Ontario Health

Prevention System Quality Index 2023

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Prevention System Quality Index 2023

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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.

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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

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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 rivers, 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]

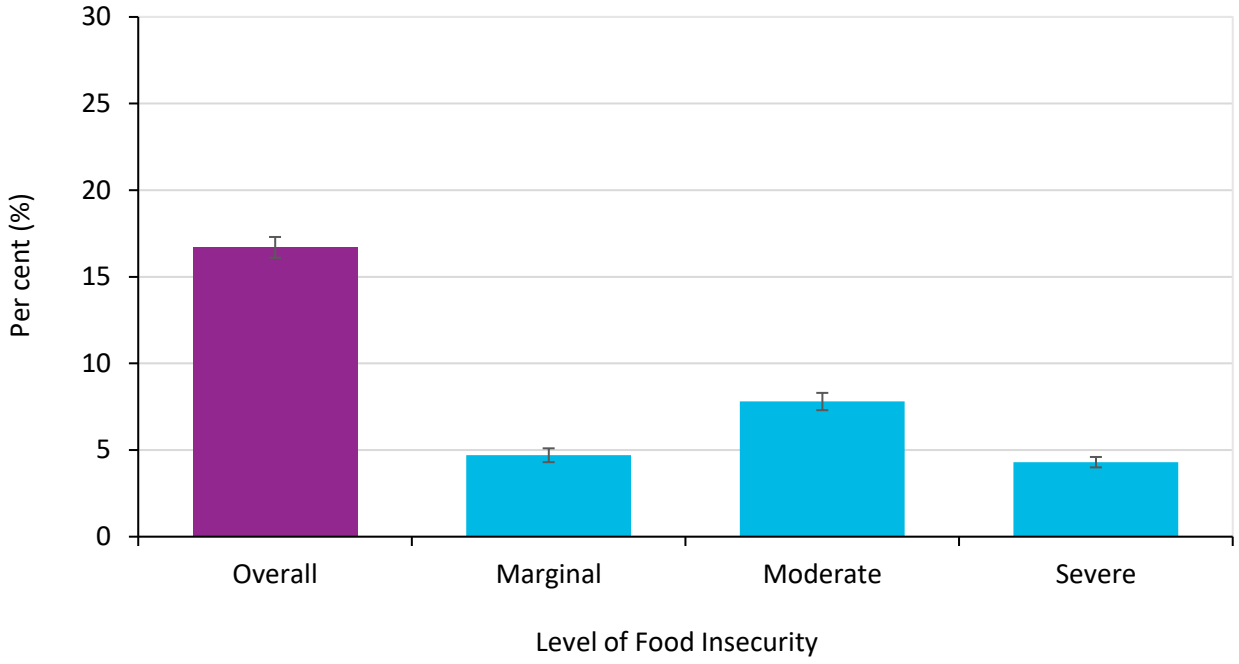
INDICATOR FINDINGