of asbestosis and over 20 times the risk of mesothelioma, as well as increased risks of lung cancer and chronic obstructive pulmonary disease.³⁸⁸ In addition, workers in the non-metallic mineral products manufacturing industry, who may have manufactured asbestos-containing products such as brake pads, gaskets and asbestos-cement pipe, have increased risks of asbestosis, mesothelioma, lung cancer, and chronic obstructive pulmonary disease.³⁸⁸

Policies and programs to reduce asbestos exposure in Ontario

In Ontario, the *Occupational Health and Safety Act* categorizes asbestos as a designated substance with an occupational exposure limit, although a safe limit has yet to be identified.⁴⁰⁵ A separate provision of the act also requires owners of buildings containing asbestos to develop an ongoing asbestos management plan and notify constructors of the presence of asbestos in advance of any construction or repair operations, among other requirements.⁴⁰⁵ Overall, Ontario has a relatively robust set of asbestos regulations that compare favourably to other jurisdictions in Canada.⁴⁰⁵ However, legislative authority is split between different authorities, which can lead to inconsistencies and confusion. For example, Ontario's environmental and occupational health and safety regulations use different definitions for determining if a material is "asbestos-containing".³⁹⁸

The Ministry of Labour, Immigration, Training and Skills Development maintains an Asbestos Worker Register that lists workers who are exposed to asbestos.⁴⁰⁶ When a worker has had 2,000 hours of documented exposure, they are notified and advised to undergo medical examination.⁴⁰⁶ The OCRC has linked the Asbestos Worker Register to health data to better identify asbestos-related disease.⁴⁰⁷

Diesel engine exhaust

The exhaust from diesel engines contains a complex mixture of gases and fine diesel particulate matter small enough to be breathed deep into the lungs⁴⁰⁸, which can damage the lung tissue and may cause lung diseases, such as chronic obstructive pulmonary disease and lung cancers.^{409,410}

The best measures for protecting workers from diesel exhaust exposure combine different approaches found under the Hierarchy of Controls framework.⁴¹¹ These measures include switching to electric engines or using other fuels (substitution), improving ventilation and using exhaust filters (engineering controls), and restricting idling (administrative control).⁴¹¹

Based on their *Burden of occupational cancer in Canada: Major workplace carcinogens and prevention of exposure* report, the Occupational Cancer Research Centre recommends that Canadian jurisdictions adopt a limit of 20 µg/m³ elemental carbon for the mining industry and 5 µg/m³ elemental carbon for other workplaces (elemental carbon is used as a surrogate for the measurement of diesel engine exhaust).⁴¹² These recommendations account for feasibility concerns; other groups have proposed health-based limits as low as 1 µg/m³ elemental carbon.⁴¹³

Diesel engine exhaust and chronic disease in Ontario

Diesel exhaust is one of the most common occupational exposures in Ontario.⁴¹² Based on 2016 census data, CAREX (CARcinogen Exposure) Canada has estimated that 327,000 Ontario workers are exposed to diesel engine exhaust.⁴¹⁴ People who are frequently exposed to diesel engine exhaust, such as underground miners, farmers, truckers, delivery and courier drivers, bus drivers, transit operators, railway workers, heavy equipment mechanics and construction workers, have an increased risk of occupational lung diseases.^{388,408} These diseases include lung cancer and chronic obstructive pulmonary disease.^{409,410}

In the Occupation Disease Surveillance System (ODSS), several occupational groups who frequently work in or around diesel powered equipment have increased risks of lung cancer and chronic obstructive pulmonary disease.³⁸⁸ For example, truck drivers and excavating, grading and paving labourers have increased risks of both diseases compared to other workers in the ODSS.³⁸⁸ Railway transport operators have an increased risk of lung cancer, while farm workers, who may drive diesel-powered tractors, have an increased risk of chronic obstructive pulmonary disease.³⁸⁸

Policies to reduce diesel engine exhaust exposure in Ontario

Currently, Ontario has an occupational exposure limit for diesel engine exhaust that applies only to mining industries, which is set at 400 µg/m³ total carbon (reducing to 120 µg/m³ elemental carbon as of September 1, 2023).^{415,416} This limit is significantly higher than the 20 µg/m³ elemental carbon limit suggested by the Occupational Cancer Research Centre⁴¹⁵ and there is no occupational exposure limit for diesel engine exhaust that applies to industries outside of mining.⁴¹²

Radon

For a more detailed description of radon, please refer to the “Environmental exposures” section. Radon has no significant industrial purpose, but people may be exposed if they work in enclosed spaces where radon can build up and reach high levels, especially in underground work, such as mining.^{350,388}

In Canada, radon is the second leading cause of lung cancer, after smoking tobacco.³⁵⁰ Workers, and others, who smoke and are exposed to radon are at an even greater risk for developing lung cancer than those who do not smoke.³⁵⁰

Radon and chronic disease in Ontario

Based on estimates using 2016 census data, 34,000 Ontario workers are exposed to radon in the workplace at levels above 200 Bq/m³.⁴¹⁷ A further 112,000 are exposed to radon levels that are 100 to 200 Bq/m³.⁴¹⁸

Uranium miners have well-documented exposure to radon.⁴¹⁹ In the Occupation Disease Surveillance System, former workers from Ontario’s uranium mining industry have approximately 1.9 times the risk of developing lung cancer other than other workers.³⁸⁸

Evidence for policies and programs to reduce radon exposure

A combination of radon control in new buildings and mitigation in older buildings is ideal for reducing exposure.³⁷⁷ Reducing radon in workplaces starts with monitoring levels as part of a surveillance program.⁴²⁰ Other steps that can be taken to reduce radon exposure include installing radon gas mitigation systems, adequate ventilation systems, selecting low radon-containing materials and developing an exposure reduction program.⁴²⁰

The Canadian Federal Provincial Territorial Radiation Protection Committee is tasked with advancing the development and harmonization of practices and standards across all federal, provincial and territorial jurisdictions.⁴²¹ The committee has developed the Naturally Occurring Radioactive Materials (NORM) Guidelines.⁴²¹ NORM recommends reducing radon levels to less than 200 Bq/m³, which is higher than the World Health Organization’s recommendation to reduce radon levels to less than 100 Bq/m³.^{377,420} Select Canadian workers who may face high levels of exposure (e.g., workers in uranium mines) are monitored annually for their exposure through the National Dose Registry.⁴²⁰

Policies and programs in Ontario

The *Occupational Health and Safety Act* states that employers must use every reasonable precaution to protect workers from hazards associated with exposure to radon.⁴²² In mines, exposure to radon must be monitored closely and is measured differently than in other workplaces. Outside of mining, NORM guidelines are used but there are no requirements for monitoring exposure.⁴²²

Crystalline silica

Crystalline silica is one of the most common naturally occurring minerals found in soil, sand and rocks.⁴²³ It is used in many industrial applications and can be found in materials such as concrete, mortar and brick.^{423,424} Occupational processes of grinding, cutting, drilling, or chipping of materials containing silica creates a dust that can cause health issues when inhaled.⁴²³ Workers who are most likely to be exposed to silica include construction workers, heavy equipment operators, plasterers, drywallers and plumbers.⁴²³

International Agency for Research on Cancer has classified crystalline silica as a Group 1 carcinogen.⁴²³ Specifically, crystalline silica inhalation increases workers' risk of lung cancer.⁴²³ Inhalation of crystalline silica also causes silicosis (a non-reversible fibrotic lung disease) and is linked to the development of chronic obstructive pulmonary disease.⁴²³

Crystalline silica and chronic disease in Ontario

Based on 2016 census data, CAREX Canada estimates that 153,000 Ontario workers are exposed to crystalline silica.⁴²⁵

Mining can generate high levels of silica dust;⁴²⁶ across the Occupation Disease Surveillance System, workers in mining-related occupations and industries showed the highest risk of developing silicosis.³⁸⁸ For example, workers in the mining industry overall have over 10 times the risk of developing silicosis than other workers in the ODSS, as well as increased risk of lung cancer and chronic obstructive pulmonary disease.⁴²⁷ Other groups who perform tasks that release high amounts of silica into the air also showed increased risk of disease; for example, concrete finishers have an increased risk of chronic obstructive pulmonary disease, while workers in clay, glass and stone processing and forming occupations have an increased risk of developing chronic obstructive pulmonary disease and lung cancer.³⁸⁸ Workers in iron foundries, where silica is used in the foundry moulds and furnace bricks, have an increased risk of developing silicosis, chronic obstructive pulmonary disease and lung cancer compared to other workers in the ODSS.³⁸⁸

Evidence for policies and programs to reduce silica exposure

The primary way to protect workers from silica exposure is to substitute silica-containing products with safer alternatives or eliminate processes that generate silica dust.⁴²⁰ Engineering controls can also be used to reduce exposure, such as improving ventilation and enclosing dust-generating processes to prevent release of dust into the work environment.⁴²⁰ In addition, adequate training for workers is an important part of reducing exposure to silica.⁴²⁰

Policies and programs in Ontario

The *Occupational Health and Safety Act* identifies silica as a designated substance and therefore, employers are regulated to take all reasonable precautions when silica poses a hazard in the workplace.⁴²⁸ Ontario employers must ensure that occupational exposure does not exceed 0.10 mg/m³ of air by volume for quartz and tripoli (types of silica) and 0.05 mg/m³ of air by volume for another type of silica, cristobalite.⁴²⁹ These limits are higher than the limit of 0.025 mg/m³ respirable crystalline silica adopted by many Canadian jurisdictions and recommended by the American Conference of Governmental Industrial Hygienists.⁴²³

Opportunities to reduce occupational exposures

- Invest in occupational exposure surveillance systems to identify high exposures before they cause disease.
- Create a public registry of all public buildings and workplaces that contain asbestos.
- Contribute to the development of a national asbestos management standard to drive harmonization of regulations and best practices across Canada.
- Adopt occupational exposure limits for diesel engine exhaust of 20 µg/m³ elemental carbon for the mining industry and 5 µg/m³ elemental carbon for other workplaces.
- Adopt the World Health Organization Guidelines for radon exposure and limit radon exposure to less than 100 Bq/m³.
- Adopt the recommended occupational exposure limit of 0.025 mg/m³ for all forms of respirable crystalline silica.



Infectious agents

Infectious agents and chronic disease risk

Infectious agents (e.g., bacteria, viruses, fungi and parasites) can trigger an immune response in our bodies and some can increase the risk of developing select chronic diseases.^{430,431} For example, an infection from COVID-19 can result in cardiovascular complications which increase the risk of developing subsequent cardiovascular disease.⁴³²⁻⁴³⁴ This chapter will discuss this growing body of evidence and focus on the two major infectious agents in Canada, human papillomavirus (HPV) and hepatitis B.

The HPV family of viruses includes many strains that are most commonly transmitted through skin-to-skin sexual contact.⁴³⁵ Infections resulting from mainly 12 high-risk HPV strains are responsible for the highest burden of cancer infections in Ontario. HPV can cause cancers of the throat, anus, head, neck, penis, vulva, vagina and the most common preventable cancer in women, cervical cancer.^{435,436} One particular high-risk HPV strand (strand 9) is highly carcinogenic and important to prevent through vaccination.^{435,437} New associations between HPV and chronic disease are currently being investigated and preliminary studies might support a link between the HPV and cardiovascular disease.⁴³⁸ For example, one study found that women who were HPV-positive had a greater likelihood of having cardiovascular disease than women who were HPV-negative.^{438,439}

Hepatitis B is transmitted through contact with infected blood and bodily fluids (e.g., through sexual contact, sharing of needles or other injection drug equipment, or from mother to infant during birth).⁴⁴⁰ Infection with hepatitis B can cause an acute, self-limiting illness or it can progress to a chronic state and over time lead to serious outcomes such as liver cirrhosis or hepatocellular carcinoma (liver cancer).^{440,441} Hepatitis B is one of the most common infections worldwide, however, due to the asymptomatic nature of the disease, many people who are infected with it are unaware of their status.⁴⁴² People disproportionately impacted by hepatitis B include immigrants and refugees from hepatitis B-endemic countries, people who use injection drugs, FNIMUI peoples, people experiencing homelessness or incarceration and people engaged in sex work as well as gay, bisexual and other men who have sex with men.⁴⁴⁰ There is currently no cure for hepatitis B but lifelong antiviral treatment can slow disease progression and improve long-term survival.⁴⁴² Vaccination can also prevent the development of hepatocellular carcinoma in people who have been infected with hepatitis B.^{443,444}

Policies and programs to reduce infections

Both HPV and hepatitis B can be asymptomatic after infection and lead to life-threatening diseases. Early detection and routine vaccination programs are helpful in preventing the spread of these viruses, along with free resources such as access to condoms and safe sex education through community programs.⁴⁴⁵ Sexual Health Ontario, a provincial initiative led by Ontario Public Health, provides free resources on sexually transmitted infections that include information on how to prevent transmission, what symptoms to look for, and current testing and treatment options available to people in Ontario.⁴⁴⁵

HPV

Evidence for policies and programs to reduce HPV infections

Clinical trials show that HPV vaccines are highly effective in preventing cervical or anal infection before exposure through sexual activity.^{446,447} Even if an HPV infection leads to cancerous cell changes, vaccines

can reduce the risk of further disease progression.^{437,446,448} It is estimated that 75 per cent of the sexually active Canadian population will have an HPV infection if not vaccinated.^{446,449} In Canada, HPV vaccines are recommended for people age nine to 26, including those who have had cervical abnormalities, cervical cancer or genital warts and people age 27 and older who are at ongoing risk of exposure.^{446,449}

Policies and programs to reduce HPV infections in Ontario

New provincial efforts to screen for high-risk HPV types are being implemented to improve early detection and follow-up of infections.⁴⁵⁰ Ontario Health is working with the Ministry of Health to implement HPV testing in the Ontario Cervical Screening Program, which will allow sexually active people with a cervix age 25 and older (or 21 and older if someone is immune compromised) or people with visible cervical abnormalities to receive HPV testing.⁴⁵⁰ Anyone with atypical cells will then be referred for colposcopy.⁴⁵⁰

Ontario has had an HPV immunization program since 2017, which enables all Grade 7 students ages 12 and up to receive Gardasil 9 for HPV strain 9 (HPV9).^{446,451} This vaccine is free for any student until the last year of high school (Grade 12).⁴⁵¹ The COVID-19 pandemic has delayed school-based vaccination programs and catch-up clinics in communities and schools have been extended to ensure age-appropriate vaccination. Varying degrees of local catch-up activities were performed throughout the school year, however public health units (PHUs) faced potential challenges to delivering school-based immunization programs due to school closures and the diversion of PHU resources towards the pandemic response. The Ministry of Health expanded eligibility to August 31, 2023 for female students who graduated during the pandemic-affected school years.⁴⁵² The high-risk HPV immunization program in Ontario has also expanded eligibility to men who have sex with men (ages 26 or younger) who identify as gay, bisexual or trans and who did not start their HPV series before to 2017.

Indicator findings: School-based HPV vaccination coverage

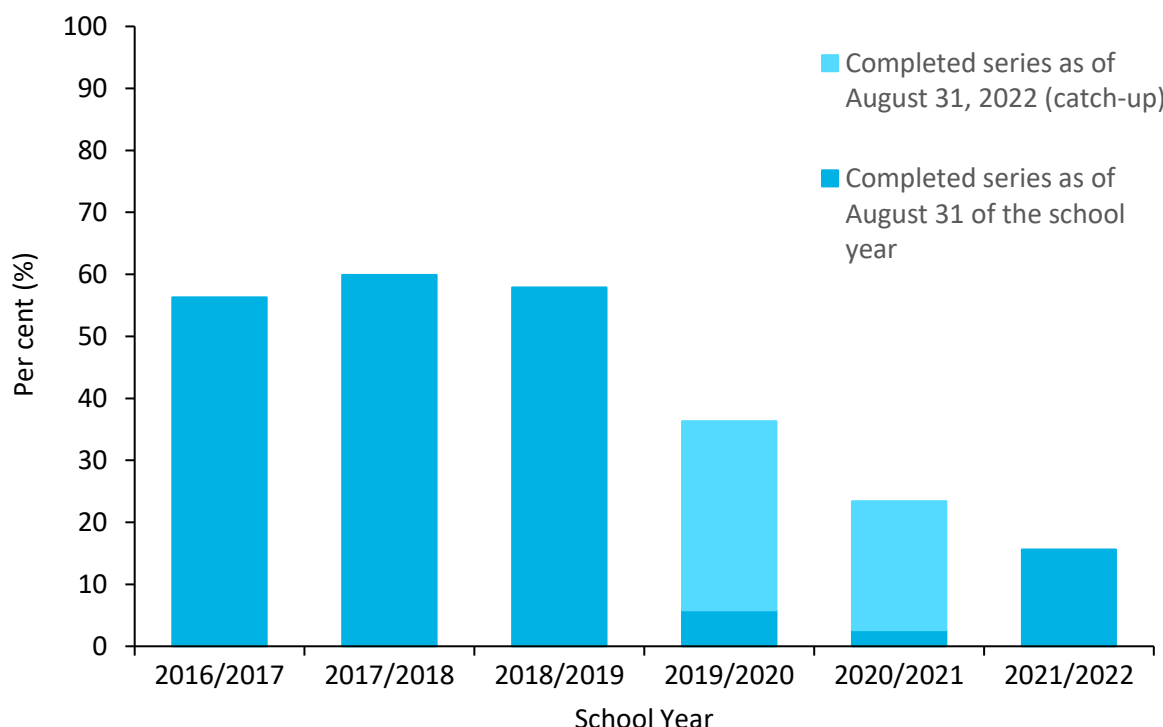
This indicator measures up-to-date immunization coverage for the HPV vaccine among 12-year-olds (Grade 7) with data current as of the 2021/22 school year. These estimates are reported by Public Health Ontario through an analysis of student and immunization record data entered by public health units in the Data Health Information Repository. Up-to-date coverage for a school year reflects the proportion of children who received the age-appropriate number of valid doses of HPV vaccine as of August 31st of that school year. Up-to-date coverage with catch-up in this report reflects immunizations received as of August 31st, 2022; catch-up estimates are only available for the 2019/20 and 2020/21 school years. This indicator does not reflect doses of the vaccine received outside the school-based programs or in catch-up clinics outside schools or public-health affiliated programs unless the doses were reported to the public health unit for entry in the Data Health Information Repository.

A population-based registry that captures at the point of care all administered doses of the vaccine is not currently available, but this type of registry would provide a better understanding of overall vaccination rates in Ontario.

- HPV immunization coverage among 12-year-olds for the three school years affected by the COVID-19 pandemic was 5.8 per cent in 2019/20, 2.6 per cent in 2020/21 and 15.6 per cent in 2021/22 (Supplementary Table S33).
- Catch-up programs in the years following the 2019/20 and 2020/21 school years resulted in large increases in coverage (from 5.8 per cent to 36.3 per cent and from 2.6 per cent to 23.4 per cent, respectively) as of August 31, 2022 (Supplementary Table S33).
- Despite increases in coverage due to catch-up programs, HPV immunization coverage remained lower than prior to the pandemic.

- There was significant geographic and temporal variability in HPV coverage among public health units. For the 2021/22 school year, HPV coverage among 12-year-olds ranged from less than 1 per cent to 62.7 per cent (Supplementary Table S33).

Figure 10: Up-to-date human papillomavirus vaccination coverage (%) in 12-year-old students in Ontario, 2016/17 to 2021/22, with catch-up for 2019/20 and 2020/21



Source: Digital Health Immunization Repository, 2016/2017 to 2021/2022 (Ministry of Health and Long-Term Care) in: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Immunization coverage report for school-based programs in Ontario: 2019-2020, 2020-2021 and 2021-22 school years with impact of catch-up programs. Toronto, ON: King's Printer for Ontario; 2023 and Ontario Agency for Health Protection and Promotion (Public Health Ontario). Immunization coverage report for school pupils in Ontario: 2018/2019 school year. Toronto, ON: Queen's Printer for Ontario; 2020.

Notes: Data are presented in Supplementary Table S33. HPV coverage is assessed for all genders for 12-year-olds as of August 31 of the respective school year. Data for 2019/2020 and 2020/2021 include catch-up estimates for immunizations received August 31, 2022. Catch-up estimates are not yet available for the 2021/22 school year. Download supplementary tables at ontariohealth.ca/psqi.

The Canadian Partnership Against Cancer has an action plan for eliminating cervical cancer by 2040 through HPV immunization, screening and improved follow-up.⁴⁵³ To increase vaccination uptake, the Canadian Pediatric Society recommends providing education to students and parents on the safety and benefits of vaccination, the importance of community immunity, increased accessibility including quick appointments for people who want to get vaccinated outside of the school program and improved registries that can be used to prompt and remind parents when vaccines are overdue.⁴⁵⁴ A recent meta-

analysis found that education, interventions targeting providers including physician training, reminders, school-based clinics, financial incentives, policy interventions including province-wide initiatives, multi-component interventions and multi-level interventions were associated with increased HPV vaccination coverage in children and adolescents.⁴⁵⁵

Hepatitis B

Evidence for policies and programs that reduce hepatitis B infections

Ontario reported the second highest rate of acute hepatitis B (after New Brunswick) and the sixth highest rate of chronic hepatitis B.⁴⁵⁶ Available data on acute hepatitis B likely underestimates the true burden of illness.^{443,456,457}

The World Health Organization has called for a 95 per cent reduction in chronic hepatitis B cases by 2030.⁴⁵⁸ Since the early 1990s, all provinces and territories have implemented universal immunization programs which have resulted in large declines in acute infection rates.^{442,457} The Association of Medical Microbiology and Infectious Disease Canada recommends the hepatitis B vaccine for all infants under age 1, and for anyone who did not receive immunization as an infant.⁴⁵⁷

Policies and programs to reduce hepatitis B infections in Ontario

A 2022 study found that Ontario is failing to meet the World Health Organization target due to a lag in vaccination, screening and treatment efforts.⁴⁵⁸ Ontario has a publicly funded school-based immunization program for students in Grade 7 (12-year-olds).⁴⁵⁷ Although many jurisdictions in Canada offer vaccination after birth, the age the vaccine is offered varies across jurisdictions.⁴⁵⁶ Many children might have also skipped getting vaccinated in recent years due to Covid-19 school closures;⁴⁵⁹ however, students can get missed vaccines from family doctors or catch-up clinics through public health.⁴⁶⁰ School closures and the public health response to the COVID-19 pandemic have resulted in gaps in the delivery and assessment of school-based immunizations. The Ontario Ministry of Health has expanded eligibility for hepatitis B immunization until the end of Grade 12.⁴⁵²

In addition, anyone migrating from countries where hepatitis B is endemic should be screened to allow for early detection and follow-up.⁴⁶¹ Currently, people in Ontario only have access to prenatal screening for hepatitis B.⁴⁶¹ A recent study in Ontario found that almost 40 per cent of people who develop complications from hepatitis B (liver cirrhosis or liver cancer) were diagnosed within six months of suffering complications.⁴⁶² Earlier vaccination and increased screening efforts are the best approach to prevent complications from asymptomatic hepatitis B in the province.^{458,461,462}

Indicator findings: School-based hepatitis B vaccination coverage

This indicator measures up-to-date immunization coverage for hepatitis B vaccine among 12-year-olds (Grade 7) with data current as of the 2021/22 school year. Up-to-date coverage for a school year reflects the proportion of children who received the age-appropriate number of valid doses of hepatitis B vaccine as of August 31 of that school year. Up-to-date coverage with catch-up in this report reflects immunizations received as of August 31, 2022; catch-up estimates are only available for the 2019/20 and 2020/21 school years.

These estimates were reported by Public Health Ontario through an analysis of student and immunization record data entered by public health units in the Data Health Information Repository. Doses received in primary care or outside of public health unit-delivered programs may not be included unless the doses were reported to the public health unit for entry in Data Health Information Repository.

- Hepatitis B immunization coverage among 12-year-olds for the three school years affected by the COVID-19 pandemic was 26.2 per cent in 2019/20, 19.2 per cent in 2020/21 and 29.8 per cent in 2021/22 (Supplementary Table S34).
- Catch-up programs in the years following the 2019/20 and 2020/21 school years resulted in large increases in coverage (from 26.2 per cent to 50.8 per cent and from 19.2 per cent to 37.5 per cent, respectively) as of August 31, 2022 (Supplementary Table S34).
- Despite increases in coverage due to catch-up programs, hepatitis B immunization coverage remained lower than prior to the pandemic.
- There was significant geographic and temporal variability in hepatitis B coverage among public health units. For the 2021/22 school year, hepatitis B coverage among 12-year-olds ranged from 3.2 per cent to 69.2 per cent (Supplementary Table S34).

Ongoing education for students and parents by public health professionals and healthcare providers will increase knowledge of the benefits and safety of vaccinations and increase hepatitis B vaccination rates.⁴⁵⁸ Mass health promotion campaigns may also support positive attitudes towards hepatitis B vaccination.⁴⁵⁸

Opportunities to reduce infections

- Develop a provincial registry to report on coverage of HPV and hepatitis B vaccinations in the population.
- Develop free education campaigns to promote positive attitudes towards vaccination and address vaccine hesitancy, and support free education.
- Implement multi-level interventions including programs to increase vaccine education, interventions targeting providers including physician training, reminders, school-based clinics, financial incentives, and policy interventions including province-wide initiatives.
- Implement HPV testing in the Ontario Cervical Screening Program.
- Implement better screening and earlier vaccination for hepatitis B among high-risk groups.

Conclusion

The findings of the *Prevention System Quality Index 2023* suggest that Ontario has had some limited improvements in system-level policy and programs aimed at reducing chronic disease risk factors and exposures. However, there are still many opportunities to improve chronic disease prevention in the province. As the evidence shows, the greatest impact to chronic disease prevention will come from addressing the social determinants of health. Without adequate policies to address economic root causes, chronic disease risk factors will continue to negatively impact all populations living in Ontario. In addition, tailoring programs specific to the needs of FNIMUI, Black, and racialized people will benefit the populations who lack adequate access to healthcare. Tackling chronic disease prevention will require a multi-faceted and multi-sectoral approach. The best solutions should be accessible and allow every person in Ontario to make the healthier choice, the easier choice. Working with partners to implement comprehensive strategies across sectors and multiple levels of government can help achieve broader improvements in chronic disease prevention in Ontario.

Indicator findings that are encouraging show that:

- Smoking rates in Ontario decreased from 17.7 per cent from 2015 to 2017 to 15.4 per cent from 2017 to 2020;
- Three more local housing corporations have introduced a smoke-free policy across all of their properties since January 1, 2020;
- Three more local municipalities strengthened their shade policies since 2018; and
- The annual mean PM_{2.5} concentrations in Ontario decreased by 17 per cent over the last 10 years.

Improvements could be made in the following indicators:

- Tobacco taxes in Ontario, which continue to fall well below the level recommended by the World Health Organization;
- Minimum alcohol prices, which continue to fall below the amount needed to see substantial reductions in drinking in Ontario;
- The percentage of secondary schools with health and physical education specialist teachers decreased from the 2017/18 to the 2020/21 school year;
- Public secondary school enrolment in health and physical education courses tends to decrease in higher grades;
- Household food insecurity, which shows that 16.7 per cent of Ontario households during 2018 to 2020 experienced some level of food insecurity in the past 12 months.

Analyses of indicators by the new health equity stratifications showed differences in indicators by racial group, immigration status, and geography in addition to the previously reported on stratifications of sex and income quintile. A detailed breakdown of these differences can be found in the supplementary tables available online.

The *Prevention System Quality Index 2023* builds on past reports and highlights the best available data for Ontario to help reduce risk factors and exposures linked to chronic diseases. Comprehensive work with partners across sectors and multiple levels of government is needed to achieve greater improvements for chronic disease prevention in Ontario.

References

1. World Health Organization. Social determinants of health [Internet]. [cited 2023 Jan 4]. Available from: <https://www.who.int/health-topics/universal-health-coverage/social-determinants-of-health>.
2. Government of Canada. Social determinants of health and health inequalities [Internet]. 2022 [updated 2022 Jun 14 cited 2023 Feb 03]. Available from: <https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health.html>.
3. Braveman P, Gottlieb L. The social determinants of health: it's time to consider the causes of the causes. Public Health Rep. 2014;129 Suppl 2(Suppl 2):19-31.
4. Cockerham WC, Hamby BW, Oates GR. The Social Determinants of Chronic Disease. Am J Prev Med. 2017;52(1S1):S5-S12.
5. Mira R, Newton T, Sabbah W. Inequalities in the progress of multiple chronic conditions: A systematic review of longitudinal studies. PLoS One. 2022;17(2):e0263357.
6. Whitman A DLN, Chappel A, Aysola V, Zuckerman R, Sommers BD. Addressing social determinants of health: Examples of successful evidence-based strategies and current federal efforts. Washington, DC: US Department of Health and Human Services, Office of Health Policy; 2022 Apr 1.
7. Schillinger D. The Intersections Between Social Determinants of Health, Health Literacy, and Health Disparities. Stud Health Technol Inform. 2020;269:22-41.
8. Black Health Alliance. Health inequities: Chronic disease [Internet]. Toronto, ON: Black Health Alliance; 2018 [cited 2023 Feb 13]. Available from: <https://blackhealthalliance.ca/home/health-inequities/>.
9. Carbado DW, Crenshaw KW, Mays VM, Tomlinson B. INTERSECTIONALITY: Mapping the Movements of a Theory. Du Bois Rev. 2013;10(2):303-12.
10. Schillinger D. The intersections between social determinants of health, health literacy, and health disparities. . Studies in health technology and informatics. 2020 Jun 6;269:22.
11. National Collaborating Centre for Determinants of Health. Let's Talk: Intersectionality [Internet]. Antigonish, NS: NCCDH, St. Francis Xavier University; 2022 [Available from: <https://nccdh.ca/resources/entry/lets-talk-intersectionality>].
12. López N GV. Health inequities, social determinants, and intersectionality. National Academy of Medicine. 2016 Dec 5:1-15.
13. Chiu M, Maclagan LC, Tu JV, Shah BR. Temporal trends in cardiovascular disease risk factors among white, South Asian, Chinese and black groups in Ontario, Canada, 2001 to 2012: a population-based study. BMJ Open. 2015;5(8):e007232.
14. National Collaborating Centre for Determinants of Health. Let's Talk: Intersectionality [Internet]. Antigonish, NS: NCCDH, St. Francis Xavier University; 2022 [cited 5 July 2023]. Available from: <https://nccdh.ca/resources/entry/lets-talk-intersectionality>.
15. Abdi S, Bennett-AbuAyyash C, MacDonald L, Hohenadel K, Johnson KO, Leece P. Provincial implementation supports for socio-demographic data collection during COVID-19 in Ontario's public health system. Can J Public Health. 2021;112(5):853-61.
16. McKenzie K, Dube, S., Peterson, S., & Ontario Health,. Tracking Covid-19 Through Race-Based Data [Internet]. 2022 Sep 27 [cited 2023 Jan 4]. Available from: <https://www.ontariohealth.ca/sites/ontariohealth/files/2021-08/Tracking%20COVID%2019%20Through%20Race%20Based%20Data-EN.pdf>.
17. Public Health Agency of Canada. Inequalities in diabetes and related risk facotrs: Comparing Canadian adults by income level [Internet]. Ottawa, ON: Government of Canada; 2022 [updated 2022 July 07; cited 2023 Apr 11]. Available from: <https://www.canada.ca/en/public->

health/services/publications/science-research-data/inequalities-diabetes-related-risk-factors-comparing-adults-levels-income.html.

18. Canadian Institute for Health Information. Trends in income-related health inequalities in Canada. Canadian Institute for Health Information; 2015.
19. Canadian Partnership Against Cancer. Lung cancer and equity report [Internet]. Toronto, ON: Canadian Partnership Against Cancer; 2020 [updated 2022 cited 2023 Apr 11]. Available from: <https://www.partnershipagaincancer.ca/topics/lung-cancer-equity/outcomes/>.
20. Burkinshaw S, Terajima, Y., Wilkins, C.. Income Inequality in Canada [Internet]. 2022 Jul 26 [cited 2023 Feb 04]. Available from: <https://www.bankofcanada.ca/wp-content/uploads/2022/07/sdp2022-16.pdf>
21. Yalnizyan A. Canadian Centre for Policy Alternatives: The Rise of Canada's Richest 1% [Internet]. 2010 Dec [updated 2010 Dec; cited 2023 Feb 3]. Available from: <https://policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2010/12/Richest%201%20Percent.pdf>
22. Lee CR, A. Briggs. The Cost of Poverty in Ontario: 10 Years Later [Internet]. Toronto, Ontario: Feed Ontario; 2019 Oct 1 [cited 2023 Mar 10]. Available from: <https://feedontario.ca/research/cost-of-poverty-2019/>.
23. Mondor L, Cohen D, Khan AI, Wodchis WP. Income inequalities in multimorbidity prevalence in Ontario, Canada: a decomposition analysis of linked survey and health administrative data. *Int J Equity Health*. 2018;17(1):90.
24. Mondor L, Watson T, Kornas K, Bornbaum C, Wodchis WP, Rosella LC. Direct and indirect pathways between low income status and becoming a high-cost health care user in Ontario, Canada: a mediation analysis of health risk behaviors. *Ann Epidemiol*. 2020;51:28-34 e4.
25. Statistics Canada. Disaggregated trends in poverty from the 2021 Census of Population. [Internet]. 2022 Nov 09 [cited 2023 Jan 04]. Available from: <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-X/2021009/98-200-X2021009-eng.cfm>
26. Government of Canada. Transforming our Systems: the 2022 Report of the National Advisory Council on Poverty. [Internet]. 2022 [cited 2023 Feb 04]. Available from: https://www.canada.ca/content/dam/esdc-edsc/documents/programs/poverty-reduction/national-advisory-council/reports/2022-annual/NACP_2022-Report-EN-final.pdf
27. Government of Ontario. Building a Strong Foundation for Success: Reducing Poverty in Ontario (2020-2025). [Internet]. [cited 2023 Feb 04]. Available from: <https://www.ontario.ca/page/building-strong-foundation-success-reducing-poverty-ontario-2020-2025>.
28. Tarasuk V L, T, Farfard St-Germain, A. Household food insecurity in Canada, 2021. Research to identify policy options to reduce food insecurity (PROOF). Toronto; 2022.
29. Tarasuk V L, T, Farfard St-Germain, A. . Household food insecurity in Canada, 2021. Research to identify policy options to reduce food insecurity (PROOF). . Toronto; 2022.
30. Hutchinson J, Tarasuk V. The relationship between diet quality and the severity of household food insecurity in Canada. *Public Health Nutr*. 2022;25(4):1013-26.
31. Laraia BA. Food insecurity and chronic disease. *Advances in Nutrition*. 2013;4(2):203-12.
32. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. *The Journal of nutrition*. 2010;140(2):304-10.
33. Gucciardi E, Vahabi M, Norris N, Del Monte JP, Farnum C. The Intersection between Food Insecurity and Diabetes: A Review. *Curr Nutr Rep*. 2014;3(4):324-32.
34. Men F, Gundersen C, Urquia ML, Tarasuk V. Association between household food insecurity and mortality in Canada: a population-based retrospective cohort study. *CMAJ*. 2020;192(3):E53-E60.

35. Men F, Gundersen C, Urquia ML, Tarasuk V. Food Insecurity Is Associated With Higher Health Care Use And Costs Among Canadian Adults: Study examines the association of food insecurity with acute care hospitalization, same-day surgery, and acute care costs among Canadian adults. *Health Affairs*. 2020;39(8):1377-85.
36. Tarasuk V, Cheng J, Gundersen C, de Oliveira C, Kurdyak P. The relation between food insecurity and mental health care service utilization in Ontario. *The Canadian Journal of Psychiatry*. 2018;63(8):557-69.
37. Dalhousie University, The University of British Columbia, University of Guelph, University of Saskatchewan. *Canada's Food price Report 2023*. 2023.
38. Statistics Canada. Consumer Price Index, monthly, percentage change, not seasonally adjusted, Canada, provinces, Whitehorse and Yellowknife — Food [Internet]. Ottawa, ON: Government of Canada; 2023 [updated 2023 May 25; cited 2023 May 25]. Available from: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000403&pickMembers%5B0%5D=1.14&cubeTimeFrame.startMonth=04&cubeTimeFrame.startYear=2023&referencePeriods=20230401%2C20230401>.
39. PROOF. Provincial policy levers to reduce household food insecurity. Toronto: University of Toronto; 2021.
40. Tait CA, L'Abbe MR, Smith PM, Rosella LC. The association between food insecurity and incident type 2 diabetes in Canada: A population-based cohort study. *PLoS One*. 2018;13(5):e0195962.
41. Rolfe S, Garnham L, Godwin J, Anderson I, Seaman P, Donaldson C. Housing as a social determinant of health and wellbeing: developing an empirically-informed realist theoretical framework. *BMC Public Health*. 2020;20(1):1138.
42. Krieger J, Higgins DL. Housing and health: time again for public health action. *Am J Public Health*. 2002;92(5):758-68.
43. Wimalasena NN, Chang-Richards A, Wang KI, Dirks KN. Housing Risk Factors Associated with Respiratory Disease: A Systematic Review. *Int J Environ Res Public Health*. 2021;18(6).
44. Currie CL, Motz T, Copeland JL. The Impact of Racially Motivated Housing Discrimination on Allostatic Load among Indigenous University Students. *J Urban Health*. 2020;97(3):365-76.
45. Leon S II. Forced out: Evictions, race, and poverty in Toronto. [Internet]. Wellesley Institute; 2020 Aug [cited 2023 Feb 04]. Available from: <https://www.wellesleyinstitute.com/wp-content/uploads/2020/08/Forced-Out-Evictions-Race-and-Poverty-in-Toronto-.pdf>
46. Randle J HZ, Thurston Z. . Housing Statistics in Canada- Housing experiences in Canada: Black people in 2018 [Internet]. 2021 Nov 22 [cited 2023 Feb 04]. Available from: <https://www150.statcan.gc.ca/n1/pub/46-28-0001/2021001/article/00006-eng.htm>
47. Canadian Observatory on Homelessness. What is homelessness? [Internet]. Homeless Hub; 2021 [cited 26 June 2023]. Available from: <https://www.homelesshub.ca/about-homelessness/homelessness-101/what-homelessness#:~:text=According%20to%20the%20Canadian%20Definition,and%20ability%20of%20acquiring%20it.%E2%80%9D>.
48. Canadian Observatory on Homelessness. Top ten health issues facing homeless people [Internet]. Homeless hub; 2021 [cited 26 June 2023]. Available from: <https://www.homelesshub.ca/blog/top-ten-health-issues-facing-homeless-people>.
49. Statistics Canada. To buy or rent: The housing market continues to be reshaped by several factors as Canadians search for an affordable place to call home [Internet]. 2022 Sep 21 [cited 2023 Feb 07]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/220921/dq220921b-eng.htm>.
50. Statistics Canada. Core housing need in Canada [Internet]. 2022 Sep 21 [cited 2023 Apr 24]. Available from: <https://www150.statcan.gc.ca/n1/en/pub/11-627-m/11-627-m2022056-eng.pdf?st=olguTDFo>.

51. Statistics Canada. Table 98-10-0252-01 Shelter-cost-to-income ratio by tenure: Canada, provinces and territories, census metropolitan areas and census agglomerations [Internet]. 2023 Apr 24 [cited 2023 Apr 24]. Available from: <https://doi.org/10.25318/9810025201-eng>.
52. Statistics Canada. Housing conditions among racialized groups: A brief overview [Internet]. 2023 Jan 23 [cited 2023 Apr 24]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/230123/dq230123b-eng.htm>.
53. Williams DR, Lavizzo-Mourey R, Warren RC. The concept of race and health status in America. *Public Health Rep.* 1994;109(1):26-41.
54. Government of Canada. Inequalities in health of racialized adults in Canada [Internet]. 2022 Jul 07 [cited 2023 Jan 04]. Available from: <https://www.canada.ca/en/public-health/services/publications/science-research-data/inequalities-health-racialized-adults-18-plus-canada.html>
55. Public Health Agency of Canada. Social Determinants and Inequities in Health for Black Canadians: A Snapshot [Internet]. 2020 Sep 8 [cited 2023 Jan 04]. Available from: <https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health/social-determinants-inequities-black-canadians-snapshot.html>.
56. National Collaborating Centre for Determinants of Health. Let's Talk: Racism and Health Equity [Internet]. 2018 [cited 2023 Jan 04].
57. Government of Canada. Minister of National Defence Advisory Panel on Systemic Racism and Discrimination – Final Report. [Internet]. 2022 Jan [cited 2023 Jan 23]. Available from: <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/mnd-advisory-panel-systemic-racism-discrimination-final-report-jan-2022.html>
58. Fridares J. The Canadian Encyclopedia: Racism. [Internet]. 2006 Feb 7 [cited 2023 Jan 23]. Available from: <https://www.thecanadianencyclopedia.ca/en/article/racism>
59. Pager D, Shepherd H. The Sociology of Discrimination: Racial Discrimination in Employment, Housing, Credit, and Consumer Markets. *Annu Rev Sociol.* 2008;34:181-209.
60. Aspen Institute. Glossary for understanding the dismantling structural racism/promoting racial equity analysis. [Internet]. 2013 [cited 2023 Jan 04]. Available from: <https://www.aspeninstitute.org/wp-content/uploads/files/content/docs/rcc/RCC-Structural-Racism-Glossary.pdf>
61. David EJ ST, Fernandez J. Internalized racism: A systematic review of the psychological literature on racism's most insidious consequence. *Journal of Social Issues.* 2019 Dec;75(4):1057-86.
62. Datta G, Siddiqi A, Lofters A. Transforming race-based health research in Canada. *CMAJ.* 2021;193(3):E99-E100.
63. Siddiqi A, Shahidi FV, Ramraj C, Williams DR. Associations between race, discrimination and risk for chronic disease in a population-based sample from Canada. *Soc Sci Med.* 2017;194:135-41.
64. Veenstra G, Patterson AC. Black-White Health Inequalities in Canada. *J Immigr Minor Health.* 2016;18(1):51-7.
65. Henry N. Black Enslavement in Canada [Internet]. 2016 Jun 16 [cited 2023 Jan]. Available from: <https://www.thecanadianencyclopedia.ca/en/article/black-enslavement>
66. The Ontario Human Rights Commission. Racial Discrimination. [Internet]. [cited 2023 Jan 4]. Available from: <https://www.ohrc.on.ca/en/racial-discrimination-brochure>
67. Statistics Canada. Portrait of the social, political and economic participation of racialized groups [Internet]. 2022 May 17 [cited 2023 Jan 4]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/220517/dq220517c-eng.htm>
68. Lacey KK, Briggs AQ, Park J, Jackson JS. Social and economic influences on disparities in the health of racial and ethnic group Canadian immigrants. *Can J Public Health.* 2021;112(3):482-92.
69. Paradies Y, Ben J, Denson N, Elias A, Priest N, Pieterse A, et al. Racism as a Determinant of Health: A Systematic Review and Meta-Analysis. *PLoS One.* 2015;10(9):e0138511.

70. Benjamins MR, Whitman S. Relationships between discrimination in health care and health care outcomes among four race/ethnic groups. *J Behav Med*. 2014;37(3):402-13.
71. Mahabir DF, O'Campo P, Lofters A, Shankardass K, Salmon C, Muntaner C. Experiences of everyday racism in Toronto's health care system: a concept mapping study. *Int J Equity Health*. 2021;20(1):74.
72. Public Health Ontario. COVID-19 in Ontario – A Focus on Neighbourhood Diversity, February 26, 2020 to December 13, 2021 [Internet]. Ontario: 2022 Apr [cited 2023 Jan 4]. Available from: <https://www.publichealthontario.ca/-/media/documents/ncov/epi/2020/06/covid-19-epi-diversity.htm>
73. Government of Ontario. Annual progress report 2021: Ontario's Anti-racism strategic plan. [Internet]. 2021 [cited 2023 Jan 31]. Available from: <https://www.ontario.ca/page/annual-progress-report-2021-ontarios-anti-racism-strategic-plan>
74. Canadian Institute for Health Information. Race-Based and Indigenous Identity Data Collection and Health Reporting in Canada — Supplementary Report. . Ottawa, ON: CIHI; 2022
75. Ontario Health. Ontario Health's Equity, Inclusion, Diversity and Anti-Racism Framework [Internet]. Ontario: 2022 Jun 14 [cited 2023 Jul 13]. Available from: <https://www.ontariohealth.ca/sites/ontariohealth/files/2020-12/Equity%20Framework.pdf>.
76. Zhang K, Ran B. Active Health Governance—A Conceptual Framework Based on a Narrative Literature Review. *International Journal of Environmental Research and Public Health*. 2022;19(4):2289.
77. Poitras M-E, Vaillancourt VT, Canapé A, Boudreault A, Bacon K, Hatcher S. Culturally safe interventions in primary care for the management of chronic diseases of urban Indigenous People: a scoping review. *Family Medicine and Community Health*. 2022;10(Suppl 1).
78. Chiefs of Ontario, Cancer Care Ontario and Institute for Clinical Evaluative Sciences,. Cancer in First Nations People in Ontario: Incidence, Mortality, Survival and Prevalence. Toronto; 2017.
79. First Nations Information Governance Centre. First Nations Regional Health Survey (RHS) 2008/10: national report on adults, youth and children living in First Nations communities. . Ottawa; 2012.
80. Foulds HJA, Bredin SSD, Warburton DER. Cardiovascular dynamics of Canadian Indigenous peoples. *Int J Circumpolar Health*. 2018;77(1):1421351.
81. Gershon AS, Khan S, Klein-Geltink J, Wilton D, To T, Crighton EJ, et al. Asthma and chronic obstructive pulmonary disease (COPD) prevalence and health services use in Ontario Metis: a population-based cohort study. *PLoS One*. 2014;9(4):e95899.
82. Reading J. Confronting the Growing Crisis of Cardiovascular Disease and Heart Health Among Aboriginal Peoples in Canada. *Can J Cardiol*. 2015;31(9):1077-80.
83. Slater M, Green ME, Shah B, Khan S, Jones CR, Sutherland R, et al. First Nations people with diabetes in Ontario: methods for a longitudinal population-based cohort study. *CMAJ Open*. 2019;7(4):E680-E8.
84. Miller JR. Residential Schools in Canada [Internet]. 2012 Oct 10 [updated 2023 Jan 6; cited 2023 Feb 04]. Available from: <https://thecanadianencyclopedia.ca/en/article/residential-schools>
85. Phillips-Beck W, Sinclair S, Campbell R, Star L, Cidro J, Wicklow B, et al. Early-life origins of disparities in chronic diseases among Indigenous youth: pathways to recovering health disparities from intergenerational trauma. *J Dev Orig Health Dis*. 2019;10(1):115-22.
86. Parrot Z. The Canadian Encyclopedia: Indigenous Peoples in Canada [Internet]. 2007 Mar 13 [updated 2023 Jan 11 cited 2023 Feb 04]. Available from: <https://www.thecanadianencyclopedia.ca/en/article/aboriginal-people#:~:text=Indigenous%20peoples%20have%20been%20in,of%20life%20were%20forever%20altered>.
87. Roberts C, Barton G, McDonald A. Supporting First Nations, Inuit and Metis (FNIM) in an oncology setting-My experience as a FNIM Nurse Navigator. *Can Oncol Nurs J*. 2020;30(4):300-3.

88. Rosella LC, Kornas K, Green ME, Shah BR, Walker JD, Frymire E, et al. Characterizing risk of type 2 diabetes in First Nations people living in First Nations communities in Ontario: a population-based analysis using cross-sectional survey data. *CMAJ Open*. 2020;8(1):E178-E83.
89. Truth and Reconciliation Commission of Canada. Calls to Action [Internet]. 2015 [cited 2023 Feb 04]. Available from: https://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/indigenous-people/aboriginal-peoples-documents/calls_to_action_english2.pdf
90. Benoit AC CJ, O'Brien-Teengs D, Greene S, Beaver K, Zoccole A, Loutfy M,. Racism experiences of urban indigenous women in Ontario, Canada: "We all have that story that will break your heart". *International Indigenous policy journal*. 2019 Apr 1;10(2).
91. Boyer Y. Healing racism in Canadian health care. *CMAJ*. 2017;189(46):E1408-E9.
92. Hacker KA, Briss PA, Richardson L, Wright J, Petersen R. COVID-19 and Chronic Disease: The Impact Now and in the Future. *Prev Chronic Dis*. 2021;18:E62.
93. Kitching GT, Firestone M, Schei B, Wolfe S, Bourgeois C, O'Campo P, et al. Unmet health needs and discrimination by healthcare providers among an Indigenous population in Toronto, Canada. *Can J Public Health*. 2020;111(1):40-9.
94. Statistics Canada. Impact of Indigenous Peoples [Internet]. 2020 Oct 20 [cited 2023 Feb 14]. Available from: <https://www150.statcan.gc.ca/n1/pub/11-631-x/2020004/s7-eng.htm>
95. Statistics Canada. A snapshot: Status First Nations people in Canada. 2021 Apr 20.
96. Statistics Canada. Housing conditions among First Nations people, Métis, and Inuit in Canada from the 2021 Census [Internet]. 2022 Sep 21 [cited 2023 Feb 14]. Available from: <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-X/2021007/98-200-X2021007-eng.cfm>
97. Belanger YD AO, Weasel Head G,. Homelessness, urban Aboriginal people, and the need for a national enumeration. *Aboriginal Policy Studies*. 2013 Feb 19;2(2).
98. Parsons H. More than Just a number: addressing the homelessness, addiction, and mental health crisis in the North [Internet]. 2022 Aug [cited 2023 Feb 14]. Available from: <https://www.aptnnews.ca/wp-content/uploads/2022/08/homelessness-mental-health-and-addiction.pdf>
99. Government of Ontario. Ontario Investing in Indigenous Supportive Housing [Internet]. 2022 Jan 13 [cited 2023 Feb 14]. Available from: <https://news.ontario.ca/en/release/1001419/ontario-investing-in-indigenous-supportive-housing>
100. McIvor O, Napoleon A, Dickie KM. Language and culture as protective factors for at-risk communities. *International Journal of Indigenous Health*. 2009;5(1):6-25.
101. Wilson K, Rosenberg MW. Exploring the determinants of health for First Nations peoples in Canada: can existing frameworks accommodate traditional activities? *Social science & medicine*. 2002;55(11):2017-31.
102. Cancer Care Ontario. Path to Prevention – Recommendations for Reducing Chronic Disease in First Nations, Inuit and Métis. . Toronto: Queen's Printer for Ontario; 2016.
103. Cancer Care Ontario. Prevention System Quality Index: health equity. Toronto, ON: Queen's Printer for Ontario; 2018.
104. Chiefs of Ontario and Cancer Care Ontario. Cancer in First Nations in Ontario: Risk Factors and Screening. Toronto; 2016.
105. Johnson S, First Nations Health Authority. Healthy Food Guidelines for First Nations Communities [Internet]. 2016 [cited 2023 Feb 14]. Available from: https://www.fnha.ca/documents/healthy_food_guidelines_for_first_nations_communities.pdf
106. CBC News. Grocery prices up nearly 20 per cent for some in Thunder Bay district. [Internet]. 2022 Dec 16 [cited 2023 May 2]. Available from: <https://www.cbc.ca/news/canada/thunder-bay/thunder-bay-grocery-prices-1.6687634>.

107. Elton-Marshall T, Leatherdale ST, Burkhalter R. Tobacco, alcohol and illicit drug use among Aboriginal youth living off-reserve: results from the Youth Smoking Survey. *CMAJ*. 2011;183(8):E480-6.
108. Sikorski C, Leatherdale S, Cooke M. Tobacco, alcohol and marijuana use among Indigenous youth attending off-reserve schools in Canada: cross-sectional results from the Canadian Student Tobacco, Alcohol and Drugs Survey. *Health Promot Chronic Dis Prev Can*. 2019;39(6-7):207-15.
109. Ritchie AJ, Reading JL. Tobacco smoking status among Aboriginal youth. *Int J Circumpolar Health*. 2004;63 Suppl 2:405-9.
110. Statistics Canada. Low-income statistics for the population living on reserve and in the North using the 2016 Census [Internet]. 2021 Sep 21 [cited 2023 Feb 14]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/210921/dq210921d-eng.htm>
111. Batal M, Chan HM, Fediuk K, Ing A, Berti PR, Mercille G, et al. First Nations households living on-reserve experience food insecurity: prevalence and predictors among ninety-two First Nations communities across Canada. *Can J Public Health*. 2021;112(Suppl 1):52-63.
112. Alexander Y SJ, Caroline C,. Cancer risk factors and screening in First Nations in Ontario. *Health promotion and chronic disease prevention in Canada: research, policy and practice*. 2017 Jun;37(6):186.
113. Baillie CP JA, Drane S, LePage R, Whitecrow D, Lévesque L,. For the community, by the community: working with youth to understand the physical activity-environment relationship in First Nations communities. *Youth Engagement in Health Promotion*. 2016 Sep 27;1(2).
114. Findlay LC. Physical activity among First Nations people off reserve, Metis and Inuit. *Health Rep*. 2011;22(1):47-54.
115. Bruce SG, Riediger ND, Lix LM. Chronic disease and chronic disease risk factors among First Nations, Inuit and Metis populations of northern Canada. *Chronic Dis Inj Can*. 2014;34(4):210-7.
116. Stewart SH, Sherry SB, Comeau MN, Mushquash CJ, Collins P, Van Wilgenburg H. Hopelessness and Excessive Drinking among Aboriginal Adolescents: The Mediating Roles of Depressive Symptoms and Drinking to Cope. *Depress Res Treat*. 2011;2011:970169.
117. Hele K. The Canadian Encyclopedia: Reserves in Ontario [Internet]. 2019 Jun 14 [updated 2022 Nov 11; cited 2023 Apr 17]. Available from: <https://www.thecanadianencyclopedia.ca/en/article/reserves-in-ontario>.
118. Turin TC, Saad N, Jun M, Tonelli M, Ma Z, Barnabe CCM, et al. Lifetime risk of diabetes among First Nations and non-First Nations people. *CMAJ*. 2016;188(16):1147-53.
119. Anand SS, Abonyi S, Arbour L, Balasubramanian K, Brook J, Castleden H, et al. Explaining the variability in cardiovascular risk factors among First Nations communities in Canada: a population-based study. *Lancet Planet Health*. 2019;3(12):e511-e20.
120. Vervoort D, Kimmaliardjuk DM, Ross HJ, Fremes SE, Ouzounian M, Mashford-Pringle A. Access to Cardiovascular Care for Indigenous Peoples in Canada: A Rapid Review. *CJC Open*. 2022;4(9):782-91.
121. Garaszczuk R, Yong JHE, Sun Z, de Oliveira C. The Economic Burden of Cancer in Canada from a Societal Perspective. *Curr Oncol*. 2022;29(4):2735-48.
122. Chiefs of Ontario, Cancer Care Ontario and Institute for Clinical Evaluation Sciences,. Lung cancer in First Nations people in Ontario: incidence, mortality, survival and prevalence. Toronto, ON: Chiefs of Ontario, Cancer Care Ontario and Institute for Clinical Evaluation Sciences; 2017.
123. Sheppard AJ, Chiarelli AM, Marrett LD, Mirea L, Nishri ED, Trudeau ME, et al. Detection of later stage breast cancer in First Nations women in Ontario, Canada. *Canadian Journal of Public Health*. 2010;101:101-5.
124. Tungasuvvingat Inuit and Cancer Care Ontario. Cancer Risk Factors and Screening Among Inuit in Ontario and Other Canadian Regions. . Toronto; 2017.

125. Akande VO, Hendriks AM, Ruiter RA, Kremers SP. Determinants of dietary behavior and physical activity among Canadian Inuit: a systematic review. *Int J Behav Nutr Phys Act*. 2015;12:84.
126. Egeland GM, Cao Z, Young TK. Hypertriglyceridemic-waist phenotype and glucose intolerance among Canadian Inuit: the international polar year Inuit health survey for adults 2007–2008. *CMAJ*. 2011;183(9):E553-E8.
127. Indigenous Services Canada. Diabetes [Internet]. Ottawa, ON: Government of Canada; 2021 [updated 2021 June 08; cited 2023 May 03]. Available from: <https://www.sac-isc.gc.ca/eng/1569960595332/1569960634063>.
128. Tvermosegaard M, Dahl-Petersen IK, Nielsen NO, Bjerregaard P, Jørgensen ME. Cardiovascular disease susceptibility and resistance in circumpolar inuit populations. *Canadian Journal of Cardiology*. 2015;31(9):1116-23.
129. Cancer Care Ontario. Path to prevention: recommendations for reducing chronic disease in First Nations, Inuit and Métis. Toronto, ON: Queen's Printer for Ontario; 2016.
130. Healey S, Plaza D, Osborne G. A Ten-Year Profile of Cancer in Nunavut. Iqaluit, NU: Nunavut Department of Health and Social Services. 2003.
131. Quanuipitaa? National Health Survey. About [Internet]. Quanuipitaa? National Health Survey, ; 2021 [cited 2023 May 3]. Available from: <https://nationalinuithealthsurvey.ca/about/>.
132. Métis Nation of Ontario. Chronic disease and risk factors in the Métis population of Ontario: key research findings [Internet]. Ottawa, ON: 2015 [cited 2023 May 03]. Available from: https://www.metisnation.org/wp-content/uploads/2020/04/key20findings-factsheet-en_6.pdf.
133. Tjepkema M, Wilkins R, Senécal S, Guimond É, Penney C. Mortality of Métis and registered Indian adults in Canada: an 11-year follow-up study. *Health Rep*. 2009;20(4):31-51.
134. Khan S, Henry DA, Gershon AS. Chronic airways disease in First Nations, Inuit and Metis in Canada. *Can Respir J*. 2012;19(6):353-4.
135. Kovesi T, Gilbert NL, Stocco C, Fugler D, Dales RE, Guay M, et al. Indoor air quality and the risk of lower respiratory tract infections in young Canadian Inuit children. *CMAJ*. 2007;177(2):155-60.
136. Atzema CL, Khan S, Lu H, Allard YE, Russell SJ, Gravelle MR, et al. Cardiovascular disease rates, outcomes, and quality of care in Ontario Métis: a population-based cohort study. *PLoS One*. 2015;10(3):e0121779.
137. Shah BR, Cauch-Dudek K, Pigeau L. Diabetes prevalence and care in the Métis population of Ontario, Canada. *Diabetes care*. 2011;34(12):2555-6.
138. Baliunas D, Patra J, Rehm J, Popova S, Kaiserman M, Taylor B. Smoking-attributable mortality and expected years of life lost in Canada 2002: conclusions for prevention and policy. *Chronic Dis Can*. 2007;27(4):154-62.
139. Carter BD, Abnet CC, Feskanich D, Freedman ND, Hartge P, Lewis CE, et al. Smoking and mortality--beyond established causes. *N Engl J Med*. 2015;372(7):631-40.
140. Government of Canada. Smoking and Mortality [Internet]. 2011 Sep 21 [cited 2022 Dec 12]. Available from: <https://www.canada.ca/en/health-canada/services/health-concerns/tobacco/legislation/tobacco-product-labelling/smoking-mortality.html#note1>.
141. Loretan CG CM, Jamal A, Cheng YJ, Homa DM. Cigarette Smoking Among US Adults With Selected Chronic Diseases Associated With Smoking, 2010–2019. *Preventing Chronic Disease*. 2022 Sep 29;19(E62).
142. Liu Y, Pleasants RA, Croft JB, Wheaton AG, Heidari K, Malarcher AM, et al. Smoking duration, respiratory symptoms, and COPD in adults aged ≥45 years with a smoking history. *Int J Chron Obstruct Pulmon Dis*. 2015;10:1409-16.
143. International Agency for Research on Cancer. Personal habits and indoor combustions. Geneva, CH: WHO; 2012.
144. Canadian Cancer Society. Cigarettes: the hard truth [Internet]. [cited 2023 Apr 10]. Available from: <https://cancer.ca/en/cancer-information/reduce-your-risk/live-smoke-free/cigarettes-the-hard-truth>.

145. Jiang C, Chen Q, Xie M. Smoking increases the risk of infectious diseases: A narrative review. *Tob Induc Dis*. 2020;18:60.
146. Patanavanich R, Glantz SA. Smoking Is Associated With COVID-19 Progression: A Meta-analysis. *Nicotine Tob Res*. 2020;22(9):1653-6.
147. Primatesta P, Falaschetti E, Gupta S, Marmot MG, Poulter NR. Association between smoking and blood pressure: evidence from the health survey for England. *Hypertension*. 2001;37(2):187-93.
148. U.S. Department of Health and Human Services. Smoking Cessation: A Report of the Surgeon General. Atlanta, GA; 2020
149. Maddatu J, Anderson-Baucum E, Evans-Molina C. Smoking and the risk of type 2 diabetes. *Transl Res*. 2017;184:101-7.
150. Cancer Care Ontario, Public Health Ontario. The burden of chronic diseases in Ontario. Toronto, ON: CCO and Public Health Ontario; 2019.
151. Ontario Health and Ontario Agency for Health Protection and Promotion (Public Health Ontario). Burden of Health Conditions Attributable to Smoking and Alcohol by Public Health Unit in Ontario. Toronto: King's Printer for Ontario; 2023 Feb.
152. Manuel DG WA, Rohit Dass A, Laporte A, Gandhi S, Bennett C. Health Care Cost of Smoking in Ontario, 2003 to 2041. Toronto ON: Institute for Clinical Evaluative Sciences; 2018.
153. Kim-Mozeleski JE, Pandey R, Tsoh JY. Psychological distress and cigarette smoking among U.S. households by income: Considering the role of food insecurity. *Prev Med Rep*. 2019;16:100983.
154. Moylan S, Jacka FN, Pasco JA, Berk M. How cigarette smoking may increase the risk of anxiety symptoms and anxiety disorders: a critical review of biological pathways. *Brain Behav*. 2013;3(3):302-26.
155. Rosario M, Schrimshaw EW, Hunter J. Cigarette smoking as a coping strategy: negative implications for subsequent psychological distress among lesbian, gay, and bisexual youths. *J Pediatr Psychol*. 2011;36(7):731-42.
156. Skov-Ettrup LS, Nordestgaard BG, Petersen CB, Tolstrup JS. Does High Tobacco Consumption Cause Psychological Distress? A Mendelian Randomization Study. *Nicotine Tob Res*. 2017;19(1):32-8.
157. Tomioka K, Shima M, Saeki K. Association between heaviness of cigarette smoking and serious psychological distress is stronger in women than in men: a nationally representative cross-sectional survey in Japan. *Harm Reduct J*. 2021;18(1):27.
158. Fairman RT, Weaver SR, Nyman AL, Popova L, Massey Z, Reynolds RM, et al. Disparities among smokers during the COVID-19 pandemic: Examination of COVID-19-related worries by sociodemographic factors in a U.S. Nationally representative survey. *Prev Med Rep*. 2022;28:101835.
159. Jackson SE, Brown J, Shahab L, Steptoe A, Fancourt D. COVID-19, smoking and inequalities: a study of 53 002 adults in the UK. *Tob Control*. 2021;30(e2):e111-e21.
160. Minian N, Veldhuizen S, Tanzini E, Duench S, deRuiter WK, Barker M, et al. Changes in the reach of a smoking cessation program in Ontario, Canada, during the COVID-19 pandemic: a cross-sectional study. *Canadian Medical Association Open Access Journal*. 2021;9(4):E957-E65.
161. Hartmann-Boyce J, Lindson N, Butler AR, McRobbie H, Bullen C, Begh R, et al. Electronic cigarettes for smoking cessation. *Cochrane Database Syst Rev*. 2022;11(11):CD010216.
162. Park JA, Crotty Alexander LE, Christiani DC. Vaping and Lung Inflammation and Injury. *Annu Rev Physiol*. 2022;84:611-29.
163. Wills TA, Soneji SS, Choi K, Jaspers I, Tam EK. E-cigarette use and respiratory disorders: an integrative review of converging evidence from epidemiological and laboratory studies. *Eur Respir J*. 2021;57(1).
164. Government of Canada. Canada's Tobacco Strategy. [Internet]. 2022 Feb 7 [updated 2022 Dec 19; cited 2022 Dec 8]. Available from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/canada-tobacco-strategy.html>

165. Chaiton M, Callard C. Mind the Gap: Disparities in Cigarette Smoking in Canada. *Tob Use Insights*. 2019;12:1179173X19839058.
166. Gostin LO. Tobacco endgame: the poverty conundrum. *Hastings Cent Rep*. 2014;44(3):10-1.
167. Reid JL, Hammond D, Boudreau C, Fong GT, Siahpush M, Collaboration ITC. Socioeconomic disparities in quit intentions, quit attempts, and smoking abstinence among smokers in four western countries: findings from the International Tobacco Control Four Country Survey. *Nicotine Tob Res*. 2010;12 Suppl(Suppl 1):S20-33.
168. Hill S, Amos A, Clifford D, Platt S. Impact of tobacco control interventions on socioeconomic inequalities in smoking: review of the evidence. *Tob Control*. 2014;23(e2):e89-97.
169. Smith CE, Hill SE, Amos A. Impact of population tobacco control interventions on socioeconomic inequalities in smoking: a systematic review and appraisal of future research directions. *Tob Control*. 2020;30(e2):e87-95.
170. 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;17(4):230-7.
171. World Health Organization. WHO report on the global tobacco epidemic, 2017: monitoring tobacco use and prevention policies. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO.
172. Public Health Ontario. Ontario Tobacco Monitoring Report 2018 [Internet]. 2018 [cited 2022 Dec 13]. Available from: https://www.health.gov.on.ca/en/common/ministry/publications/reports/SmokeFreeOntario/SFO_The_Next_Chapter.pdf
173. Nazar GP, Sharma N, Chugh A, Abdullah SM, Lina S, Mdege ND, et al. Impact of tobacco price and taxation on affordability and consumption of tobacco products in the South-East Asia Region: A systematic review. *Tob Induc Dis*. 2021;19:97.
174. Blakely T, Gartner C. Tobacco taxes have mixed effects on socioeconomic disparities. *Lancet Public Health*. 2019;4(12):e595-e6.
175. Partos TR, Hiscock R, Gilmore AB, Branston JR, Hitchman S, McNeill A. Impact of tobacco tax increases and industry pricing on smoking behaviours and inequalities: a mixed-methods study. *Public Health Research*. 2020.
176. Wilkinson AL, Scollo MM, Wakefield MA, Spittal MJ, Chaloupka FJ, Durkin SJ. Smoking prevalence following tobacco tax increases in Australia between 2001 and 2017: an interrupted time-series analysis. *Lancet Public Health*. 2019;4(12):e618-e27.
177. Sheikh ZD, Branston JR, Gilmore AB. Tobacco industry pricing strategies in response to excise tax policies: a systematic review. *Tob Control*. 2023;32(2):239-50.
178. Government of Ontario. Tobacco Tax [Internet]. 2022 Feb 24 [cited 2022 Dec 15]. Available from: <https://www.ontario.ca/document/tobacco-tax>
179. Government of Canada. Excise Duty Rates [Internet]. 2022 Dec 12 [updated 2023 Mar 03; cited 2022 Dec 15]. Available from: https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/edrates/excise-duty-rates.html#_Toc527013628.
180. Chaiton M, Mecredy G, Rehm J, Samokhvalov AV. Tobacco retail availability and smoking behaviours among patients seeking treatment at a nicotine dependence treatment clinic. *Tob Induc Dis*. 2014;12(1):19.
181. Lee JGL, Kong AY, Sewell KB, Golden SD, Combs TB, Ribisl KM, et al. Associations of tobacco retailer density and proximity with adult tobacco use behaviours and health outcomes: a meta-analysis. *Tob Control*. 2022;31(e2):e189-e200.
182. Agaku IT, Adisa AO, Omaduvie UT, Vardavas CI. The relationship between proximity of tobacco retail outlets to schools and tobacco use among school personnel in sub-Saharan Africa. *Prev Med*. 2014;69:21-7.

183. Finan LJ, Lipperman-Kreda S, Abadi M, Grube JW, Kaner E, Balassone A, et al. Tobacco outlet density and adolescents' cigarette smoking: a meta-analysis. *Tob Control*. 2019;28(1):27-33.
184. Chaiton MO, Mecredy GC, Cohen JE, Tilson ML. Tobacco retail outlets and vulnerable populations in Ontario, Canada. *Int J Environ Res Public Health*. 2013;10(12):7299-309.
185. Guindon GE, Montreuil A, Driezen P, Stahlbaum R, Giolat D, Baskerville NB. Do cigarette prices near secondary schools vary by area-level socioeconomic status? Findings from a field study in Ontario and Quebec, Canada. *Health Place*. 2023;79:102936.
186. Driezen P, Guindon GE, Hammond D, Thompson ME, Quah ACK, Fong GT. Contraband Cigarette Purchasing from First Nation reserves in Ontario and Quebec: Findings from the 2002-2014 ITC Canada Survey. *Int J Drug Policy*. 2020;75:102612.
187. Jetty R, Canadian Paediatric Society FNI, Metis Health Committee OO. Tobacco use and misuse among Indigenous children and youth in Canada. *Paediatr Child Health*. 2017;22(7):395-405.
188. Maddox R, Waa A, Lee K, Nez Henderson P, Blais G, Reading J, et al. Commercial tobacco and indigenous peoples: a stock take on Framework Convention on Tobacco Control progress. *Tob Control*. 2019;28(5):574-81.
189. Palmer M CM, Schwartz R. Commercial Tobacco Reduction in Indigenous Communities: 2017 Literature Update [Internet]. Toronto: Ontario Tobacco Research Unit 2017 Mar [cited cited 2022 Dec 23].
190. Pearson AL, Cleghorn CL, van der Deen FS, Cobiack LJ, Kvizhinadze G, Nghiem N, et al. Tobacco retail outlet restrictions: health and cost impacts from multistate life-table modelling in a national population. *Tob Control*. 2016.
191. Fischer F, Kraemer A. Meta-analysis of the association between second-hand smoke exposure and ischaemic heart diseases, COPD and stroke. *BMC Public Health*. 2015;15:1202.
192. Mariano LC, Warnakulasuriya S, Straif K, Monteiro L. Secondhand smoke exposure and oral cancer risk: a systematic review and meta-analysis. *Tob Control*. 2022;31(5):597-607.
193. Poirier AE, Ruan Y, Grevers X, Walter SD, Villeneuve PJ, Friedenreich CM, et al. Estimates of the current and future burden of cancer attributable to active and passive tobacco smoking in Canada. *Preventive medicine*. 2019;122:9-19.
194. Murthy VH. Reducing Exposure to Secondhand Smoke: Let's Keep the Momentum Going. *Public Health Rep*. 2016;131(4):515-7.
195. Driezen P, Kaufman P, Chaiton M, Goodman S, Hammond D. Prevalence and factors associated with self-reported exposure to secondhand cannabis smoke in the United States and Canada in 2019. *Prev Med*. 2022;157:107006.
196. Ghasemiesfe M, Ravi D, Vali M, Korenstein D, Arjomandi M, Frank J, et al. Marijuana Use, Respiratory Symptoms, and Pulmonary Function: A Systematic Review and Meta-analysis. *Ann Intern Med*. 2018;169(2):106-15.
197. Holitzki H, Dowsett LE, Spackman E, Noseworthy T, Clement F. Health effects of exposure to second- and third-hand marijuana smoke: a systematic review. *CMAJ Open*. 2017;5(4):E814-E22.
198. Ontario Ministry of Health and Long-Term Care. School health guidelines, 2018. Toronto, ON: Queen's Printer for Ontario; 2018.
199. Smoke-free Housing Ontario. Second-hand smoke in multi-unit housing: a tenant's guide. [Internet]. 2015 [cited 2022 Dec 23]. Available from: https://smokefreehousingon.ca/wp-content/uploads/2015/12/SFO-Tenants-Guide_Web-Use.pdf
200. Driezen P, Fong GT, Hyland A, Craig LV, Sansone G, Hitchman SC, et al. Self-Reported Exposure to Secondhand Smoke and Support for Complete Smoking Bans in Multiunit Housing Among Smokers in the United States, Canada, and the United Kingdom. *Prev Chronic Dis*. 2020;17:E147.
201. King BA, Travers MJ, Cummings KM, Mahoney MC, Hyland AJ. Prevalence and predictors of smoke-free policy implementation and support among owners and managers of multiunit housing. *Nicotine Tob Res*. 2010;12(2):159-63.

202. Government of Yukon. Yukon Housing Corporation Smoke-free Housing Policy. Whitehorse: Queen's Printer for Yukon [Internet]. 2018 Sep 06 [cited 2022 Oct 12]. Available from: <https://yukon.ca/en/yukon-housing-smoke-free-housing-policy>.
203. Saskatchewan Go. Saskatchewan Housing Corporation Introduces No-Smoking Policy [Internet]. Regina: Publications Saskatchewan; 2018 Jun 20 [cited 2022 Oct 12]. Available from: <https://www.saskatchewan.ca/government/news-and-media/2018/june/20/no-smoking-policy>
204. U.S Housing and Urban Development. Smoke-free Public Housing [Internet]. Washington, DC: [cited 2022 Oct 12]. Available from: <https://www.hud.gov/smokefreepublichousing>
205. Choi HK, Ataucuri-Vargas J, Lin C, Singrey A. The current state of tobacco cessation treatment. *Cleve Clin J Med*. 2021;88(7):393-404.
206. Government of Canada. Quitting smoking: provincial and territorial services [Internet]. 2022 Nov 10 [cited 2022 Dec 23]. Available from: <https://www.canada.ca/en/health-canada/services/smoking-tobacco/quit-smoking/provincial-territorial-services.html>
207. Centre for Addiction and Mental Health CANftADaAoP-iTT. Canadian Smoking Cessation Clinical Practice Guideline [Internet]. Toronto, Canada: 2011 [
208. Canadian Partnership Against Cancer. Strategic priorities for Ontario. [Internet]. N.D. [cited 2022 Dec 23]. Available from: <https://www.partnershipagaincancer.ca/cancer-strategy/strategic-priorities/priority-1-decrease-risk/>
209. Government of Ontario. Support to quit smoking [Internet]. 2022 [updated 2022 Apr 22 cited 2022 Dec 23]. Available from: <https://www.ontario.ca/page/support-quit-smoking#:~:text=visit%20Health%20Connect%20Ontario%20or,programs%20and%20text%2Dmessage%20support>.
210. Rzepka AM, Wong L, Chaudhry M, Sproule BA, He N, Cadarette SM. The Ontario Pharmacy Evidence Network Atlas of Smoking Cessation Services. *Can Pharm J (Ott)*. 2022;155(4):194-9.
211. Barberia-Latasa M, Gea A, Martinez-Gonzalez MA. Alcohol, Drinking Pattern, and Chronic Disease. *Nutrients*. 2022;14(9).
212. Zhong L, Chen W, Wang T, Zeng Q, Lai L, Lai J, et al. Alcohol and Health Outcomes: An Umbrella Review of Meta-Analyses Base on Prospective Cohort Studies. *Front Public Health*. 2022;10:859947.
213. World Cancer Research Fund. Alcohol drinks and the risk of cancer. London, UK: World Cancer Reaserch Fund International; 2018.
214. Freedman ND, Abnet CC. Reducing Alcohol Use for Cancer Prevention. *JAMA Netw Open*. 2022;5(8):e2228552.
215. Klein WMP, Jacobsen PB, Helzlsouer KJ. Alcohol and Cancer Risk: Clinical and Research Implications. *Jama*. 2020;323(1):23-4.
216. Rumgay H, Shield K, Charvat H, Ferrari P, Sornpaisarn B, Obot I, et al. Global burden of cancer in 2020 attributable to alcohol consumption: a population-based study. *Lancet Oncol*. 2021;22(8):1071-80.
217. World Heart Federation. The impact of alcohol consumption on cardiovascular health: Myths and measures.
218. Griswold MG FN, Hawley C, Arian N, Zimsen SR, Tymeson HD, Venkateswaran V, Tapp AD, Forouzanfar MH, Salama JS, Abate KH. Alcohol use and burden for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*. 2018 Sep 22;392(10152):1015-35.
219. Kellerborg K, Danielsson AK, Allebeck P, Coates MM, Agardh E. Disease burden attributed to alcohol: How methodological advances in the Global Burden of Disease 2013 study have changed the estimates in Sweden. *Scand J Public Health*. 2016;44(6):604-10.
220. Zhao J, Stockwell T, Roemer A, Naimi T, Chikritzhs T. Alcohol consumption and mortality from coronary heart disease: an updated meta-analysis of cohort studies. *Journal of studies on alcohol and drugs*. 2017;78(3):375-86.

221. Brien SE, Ronksley PE, Turner BJ, Mukamal KJ, Ghali WA. Effect of alcohol consumption on biological markers associated with risk of coronary heart disease: systematic review and meta-analysis of interventional studies. *Bmj*. 2011;342:d636.
222. Knott C, Bell S, Britton A. Alcohol Consumption and the Risk of Type 2 Diabetes: A Systematic Review and Dose-Response Meta-analysis of More Than 1.9 Million Individuals From 38 Observational Studies. *Diabetes care*. 2015;38(9):1804-12.
223. Schrieke IC, Heil AL, Hendriks HF, Mukamal KJ, Beulens JW. The effect of alcohol consumption on insulin sensitivity and glycemic status: a systematic review and meta-analysis of intervention studies. *Diabetes care*. 2015;38(4):723-32.
224. Stockwell T, Naimi T. Study raises new doubts regarding the hypothesised health benefits of 'moderate' alcohol use. *Evid Based Med*. 2016;21(4):156.
225. Yang JH, Jeong JA, Kweon SS, Lee YH, Choi SW, Ryu SY, et al. Causal Association Between Alcohol Consumption and Atrial Fibrillation: A Mendelian Randomization Study. *Korean Circ J*. 2022;52(3):220-30.
226. Paradis, C., Butt, P., Shield, K., Poole, N., Wells, S., Naimi, T., Sherk, A., & the Low-Risk Alcohol Drinking Guidelines Scientific Expert Panels. Canada's Guidance on Alcohol and Health: Final Report. Ottawa, Ont.: Canadian Centre on Substance Use and Addiction; 2023.
227. Myran D, Hsu A, Kunkel E, Rhodes E, Imsirovic H, Tanuseputro P. Socioeconomic and Geographic Disparities in Emergency Department Visits due to Alcohol in Ontario: A Retrospective Population-level Study from 2003 to 2017. *Can J Psychiatry*. 2022;67(7):534-43.
228. Myran DT, Hsu AT, Smith G, Tanuseputro P. Rates of emergency department visits attributable to alcohol use in Ontario from 2003 to 2016: a retrospective population-level study. *CMAJ*. 2019;191(29):E804-E10.
229. Canadian Institute for Substance Use Research (CISUR). Canadian Substance Use Costs and Harms 2007-2020. Ottawa, ON: Canadian Institute for Substance Use Research; 2023.
230. Stockwell T, Zhao J. Estimates of compliance with Canada's guidelines for low and moderate risk alcohol consumption: the importance of adjustment for underreporting in self-report surveys. *Canadian Journal of Public Health*. 2023:1-6.
231. Probst C, Kilian C, Sanchez S, Lange S, Rehm J. The role of alcohol use and drinking patterns in socioeconomic inequalities in mortality: a systematic review. *The Lancet Public Health*. 2020;5(6):e324-e32.
232. Hobin E, Smith B. Is another public health crisis brewing beneath the COVID-19 pandemic? *Canadian Journal of Public Health*. 2020;111:392-6.
233. Myran DT, Smith BT, Cantor N, Li L, Saha S, Paradis C, et al. Changes in the dollar value of per capita alcohol, essential, and non-essential retail sales in Canada during COVID-19. *BMC Public Health*. 2021;21(1):1-9.
234. Canadian Centre For on Substance Use and Addiction. Boredom and Stress Drives Increased Alcohol Consumption during COVID-19: NANOS Poll Summary Report. 2020.
235. World Health Organization. Draft Action Plan (2022-2030) to effectively implement the global strategy to reduce the harmful use of alcohol as a public health priority. [Internet]. 2022 Jan 11 [cited 2022 Nov 10]. Available from: https://apps.who.int/gb/ebwha/pdf_files/EB150/B150_7Add1-en.pdf
236. Zhang R, Tang Z, Xu W, Ding Y, Zhang M, Guan Q, et al. Risk factors and protective factors for alcohol-related liver disease: A systematic review and meta-analysis. *Alcohol Clin Exp Res*. 2022;46(12):2128-36.
237. Naimi T, Stockwell, T., Giesbrecht, N., Wettlaufer, A., Vallance, K., Farrell-Low, A., Farkouh, E., Ma, J., Priore, B., Vishnevsky, N., Price, T., Asbridge, M., Gagnon, M., Hynes, G., Shelley, J., Sherk, A., Shield, K., Solomon, R., Thomas, G. & Thompson, K. Canadian Alcohol Policy Evaluation (CAPE) 3.0: Methodology and Evidence (Federal and Provincial/Territorial). Victoria, BC: Canadian Institute for Substance Use Research, University of Victoria; 2023.

238. World Health Organization. No Place for cheap alcohol: the potential value of minimum pricing for protecting lives [Internet]. 2022 [cited 2022 Nov 15]. Available from: <https://www.who.int/europe/publications/i/item/9789289058094>
239. Foran HM, O'Leary KD. Alcohol and intimate partner violence: a meta-analytic review. Clin Psychol Rev. 2008;28(7):1222-34.
240. United Nations. The Sustainable Development Goals Report [Internet]. 2022 [cited 2022 Nov 10]. Available from: <https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf>
241. Udmuangpia T YM, Laughon K, Saywat T, Bloom TL. Prevalence, risks, and health consequences of intimate partner violence during pregnancy among young women: A systematic review. Pacific Rim International Journal of Nursing Research. 2020 Jul 9;24(3):412-29.
242. Stockwell T, Churchill S, Sherk A, Sorge J, Gruenewald P. How many alcohol-attributable deaths and hospital admissions could be prevented by alternative pricing and taxation policies? Modelling impacts on alcohol consumption, revenues and related harms in Canada. Health Promot Chronic Dis Prev Can. 2020;40(5-6):153-64.
243. Government of Ontario. Newsroom: Ontario Cutting Wholesale Alcohol Prices to Support Restaurants and Bars. [Internet]. 2021 Dec 15 [cited 2022 Nov 15]. Available from: <https://news.ontario.ca/en/release/1001350/ontario-cutting-wholesale-alcohol-prices-to-support-restaurants-and-bars>
244. Auchincloss AH, Niamatullah S, Adams M, Melly SJ, Li J, Lazo M. Alcohol outlets and alcohol consumption in changing environments: prevalence and changes over time. Subst Abuse Treat Prev Policy. 2022;17(1):7.
245. Österberg E. Availability of alcohol. Alcohol in the European Union: consumption, harm and policy approaches. Copenhagen, : WHO Regional Office for Europe; 2012. 83-8.
246. Alcohol and Gaming Commission of Ontario. Information Bulletin: Highlights of Recent Liquor Reforms to Support Businesses [Internet]. 2020 Dec 9 [cited 2023 Mar 20]. Available from: <https://www.agco.ca/bulletin/2020/information-bulletin-highlights-recent-liquor-reforms-support-businesses#extending>.
247. Zipursky JS, Stall NM, Silverstein WK, Huang Q, Chau J, Hillmer MP, et al. Alcohol Sales and Alcohol-Related Emergencies During the COVID-19 Pandemic. Ann Intern Med. 2021;174(7):1029-32.
248. Statistics Canada. Control and sale of alcoholic beverages, April 1, 2020 to March 31, 2021 [Internet]. 2022 Feb 15 [cited 2022 Dec 16]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/220215/dq220215a-eng.htm>
249. World Health Organization. Reducing the harm from alcohol by regulating cross-border alcohol marketing, advertising and promotion: a technical report. Geneva; 2022. Licence: CC BY-NC-SA 3.0 IGO
250. Paradis C ZJ, Stockwell T, Joy-Goatley S,. What popular bars post on social media platforms: a case for improved alcohol advertising regulation [Internet]. [updated 2021 Jan cited 2022 Dec 19]. Available from: <https://www.canada.ca/content/dam/phac-aspc/documents/services/reports-publications/health-promotion-chronic-disease-prevention-canada-research-policy-practice/vol-40-no-5-6-2020/hpcdp.40.5-6.03.pdf>
251. Finan LJ, Lipperman-Kreda S, Grube JW, Balassone A, Kaner E. Alcohol Marketing and Adolescent and Young Adult Alcohol Use Behaviors: A Systematic Review of Cross-Sectional Studies. J Stud Alcohol Drugs Suppl. 2020;Sup 19(Suppl 19):42-56.
252. Raninen J, Livingston M, Ramstedt M, Zetterqvist M, Larm P, Svensson J. 17 Is the New 15: Changing Alcohol Consumption among Swedish Youth. Int J Environ Res Public Health. 2022;19(3).
253. Tigerstedt C, Makela P, Karlsson T, Harkonen J, Lintonen T, Warpenius K. Change and continuity in Finnish drinking in the 21st century. Nordisk Alkohol Nark. 2020;37(6):609-18.

254. Jane-Llopis E, Kokole D, Neufeld M, Hasan OSM, Rehm J. What is the current alcohol labelling practice in the WHO European Region and what are barriers and facilitators to development and implementation of alcohol labelling policy? Copenhagen:2020. p.
255. Giesbrecht N, Reisdorfer E, Rios I. Alcohol Health Warning Labels: A Rapid Review with Action Recommendations. *Int J Environ Res Public Health*. 2022;19(18).
256. Picard A. Removing warning labels from Yukon liquor is shameful. *The Globe and Mail* [Internet]. 2018 Jan 2 [cited 2022 Dec 20]. Available from: <https://www.theglobeandmail.com/%0Aopinion/removing-warning-labels-on-yukon-liquor-is-shameful/article%0A37459759>.
257. Hobin E, Schoueri-Mychasiw N, Weerasinghe A, Vallance K, Hammond D, Greenfield TK, et al. Effects of strengthening alcohol labels on attention, message processing, and perceived effectiveness: A quasi-experimental study in Yukon, Canada. *Int J Drug Policy*. 2020;77:102666.
258. Zhao J, Stockwell T, Vallance K, Hobin E. The Effects of Alcohol Warning Labels on Population Alcohol Consumption: An Interrupted Time Series Analysis of Alcohol Sales in Yukon, Canada. *J Stud Alcohol Drugs*. 2020;81(2):225-37.
259. Canadian Institute for Health Information. Hospitalizations Entirely Caused by Alcohol details for Ontario [Internet]. 2022 [cited 2022 Dec 19]. Available from: <https://yourhealthsystem.cihi.ca/hsp/indepth?lang=en#/indicator/061/2/C5001/N4lgKgTgpgdgJgeQG5QmAlgWygYQC4QA2IAXKAMYD2MAZunLOVAJlx6pICGhAazqSHhABfIUa>
260. Myran DT, Cantor N, Pugliese M, Hayes T, Talarico R, Kurdyak P, et al. Sociodemographic changes in emergency department visits due to alcohol during COVID-19. *Drug Alcohol Depend*. 2021;226:108877.
261. Ontario Health Quality Standard. Problematic Alcohol Use and Alcohol Use Disorder: Care for People 15 Years of Age and Older [Internet]. 2020 Dec 6 [cited 2022 Dec 20]. Available from: <https://www.hqontario.ca/Portals/0/documents/evidence/quality-standards/qs-alcohol-use-disorder-quality-standard-en.pdf>
262. Health Canada. Government of Canada supports first national guideline on high-risk drinking and alcohol use disorder [Internet]. 2021 Jan 29 [cited 2022 Dec 20]. Available from: <https://www.canada.ca/en/health-canada/news/2021/01/government-of-canada-supports-first-national-guideline-on-high-risk-drinking-and-alcohol-use-disorder.html>
263. Spithoff S, Turner S. A systemic failure to address at-risk drinking and alcohol use disorders: the Canadian story. *CMAJ*. 2015;187(7):479-80.
264. Statistics Canada. Table 13-10-0096-11 Heavy drinking, by age group. [Internet]. 2022 Aug 26 [cited 2022 Dec 20]. Available from: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310009611&pickMembers%5B0%5D=1.7&pickMembers%5B1%5D=3.1&cubeTimeFrame.startYear=2020&cubeTimeFrame.endYear=2021&referencePeriods=20200101%2C20210101>
265. Statistics Canada. Heavy drinking. Ottawa (ON): Statistics Canada; 2018.
266. Schwandt ML, Heilig M, Hommer DW, George DT, Ramchandani VA. Childhood trauma exposure and alcohol dependence severity in adulthood: mediation by emotional abuse severity and neuroticism. *Alcohol Clin Exp Res*. 2013;37(6):984-92.
267. Government of Ontario. Roadmap to wellness: a plan to build Ontario's mental health and addictions system [Internet]. 2020 Mar 28 [cited 2022 Dec 20]. Available from: <https://www.ontario.ca/page/roadmap-wellness-plan-build-ontarios-mental-health-and-addictions-system>
268. Papadimitriou N, Markozannes G, Kannellopoulou A, Critselis E, Alhardan S, Karafousia V, et al. An umbrella review of the evidence associating diet and cancer risk at 11 anatomical sites. *Nature communications*. 2021;12(1):4579.

269. World Cancer Research Fund, American Institute for Cancer Research. Colorectal cancer [Internet]. London, UK: World Cancer Research Fund International; 2022 [cited 2022 Dec 20]. Available from: <https://www.wcrf.org/diet-activity-and-cancer/cancer-types/colorectal-cancer/>.
270. World Cancer Research Fund, American Institute for Cancer Research. Meat, fish, dairy and cancer risk [Internet]. London, UK: World Cancer Research Fund International; 2022 [cited 2022 Dec 20]. Available from: <https://www.wcrf.org/diet-activity-and-cancer/risk-factors/meat-fish-dairy-and-cancer-risk/>.
271. Kahleova H, Salas-Salvadó J, Rahelić D, Kendall CW, Rembert E, Sievenpiper JL. Dietary patterns and cardiometabolic outcomes in diabetes: a summary of systematic reviews and meta-analyses. *Nutrients*. 2019;11(9):2209.
272. Heart and Stroke Foundation of Canada. Special diets. [Internet]. Toronto, ON: HSFC; 2020 [cited 2022 Dec 20]. Available from: <https://www.heartandstroke.ca/healthy-living/healthy-eating/specific-diets#:~:text=Reducing%20your%20salt%20intake%20can,disease%20by%20at%20least%2020%25.&text=Saturated%20and%20trans%20fats%20raise,and%20vegetable%20oils%20decrease%20cholesterol.&text=There%20is%20no%20specific%20amount,part%20of%20a%20healthy%20diet.>
273. Gijsbers L, Ding EL, Malik VS, De Goede J, Geleijnse JM, Soedamah-Muthu SS. Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies. *The American Journal of Clinical Nutrition*. 2016;103(4):1111-24.
274. Schwingshackl L, Hoffmann G, Lampousi A-M, Knüppel S, Iqbal K, Schwedhelm C, et al. Food groups and risk of type 2 diabetes mellitus: a systematic review and meta-analysis of prospective studies. *European journal of epidemiology*. 2017;32:363-75.
275. Greenwood D, Threapleton D, Evans C, Cleghorn C, Nykjaer C, Woodhead C, et al. Association between sugar-sweetened and artificially sweetened soft drinks and type 2 diabetes: systematic review and dose-response meta-analysis of prospective studies. *British Journal of Nutrition*. 2014;112(5):725-34.
276. Imamura F, O'Connor L, Ye Z, Mursu J, Hayashino Y, Bhupathiraju SN, et al. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction. *Bmj*. 2015;351.
277. Zheng P-F, Shu L, Si C-J, Zhang X-Y, Yu X-L, Gao W. Dietary patterns and chronic obstructive pulmonary disease: a meta-analysis. *COPD: Journal of Chronic Obstructive Pulmonary Disease*. 2016;13(4):515-22.
278. Parvizian MK, Dhaliwal M, Li J, Satia I, Kurmi OP. Relationship between dietary patterns and COPD: a systematic review and meta-analysis. *ERJ Open Research*. 2020;6(2).
279. Seyedrezazadeh E, Moghaddam MP, Ansarin K, Jafarabadi MA, Sharifi A, Sharma S, et al. Dietary factors and risk of chronic obstructive pulmonary disease: a systemic review and meta-analysis. *Tanaffos*. 2019;18(4):294.
280. Annesi-Maesano I, Roche N. Healthy behaviours and COPD. 2014;23(134):410-5.
281. Health Canada. Canada's Food Guide Healthy eating recommendations. [Internet]. Ottawa, ON: Health Canada; 2019 [cited 2022 Oct 12]. Available from: <https://food-guide.canada.ca/en/healthy-eating-recommendations/>
282. World Cancer Research Fund. Eat wholegrains, vegetables, fruit and beans [Internet]. London, UK: World Cancer Research Fund; 2022 [cited 2023 Mar 29]. Available from: <https://www.wcrf.org/diet-activity-and-cancer/cancer-prevention-recommendations/eat-wholegrains-vegetables-fruit-and-beans/>.
283. World Cancer Research Fund. Limit red and processed meat [Internet]. London, UK: World Cancer Research Fund International; 2022 [updated 2022 Apr 28; cited 2023 Mar 29]. Available

- from: <https://www.wcrf.org/diet-activity-and-cancer/cancer-prevention-recommendations/limit-red-and-processed-meat/>.
284. World Cancer Research Fund. Limit sugar sweetened drinks [Internet]. London, UK: World Cancer Research Fund International; 2022 [updated 2022 Apr 28; cited 2023 Mar 29]. Available from: <https://www.wcrf.org/diet-activity-and-cancer/cancer-prevention-recommendations/limit-sugar-sweetened-drinks/>.
 285. World Cancer Research Fund. Limit 'fast food' [Internet]. London, UK: World Cancer Research Fund International; 2022 [updated 2022 Apr 29; cited 2023 Mar 29]. Available from: <https://www.wcrf.org/diet-activity-and-cancer/cancer-prevention-recommendations/limit-fast-foods/>.
 286. Shillington KJ, Vanderloo LM, Burke SM, Ng V, Tucker P, Irwin JD. Ontario adults' health behaviors, mental health, and overall well-being during the COVID-19 pandemic. *BMC Public Health*. 2021;21:1-15.
 287. Knezevic I, Dong B, Tyson H. Food Access, Concerns and Perceptions During Covid-19 First Wave: Ontario Survey. Ottawa, ON: School of Journalism and Communication, Carleton University; 2020.
 288. Ontario Food and Nutrition Strategy Group. Ontario food and nutrition strategy: a comprehensive evidence informed plan for healthy food and food systems in Ontario. Toronto, ON: Ontario Food and Nutrition Strategy Group; 2017.
 289. Locally Driven Collaborative Project. A call to action for healthy eating: using a food literacy framework for public health program planning, policy, and evaluation. Toronto, ON; 2017.
 290. Varman SD, Cliff DP, Jones RA, Hammersley ML, Zhang Z, Charlton K, et al. Experiential learning interventions and healthy eating outcomes in children: a systematic literature review. *International Journal of Environmental Research and Public Health*. 2021;18(20):10824.
 291. Vaitkeviciute R, Ball LE, Harris N. The relationship between food literacy and dietary intake in adolescents: a systematic review. *Public health nutrition*. 2015;18(4):649-58.
 292. Health Canada. Health Canada's healthy eating strategy [Internet]. Ottawa, ON: Health Canada; 2022 [cited 2022 Oct 17]. Available from: <https://www.canada.ca/en/services/health/food-nutrition/healthy-eating.html>.
 293. Charlebois S, Music J, Faires S. The impact of COVID-19 on Canada's food literacy: results of a cross-national survey. *International Journal of Environmental Research and Public Health*. 2021;18(10):5485.
 294. Legislative Assembly of Ontario. Bill 216, Food Literacy for Students Act, 2020 [Internet]. Toronto, ON: 2020 [cited 2022 Oct 18]. Available from: <https://www.ola.org/en/legislative-business/bills/parliament-42/session-1/bill-216>.
 295. Ontario Ministry of Education. Ontario modernizing school science curriculum [Internet]. Toronto, ON: King's Printer for Ontario; 2022 [cited 2022 Mar 8]. Available from: <https://news.ontario.ca/en/release/1001722/ontario-modernizing-school-science-curriculum>.
 296. Nutrition Connections. Food literacy programming in Ontario: a focus on programs offered to children, youth, parents and caregivers. Toronto, ON: Nutrition Connections; 2019.
 297. Vanderlee L, Goorang S, Karbasy K, Vandevijvere S, L'Abbé MR. Policies to create healthier food environments in Canada: experts' evaluation and prioritized actions using the Healthy Food Environment Policy Index (Food-EPI). *International Journal of Environmental Research and Public Health*. 2019;16(22):4473.
 298. Vanderlee L, Goorang S, Karbasy K, Schermer A, L'Abbé MR. Creating healthier food environments in Canada: current policies and priority actions-Ontario report. Toronto, ON: University of Toronto; 2017.
 299. World Cancer Research Fund. NOURISHING framework: Our Policy framework to promote healthy diets and reduce obesity [Internet]. London, UK: World Cancer Research Fund

- International; 2020 [cited 2023 Mar 29]. Available from: <https://www.wcrf.org/policy/policy-databases/nourishing-framework>.
300. Arenas DJ, Beltrán S, Pharel M, Lopez-Hinojosa I, Vilá-Arroyo G, DeLisser HM. A Systematic Review and Meta-Analysis of Food Insecurity and Dyslipidemia. *The Journal of the American Board of Family Medicine*. 2022;35(4):656-67.
301. Stevenson AC, Kaufmann C, Colley RC, Minaker LM, Widener MJ, Burgoine T, et al. A pan-Canadian dataset of neighbourhood retail food environment measures using Statistics Canada's Business Register. 2022.
302. Health Canada. Measuring the food environment in Canada [Internet]. Ottawa, ON: Health Canada; 2013 [cited 2022 Oct 19]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/nutrition-policy-reports/measuring-food-environment-canada.html>.
303. Ahalya M, Éric R, Marc L, Tina M. Geographic retail food environment measures for use in public health. *Health promotion and chronic disease prevention in Canada: research, policy and practice*. 2017;37(10):357.
304. Association of Public Health Epidemiologists in Ontario. Core Indicators Development Subgroup: The built environment [Internet]. Association of Public Health Epidemiologists in Ontario; 2018 [cited 2023 Mar 29]. Available from: <https://www.apheo.ca/core-indicators-built-environment-subgroup>.
305. Kent MP, Hatoum F, Wu D, Remedios L, Bagnato M. Benchmarking unhealthy food marketing to children and adolescents in Canada: a scoping review. *Health promotion and chronic disease prevention in Canada: research, policy and practice*. 2022;42(8):307.
306. Potvin MP, Dubois L, Wanless A. A nutritional comparison of foods and beverages marketed to children in two advertising policy environments. *Obesity*. 2012;20(9):1829-37.
307. Rachel P. Food marketing to children in Canada: a settings-based scoping review on exposure, power and impact. *Health promotion and chronic disease prevention in Canada: research, policy and practice*. 2017;37(9):274.
308. Health Canada. Policy update on restricting food advertising primarily directed at children: Overview [Internet]. Ottawa, ON: Health Canada; 2023 [cited 2023 Oct 5]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating-strategy/policy-update-restricting-food-advertising-primarily-directed-children.html>.
309. Warren C, Hobin E, Manuel DG, Anderson LN, Hammond D, Jessri M, et al. Socioeconomic position and consumption of sugary drinks, sugar-sweetened beverages and 100% juice among Canadians: a cross-sectional analysis of the 2015 Canadian Community Health Survey–Nutrition. *Canadian Journal of Public Health*. 2022;113(3):341-62.
310. Jones AC, Veerman JL, Hammond D. The health and economic impact of a tax on sugary drinks in Canada. Waterloo (ON): University of Waterloo. 2017.
311. World Health Organization. Taxes on sugar drinks: Why do it? : WHO; 2017.
312. Newfoundland and Labrador House Assembly. Bill 29 – an act to amend the revenue administration act no.3 [Internet]. Newfoundland and Labrador House Assembly;; 2022 [cited 2023 Mar 29]. Available from: <https://www.assembly.nl.ca/HouseBusiness/Bills/ga50session1/bill2129.htm>.
313. Bachman V. Physical Activity and Risks of Breast Cancer, Colon Cancer, Diabetes, Ischemic Heart Disease and Ischemic Stroke Events: A Systematic Review and Dose-Response Meta-Analysis for the Global Burden of Disease Study 2013.
314. Booth FW, Roberts CK, Thyfault JP, Rueggsegger GN, Toedebusch RG. Role of inactivity in chronic diseases: evolutionary insight and pathophysiological mechanisms. *Physiological reviews*. 2017.
315. World Cancer Research Fund. Physical activity and the risk of cancer. London, UK: World Cancer Research Fund International; 2018.

316. World Health Organization. Global recommendations on physical activity for health. Geneva, CH: WHO; 2010.
317. International Agency for Research on Cancer. World cancer report: Cancer research for cancer prevention. Geneva, CH: IARC; 2020.
318. Lavie CJ, Ozemek C, Carbone S, Katzmarzyk PT, Blair SN. Sedentary behavior, exercise, and cardiovascular health. *Circulation research*. 2019;124(5):799-815.
319. World Health Organization. Global report on diabetes. Geneva, CH: WHO; 2016.
320. Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes care*. 2016;39(11):2065-79.
321. Canadian Society of Exercise Physiology. Canadian 24-hour movement guidelines. Ottawa, ON: Canadian Society of Exercise Physiology; 2020.
322. Ross R, Chaput J-P, Giangregorio LM, Janssen I, Saunders TJ, Kho ME, et al. Canadian 24-Hour Movement Guidelines for Adults aged 18–64 years and Adults aged 65 years or older: an integration of physical activity, sedentary behaviour, and sleep. *Applied Physiology, Nutrition, and Metabolism*. 2020;45(10):S57-S102.
323. World Health Organization. WHO guidelines on physical activity and sedentary behaviour: at a glance. Geneva, CH: WHO; 2020.
324. Public Health Agency of Canada. Physical Activity Tips for Adults (18-64 years) [Internet]. Ottawa, ON: Government of Canada; 2018 [updated 2018 Oct 01; cited 2023 Mar 30]. Available from: <https://www.canada.ca/en/public-health/services/publications/healthy-living/physical-activity-tips-adults-18-64-years.html>.
325. Saunders TJ, Rollo S, Kuzik N, Demchenko I, Belanger S, Brisson-Boivin K, et al. International school-related sedentary behaviour recommendations for children and youth. *Int J Behav Nutr Phys Act*. 2022;19(1):39.
326. Pan-Canadian Joint Consortium for School Health. Comprehensive School Health [Internet]. Canada: 2023 [cited May 17, 2023]. Available from: <http://www.jcsh-cces.ca/en/concepts/comprehensive-school-health/>.
327. Colley RC, Watt J. The unequal impact of the COVID-19 pandemic on the physical activity habits of Canadians. *Health Reports*. 2022;33(5):22-33.
328. Public Health Agency of Canada. Government of Canada invests in physical activity programs for children and youth [Internet]. Ottawa, ON: Public Health Agency of Canada; 2022 [cited 2022 Nov 03]. Available from: <https://www.canada.ca/en/public-health/news/2022/01/government-of-canada-invests-in-physical-activity-programs-for-children-and-youth.html>.
329. Tcymbal A, Demetriou Y, Kelso A, Wolbring L, Wunsch K, Wäsche H, et al. Effects of the built environment on physical activity: a systematic review of longitudinal studies taking sex/gender into account. *Environmental health and preventive medicine*. 2020;25(1):1-25.
330. Laddu D, Paluch AE, LaMonte MJ. The role of the built environment in promoting movement and physical activity across the lifespan: Implications for public health. *Progress in cardiovascular diseases*. 2021;64:33-40.
331. Wanner M, Götschi T, Martin-Diener E, Kahlmeier S, Martin BW. Active transport, physical activity, and body weight in adults: a systematic review. *American journal of preventive medicine*. 2012;42(5):493-502.
332. Larouche R, Saunders TJ, Faulkner GEJ, Colley R, Tremblay M. Associations between active school transport and physical activity, body composition, and cardiovascular fitness: a systematic review of 68 studies. *Journal of physical Activity and health*. 2014;11(1):206-27.
333. Schoeppe S, Duncan MJ, Badland H, Oliver M, Curtis C. Associations of children's independent mobility and active travel with physical activity, sedentary behaviour and weight status: a systematic review. *Journal of science and medicine in sport*. 2013;16(4):312-9.

334. Smith M, Hosking J, Woodward A, Witten K, MacMillan A, Field A, et al. Systematic literature review of built environment effects on physical activity and active transport—an update and new findings on health equity. *International journal of behavioral nutrition and physical activity*. 2017;14(1):1-27.
335. Thielman J, Manson H, Chiu M, Copes R, Rosella LC. Residents of highly walkable neighbourhoods in Canadian urban areas do substantially more physical activity: a cross-sectional analysis. *Canadian Medical Association Open Access Journal*. 2016;4(4):E720-E8.
336. Community Prevention Services Task Force. Physical activity: built environment approaches combining transportation system interventions with land use and environmental design. Atlanta, GA: Centres for disease Control and Prevention 2016.
337. Infrastructure Canada. National active transportation strategy 2021-2026. Ottawa, ON: Government of Canada; 2021.
338. Ontario Ministry of Transportation. Connecting the East: a draft transportation plan for eastern Ontario. Toronto, ON: Ontario Ministry of Transportation; 2022.
339. Wang K, Qian X, Circella G, Lee Y, Malik J, Fitch DT. What Mobility Modes Do Shared E-Scooters Displace? A Review of Recent Research Findings. Transportation Research Board 100th Annual Meeting. 2021.
340. Silva DAS, Chaput J-P, Katzmarzyk PT, Fogelholm M, Hu G, Maher C, et al. Physical education classes, physical activity, and sedentary behavior in children. *Medicine & Science in Sports & Exercise*. 2018;50(5):995-1004.
341. Naiman DI, Leatherdale ST, Gotay C, Mâsse LC. School factors associated with the provision of physical education and levels of physical activity among elementary school students in Ontario. *Canadian Journal of Public Health*. 2015;106:e290-e6.
342. Errisuriz V, Golaszewski N, Born K, Bartholomew J. Systematic review of physical education-based physical activity interventions among elementary school children. *The journal of primary prevention*. 2018;39:303-27.
343. Tao C, Zhu L, Strudwick G, Hopkins J, Bennington M, Fitzpatrick S, et al. The Impact of Physical Activity on Mental Health Outcomes during the COVID-19 Pandemic. *Science Briefs of the Ontario COVID-19 Science Advisory Table*; 2022. 3(62).
344. Martyn L, Bigelow H, Graham JD, Ogrodnik M, Chiodo D, Fenesi B. A mixed method investigation of teacher-identified barriers, facilitators and recommendations to implementing daily physical activity in Ontario elementary schools. *BMC Public Health*. 2022;22(1):1-15.
345. Hollis JL, Williams AJ, Sutherland R, Campbell E, Nathan N, Wolfenden L, et al. A systematic review and meta-analysis of moderate-to-vigorous physical activity levels in elementary school physical education lessons. *Preventive medicine*. 2016;86:34-54.
346. Chief Medical Officer of Health. 2004 Chief Medical Officer of Health report: Healthy weights, healthy lives. Toronto, ON: Queen's Printer for Ontario; 2004.
347. Ontario Society of Physical Activity Promoters in Public Health. Key messages and policy recommendations for physical literacy. Ontario Society of Physical Activity Promoters in Public Health; 2014.
348. ParticipACTION. Lost & Found: Pandemic-related challenges and opportunities for physical activity. Toronto, ON: ParticipACTION; 2022.
349. Allison KR, Adlaf EM, Dwyer JJ, Lysy DC, Irving HM. The decline in physical activity among adolescent students: a cross-national comparison. *Canadian Journal of Public Health*. 2007;98:97-100.
350. CAREX (CARcinogen EXposure) Canada. Radon profile [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2023 Jan 24; cited 2023 Feb 06]. Available from: <https://www.carexcanada.ca/profile/radon/>.
351. International Agency for Research on Cancer. Radiation. Volume 100 D. A review of human carcinogens. Lyon, FR: World Health Organization 2012.

352. Canadian Cancer Society. Enjoy the sun safely: UV rays increase your risk of skin cancer [Internet]. Canadian Cancer Society; 2023 [cited 2023 Feb 15]. Available from: <https://cancer.ca/en/cancer-information/reduce-your-risk/be-sun-safe/enjoy-the-sun-safely>.
353. Pearson JF, Bachireddy C, Shyamprasad S, Goldfine AB, Brownstein JS. Association between fine particulate matter and diabetes prevalence in the US. *Diabetes care*. 2010;33(10):2196-201.
354. Krämer U, Herder C, Sugiri D, Strassburger K, Schikowski T, Ranft U, et al. Traffic-related air pollution and incident type 2 diabetes: results from the SALIA cohort study. *Environmental health perspectives*. 2010;118(9):1273-9.
355. World Health Organization. Ambient (outdoor) air pollution [Internet]. Lyon, FR: World Health Organization; 2022 [updated 2022 Dec 19; cited 2023 Feb 15]. Available from: [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health).
356. Cancer Care Ontario, Ontario Agency for Health Protection and Promotion (Public Health Ontario). Environmental burden of cancer in Ontario. Toronto, ON: Queen's Printer for Ontario; 2016.
357. Sandhu PK, Elder R, Patel M, Saraiya M, Holman DM, Perna F, et al. Community-wide interventions to prevent skin cancer: two community guide systematic reviews. *American journal of preventive medicine*. 2016;51(4):531-9.
358. Holman DM, Kapelos GT, Shoemaker M, Watson M. Shade as an environmental design tool for skin cancer prevention. *American journal of public health*. 2018;108(12):1607-12.
359. Community Prevention Services Task Force. Preventing skin cancer: child care center-based interventions. Atlanta, GA: Centre for Disease Control and Prevention; 2013.
360. Community Prevention Services Task Force. Preventing skin cancer: primary and middle school interventions. Atlanta, GA: Centre for Disease Control and Prevention; 2014.
361. Community Prevention Services Task Force. Preventing skin cancer: interventions in outdoor occupational settings. Atlanta, GA: Centres for Disease Control and Prevention; 2014.
362. Ontario Health (Cancer Care Ontario). Ontario Cancer Statistics 2022. Toronto, ON: Queen's Printer of Ontario; 2022.
363. World Health Organization. Ultraviolet radiation [Internet]. Geneva, CH: World Health Organization; 2022 [cited 28 Feb 2023]. Available from: <https://www.who.int/news-room/fact-sheets/detail/ultraviolet-radiation>.
364. de Lannoy L, Rhodes RE, Moore SA, Faulkner G, Tremblay MS. Regional differences in access to the outdoors and outdoor play of Canadian children and youth during the COVID-19 outbreak. *Canadian Journal of Public Health*. 2020;111:988-94.
365. Morgan R. Concern over conservation rising as number of visitors to Ontario parks soars [Internet]. Ottawa, ON: Capital Current; 2021 [cited 07 Mar 2023]. Available from: <https://capitalcurrent.ca/concern-over-conservation-rising-as-number-of-visitors-to-ontario-parks-soars/>.
366. Linos E, Keiser E, Fu T, Colditz G, Chen S, Tang JY. Hat, shade, long sleeves, or sunscreen? Rethinking US sun protection messages based on their relative effectiveness. *Cancer Causes & Control*. 2011;22:1067-71.
367. BC Centre for Disease Control. Fact sheet: Supporting health equity through the built environment. Vancouver, BC: BC Centre for Disease Control; 2017.
368. Cimino A, McWhirter JE, Papadopoulos A. An evaluation of the amount, type and use of shade at public playgrounds in Guelph, Ontario, Canada. *Health Promot Chronic Dis Prev Can*. 2022;42(5):209-17.
369. Ontario Ministry of Municipal Affairs and Housing. Provincial policy statement [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2022 Dec 30]. Available from: <https://www.ontario.ca/page/provincial-policy-statement-2020>.
370. Health Canada. Sun safety basics [Internet]. 2022 Jan 26 [cited 2023 Jul 18]. Available from: <https://www.canada.ca/en/health-canada/services/sun-safety/sun-safety-basics.html>.

371. Cancer Care Ontario, Canadian Cancer Society. Insight on cancer: Sun exposure and protective behaviours in Ontario. Toronto, ON: Cancer Care Ontario and Canadian Cancer Society; 2010.
372. Canadian Partnership Against Cancer. Solar UVR protection: provincial and territorial sun safety policies in schools [Internet]. Toronto, ON: Canadian Partnership Against Cancer; 2019 [updated 2019 Feb 01; cited 2023 Feb 28]. Available from: <https://www.partnershipagainstcancer.ca/topics/solar-uvr-protection-provincial-and-territorial-sun-safety-policies-in-schools/>.
373. Ontario Ministry of Health and Long-Term Care. The Ontario Public Health Standards: requirements for programs, services, and accountability. Queen's Printer for Ontario: Toronto, ON; 2021.
374. Canadian Cancer Society. SunSense: supporting schools to create sun-safe environments. [Internet]. Toronto, ON: Environment and Climate Change Canada; [Available from: https://ccs-scc.my.site.com/SunSense/s/about-sunsense?language=en_US].
375. Ontario Government. Ultraviolet radiation in the workplace [Internet]. Toronto, ON: Queen's Printer for Ontario; 2022 [cited 2023 Feb 28].
376. Sun Safety at Work (SSAWC). Enhancing sun safety in Canadian workplaces [Internet]. Toronto, ON: Sun Safety at Work 2023 [updated <https://sunsafetyatwork.ca/sun-safety-work-canada>; cited 2023 Mar 8]. Available from: <https://sunsafetyatwork.ca/sun-safety-work-canada>.
377. World Health Organization. WHO handbook on indoor radon, a public health perspective. Geneva, CH: World Health Organization; 2009.
378. Government of Canada. Radon: about [Internet]. Ottawa, ON: Government of Canada; 2019 [updated 2022 Oct 13; cited 2023 Feb 07]. Available from: <https://www.canada.ca/en/healthcanada/services/health-risks-safety/radiation/radon.html>.
379. Health Canada. Cross-Canada survey of radon concentrations in homes - final report. Ottawa, ON: Minister of Health; 2012.
380. Ottawa Public Health. Radon in your home [Internet]. Ottawa, ON: Ottawa Public Health; 2023 [cited 2023 Mar 08]. Available from: [https://www.ottawapublichealth.ca/en/public-health-topics/radon-in-your-home.aspx#:~:text=If%20a%20long%2Dterm%20\(3,radon%20reduction%20plan%20to%20lower](https://www.ottawapublichealth.ca/en/public-health-topics/radon-in-your-home.aspx#:~:text=If%20a%20long%2Dterm%20(3,radon%20reduction%20plan%20to%20lower).
381. United States Environmental Protection Agency. Particulate matter (PM) basics [Internet]. Washington, DC: United States Government; 2016 [updated 2022 Jul 18; cited 2023 Feb 28]. Available from: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>.
382. Ontario Ministry of the Environment CaP. Air quality in Ontario 2019 report [Internet]. Toronto, ON: King's Printer for Ontario; 2019 [updated 2022 Mar 4; cited 2023 Feb 22]. Available from: <https://www.ontario.ca/document/air-quality-ontario-2019-report>.
383. Ontario Ministry of the Environment CaP. Fine particulate matter [Internet]. Toronto, ON: King's Printer for Ontario; 2022 [cited 2023 Feb 28]. Available from: <http://www.airqualityontario.com/science/pollutants/particulates.php>.
384. Ontario Ministry of the Environment CaP. Air quality in Ontario 2020 report: 10-year trends and annual results [Internet]. Ottawa, ON: King's Printer for Ontario; 2022 [updated 2022 Dec 21; cited 2023 Feb 28]. Available from: <https://www.ontario.ca/document/air-quality-ontario-2020-report/10-year-trends-and-annual-results#>.
385. World Health Organization. WHO global air quality guidelines. Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Geneva, CH: World Health Organization 2021.
386. Government of Canada. Population exposure to outdoor air pollutants [Internet]. Ottawa, ON: Government of Canada; [updated 2021 Mar 31; cited 2023 Feb 28]. Available from: <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/population-exposure-outdoor-air-pollutants.html#Table1>.

387. United States Environmental Protection Agency. The national ambient air quality standards for particle pollution. Washington, DC: United States Government 2012.
388. Occupational Cancer Research Centre. Chronic respiratory disease report: highlights from the occupational disease surveillance system. Toronto, ON: Ontario Health; 2022.
389. International Agency for Research on Cancer. Arsenic, Metals, Fibres, and Dusts. World Health Organization; 2012.
390. International Agency for Research on Cancer. Diesel and Gasoline Engine Exhausts and Some Nitroarenes. World Health Organization; 2013.
391. Ontario Ministry of Labour, Immigration, Training and Skills Development. Prevention works: 5-year strategy [Internet]. King's Printer for Ontario: King's Printer for Ontario; 2021 [updated 2022 Jun 16; cited 2023 Feb 08]. Available from: <https://www.ontario.ca/document/prevention-works/prevention-works-5-year-strategy>.
392. Ontario Ministry of Labour, Immigration, Training and Skills Development. Prevention works Ontario's occupational health and safety system in action [Internet]. Toronto, ON: King's Printer for Ontario; 2021 [cited 2023 Feb 07]. Available from: <https://www.ontario.ca/files/2022-06/mltsd-prevention-works-occupational-health-and-safety-strategy-en-2022-01-12.pdf>.
393. Centres for Disease Control and Prevention, The National Institute for Occupational safety and Health (NIOSH). Hierarchy of controls [Internet]. Atlanta, Georgia: Centers for Disease Control and Prevention; 2015 [updated 2023 Jan 17; cited 2023 Jan 27]. Available from: <http://www.cdc.gov/niosh/topics/hierarchy/>.
394. Occupational Health and Safety Act, R.S.O. 1990, c. O.1 [Internet]. 1990 [cited 2023 Jan 27]. Available from: <https://www.ontario.ca/laws/statute/90o01>.
395. Canadian Centre for Occupational Health and Safety. Asbestos - What is... [Internet]. Hamilton, ON: Canadian Centre for Occupational Health and Safety; 2019 [cited 2023 Jan 27]. Available from: <https://www.ccohs.ca/oshanswers/chemicals/asbestos/whatis.html>.
396. Environment and Climate Change Canada. The Government of Canada takes measures to ban asbestos and asbestos containing products [Internet]. Ottawa, ON: Government of Canada; 2018 [updated 2018 Oct 18; cited 2023 Jan 27]. Available from: <https://www.canada.ca/en/environment-climate-change/news/2018/10/the-government-ofcanada-takes-measures-to-ban-asbestos-and-asbestoscontaining-products.html>.
397. Arrandale VH, Demers P, Berriault C, Genesove L, DeBono N, Song C. RF-112 Asbestos-related disease in the Ontario Asbestos Workers Register. BMJ Publishing Group Ltd; 2021.
398. Keefe A, Demers P, Pahwa M, Parelkar S. Asbestos Management in Canada: Assessing the Need for a National Standard. Toronto, ON: Canadian Standards Association; 2021.
399. International Agency for Research on Cancer. Arsenic, metals, fibres and dust. Lyon, FR: World Health Organization; 2012.
400. Omland Ø, Würtz ET, Aasen TB, Blanc P, Brisman J, Miller MR, et al. Occupational chronic obstructive pulmonary disease: a systematic literature review. Scandinavian journal of work, environment & health. 2014;19-35.
401. Government of Canada. Asbestos [Internet]. Ottawa, ON: Government of Canada; 2012 [updated 2021 Oct 14; cited 2023 Jan 30]. Available from: <https://www.canada.ca/en/health-canada/services/air-quality/indoor-air-contaminants/health-risks-asbestos.html>.
402. CAREX (CARcinogen EXposure) Canada. Asbestos occupational exposures [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2022 Jan 18; cited 2023 Jan 30]. Available from: <https://www.carexcanada.ca/profile/asbestos-occupational-exposures/>.
403. DeBono NL, Warden H, Logar - Henderson C, Shakik S, Dakouo M, MacLeod J, et al. Incidence of mesothelioma and asbestosis by occupation in a diverse workforce. American Journal of Industrial Medicine. 2021;64(6):476-87.

404. Jung JK, Feinstein SG, Lazgare LP, Macleod JS, Arrandale VH, McLeod CB, et al. Examining lung cancer risks across different industries and occupations in Ontario, Canada: the establishment of the Occupational Disease Surveillance System. *Occupational and Environmental Medicine*. 2018;75(8):545-52.
405. Ontario Ministry of Labour. Asbestos in the workplace [Internet]. Toronto, ON: King's Printer for Ontario; 2022 [updated 2022 Nov 16; cited 2023 Feb 1]. Available from: <https://www.ontario.ca/page/asbestos-workplace>.
406. Ontario Ministry of Labour. Asbestos guide. Medical surveillance: a guide to the regulation respecting asbestos on construction projects and in buildings and repair operation [Internet]. Toronto, ON: Queen's Printer for Ontario; 2022 [updated 2022 May 03; cited 2023 Feb 03]. Available from: <https://www.ontario.ca/document/guide-regulation-respecting-asbestos-construction-projects-and-buildings-and-repair-12#>.
407. Occupational Cancer Research Centre. Occupational cancer and asbestosis among asbestos-exposed workers in Ontario [Internet]. 2018 [cited 26 Jun 2023]. Available from: <https://www.occupationalcancer.ca/2018/occupational-cancer-and-asbestosis-among-asbestos-exposed-workers-in-ontario/>.
408. CAREX (CARcinogen EXposure) Canada. Diesel engine exhaust profile [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2021 Dec 09; cited 2023 Feb 02]. Available from: https://www.carexcanada.ca/profile/diesel_engine_exhaust/.
409. International Agency for Research on Cancer. Diesel engine exhaust carcinogenic. Press release no 213 [Internet]. Lyon, FR: World Health Organization; 2012 [cited 2023 Feb 01]. Available from: https://www.iarc.who.int/wp-content/uploads/2018/07/pr213_E.pdf.
410. Hart JE, Eisen EA, Laden F. Occupational diesel exhaust exposure as a risk factor for chronic obstructive pulmonary disease. *Current opinion in pulmonary medicine*. 2012;18(2):151-4.
411. Employment and Social Development Canada. Control measures for diesel engine exhaust emissions in the work place [Internet]. Ottawa, ON: Government of Canada; 2016 [updated 2022 Sept 09; cited 2023 Feb 02]. Available from: <https://www.canada.ca/en/employment-social-development/services/health-safety/reports/control-diesel-emissions.html#h2.5>.
412. Occupational Cancer Research Centre, Ontario Health. Burden of occupational cancer in Ontario: major workplace carcinogens and prevention of exposure. Toronto, ON: King's printer for Ontario; 2017.
413. Health Council of the Netherlands. Diesel engine exhaust [Internet]. Health Council of the Netherlands; 2019 [cited 26 June 2023]. Available from: <https://www.healthcouncil.nl/documents/advisory-reports/2019/03/13/diesel-engine-exhaust>.
414. CAREX (CARcinogen EXposure) Canada. Diesel engine exhaust occupational exposure [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2021 Aug 21; cited 2023 Feb 02]. Available from: https://www.carexcanada.ca/profile/diesel_engine_exhaust-occupational-exposures/.
415. R.R.O. 1990, Reg. 854: Mines and mining plants [Internet]. 1990 Available from: <https://www.ontario.ca/laws/regulation/900854>.
416. Government of Ontario. Ontario introducing new rules to keep miners safe [Internet]. King's Printer for Ontario; 2023 [cited 27 June 2023]. Available from: <https://news.ontario.ca/en/release/1002918/ontario-introducing-new-rules-to-keep-miners-safe>.
417. CAREX (CARcinogen EXposure) Canada. Radon occupational exposures [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2021 Sept 30; cited 2023 Feb 06]. Available from: <https://www.carexcanada.ca/profile/radon-occupational-exposures/>.
418. Brobbey A, Rydz E, Fenton S, Demers P, Ge C, Peters C. Characterizing occupational radon exposure greater than 100 Bq/m³ in a highly exposed country. *Scientific Reports*. 2022;12(1):21323.

419. Navaranjan G, Berriault C, Do M, Villeneuve PJ, Demers PA. Cancer incidence and mortality from exposure to radon progeny among Ontario uranium miners. *Occupational and Environmental Medicine*. 2016;73(12):838-45.
420. Occupational Cancer Research Centre, Ontario Health. Controlling occupational exposure to carcinogens [Internet]. Toronto, ON: Ontario Health; 2019 [cited 2023 feb 07]. Available from: <https://www.occupationalcancer.ca/2019/exposure-controls/>.
421. Government of Canada. Federal provincial territorial radiation protection committee [Internet]. Ottawa, ON: Government of Canada; 2004 [updated 2022 Aug 31; cited 2023 Feb 07]. Available from: <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/understanding/federal-provincial-territorial-radiation-protection-committee.html>.
422. Ontario Ministry of Labour. Radon in the workplace [Internet]. Toronto, ON: King's Printer for Ontario; 2022 [cited 2023 Feb 01]. Available from: <https://www.ontario.ca/page/radon-workplace>.
423. CAREX (CARcinogen EXposure) Canada. Silica (crystalline) profile [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2023 Jan 31; cited 2023 Feb 07]. Available from: https://www.carexcanada.ca/profile/silica_crystalline/.
424. CAREX (CARcinogen EXposure) Canada. Silica (crystalline) occupational exposure [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2021 Oct 08; cited 2023 Feb 07]. Available from: https://www.carexcanada.ca/profile/silica_crystalline-occupational-exposures/.
425. CAREX (CARcinogen EXposure) Canada, Ontario Cancer Research Centre. Crystalline silica: Burden of occupational cancer fact sheet [Internet]. Burnaby, BC: CAREX Canada; 2019 [updated 2023 Feb 07]. Available from: https://www.carexcanada.ca/CAREX_OCRC_Burden_of_Occupational_Cancer_Silica_factsheet.pdf.
426. Jumat MI, Hayati F, Rahim SSSA, Saupin S, Lukman KA, Jeffree MS, et al. Occupational lung disease: A narrative review of lung conditions from the workplace. *Annals of Medicine and Surgery*. 2021;64:102245.
427. Occupational Cancer Research Centre. Data outputs from Ontario Occupational Disease Statistics tool [Internet]. [cited 27 June 2023]. Available from: <https://www.occdiseasestats.ca/#/>.
428. Ontario Ministry of Labour. Silica on construction projects: Legal requirements [Internet]. Toronto, ON: King's Printer for Ontario; 2022 [cited 2023 Feb 07]. Available from: <https://www.ontario.ca/document/silica-construction-projects/legal-requirements#>.
429. Occupational Health and Safety Act, R.R.O. 1990, Reg. 845: Designated substance - silica [Internet]. 1990 [cited 2023 Feb 07]. Available from: <https://www.ontario.ca/laws/regulation/900845>.
430. Bjerke W. The impact of infectious disease on chronic disease: a review of contemporary findings. *Journal of Social, Behavioral, and Health Sciences*. 2011;5(1):45-57.
431. Gargano LM, Hughes JM. Microbial origins of chronic diseases. *Annu Rev Public Health*. 2014;35:65-82.
432. Omid F, Hajikhani B, Kazemi SN, Tajbakhsh A, Riaz S, Mirsaeidi M, et al. COVID-19 and Cardiomyopathy: A Systematic Review. *Front Cardiovasc Med*. 2021;8:695206.
433. Pellicori P, Doolub G, Wong CM, Lee KS, Mangion K, Ahmad M, et al. COVID-19 and its cardiovascular effects: a systematic review of prevalence studies. *Cochrane Database Syst Rev*. 2021;3(3):CD013879.
434. Xie Y, Xu E, Bowe B, Al-Aly Z. Long-term cardiovascular outcomes of COVID-19. *Nat Med*. 2022;28(3):583-90.
435. Schiffman M, Doorbar J, Wentzensen N, de Sanjose S, Fakhry C, Monk BJ, et al. Carcinogenic human papillomavirus infection. *Nat Rev Dis Primers*. 2016;2:16086.

436. International Agency for Research on Cancer. Biological agents. A review of human carcinogens. Lyon, FR: World Health Organization; 2012.
437. Lei J, Ploner A, Elfstrom KM, Wang J, Roth A, Fang F, et al. HPV Vaccination and the Risk of Invasive Cervical Cancer. *N Engl J Med*. 2020;383(14):1340-8.
438. Brito LMO, Brito HO, Correa R, de Oliveira Neto CP, Costa JPL, Monteiro SCM, et al. Human Papillomavirus and Coronary Artery Disease in Climacteric Women: Is There an Association? *ScientificWorldJournal*. 2019;2019:1872536.
439. Cancer Care Ontario. Burden of cancer caused by infections in Ontario. Toronto: Queen's Printer for Ontario.; 2018.
440. Public Health Agency of Canada. Report on Hepatitis B and C in Canada: 2017. Ottawa: Public Health Agency of Canada; 2019.
441. Tang LSY, Covert E, Wilson E, Kottitil S. Chronic Hepatitis B Infection: A Review. *Jama*. 2018;319(17):1802-13.
442. Government of Canada. Report on Hepatitis B and C Surveillance in Canada: 2019. [Internet]. 2022 [updated 2022 Jan 17; cited 2023 Mar 3]. Available from: <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/report-hepatitis-b-c-canada-2019.html>
443. Campbell K. Hepatitis B and the liver cancer endgame. *Nature*. 2022;603(7903):S64-S5.
444. Nguyen MH, Wong G, Gane E, Kao JH, Dusheiko G. Hepatitis B Virus: Advances in Prevention, Diagnosis, and Therapy. *Clin Microbiol Rev*. 2020;33(2).
445. Ontario Public Health. Sexual Health Ontario [Internet]. [cited 2023 Mar 2]. Available from: <https://sexualhealthontario.ca/en/home>.
446. National Cancer Institute. Human Papillomavirus (HPV) Vaccines [Internet]. 2021 May 25 [cited 2023 Mar 2]. Available from: <https://www.cancer.gov/about-cancer/causes-prevention/risk/infectious-agents/hpv-vaccine-fact-sheet>
447. Porras C, Tsang SH, Herrero R, Guillen D, Darragh TM, Stoler MH, et al. Efficacy of the bivalent HPV vaccine against HPV 16/18-associated precancer: long-term follow-up results from the Costa Rica Vaccine Trial. *Lancet Oncol*. 2020;21(12):1643-52.
448. Dehlendorff C, Baandrup L, Kjaer SK. Real-World Effectiveness of Human Papillomavirus Vaccination Against Vulvovaginal High-Grade Precancerous Lesions and Cancers. *J Natl Cancer Inst*. 2021;113(7):869-74.
449. Government of Canada. Human papillomavirus vaccine: Canadian Immunization Guide. [Internet]. 2017 May [cited 2023 Mar 2]. Available from: <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-9-human-papillomavirus-vaccine.html>
450. Ontario Health (Cancer Care Ontario). Ontario Cervical Screening Program (OCSP) Screening Recommendations Summary. Ontario: Queen's Printer; 2022 Jan.
451. Government of Ontario. Information for parents. [Internet]. 2017 [cited 2023 Mar 2]. Available from: https://www.health.gov.on.ca/en/pro/programs/immunization/docs/hpv_infoparents.pdf
452. Ontario Ministry of Health. Guidance for routine and catch-up immunization services [Internet]. Toronto, ON: Queen's Printer for Ontario; 2021 [cited 2022 Dec 29]. Available from: https://health.gov.on.ca/en/pro/programs/immunization/docs/Guidance_for_Routine_CatchUp_Immunization_Services.pdf.
453. Canadian Partnership Against Cancer. Action plan for the elimination of cervical cancer in Canada, 2020–2030. Canada; N.D. ISBN 978-1-988000-48-0
454. Robinson JL. Potential strategies to improve childhood immunization rates in Canada. *Paediatr Child Health*. 2018;23(5):353-6.
455. Siddiqui FA, Padhani ZA, Salam RA, Aliani R, Lassi ZS, Das JK, et al. Interventions to Improve Immunization Coverage Among Children and Adolescents: A Meta-analysis. *Pediatrics*. 2022;149(Suppl 5).

456. Government of Canada. Hepatitis B in Canada: 2020 surveillance data update [Internet]. His Majesty the King in Right of Canada; 2023 Mar 03 [cited 2023 May 26]. Available from: <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/hepatitis-b-canada-2020-surveillance-data-update.html>.
457. Coffin CS, Fung SK, Alvarez F, Cooper CL, Doucette KE, Fournier C, et al. Management of Hepatitis B Virus Infection: 2018 Guidelines from the Canadian Association for the Study of Liver Disease and Association of Medical Microbiology and Infectious Disease Canada. *Can Liver J*. 2018;1(4):156-217.
458. World Health Organization. Global Health Sector Strategy on Viral Hepatitis 2016-2021. [Internet]. 2016 Jun [cited 2023 Mar 6]. Available from: <https://apps.who.int/iris/bitstream/handle/10665/246177/WHO-HIV-2016.06-eng.pdf?sequence=1&isAllowed=y>
459. Canadian Broadcasting Corporation. Thousands of Ontario students behind on vaccines usually administered in schools [Internet]. 2022 Apr 05 [cited 2023 Mar 6]. Available from: <https://www.cbc.ca/news/canada/toronto/ont-students-vaccines-1.6409216>
460. Public Health Ontario. Recommendations: Hepatitis B Catch-up Schedule for Adolescents 16-18 Years. Ontario; 2022 Aug 11
461. Tian F, Feld JJ, Feng Z, Sander B, Wong WWL. Feasibility of hepatitis B elimination in high-income countries with ongoing immigration. *J Hepatol*. 2022;77(4):947-56.
462. Yasseen AS, Kwong JC, Feld JJ, Kustra R, MacDonald L, Greenaway CC, et al. The viral hepatitis B care cascade: A population-based comparison of immigrant groups. *Hepatology*. 2022;75(3):673-89.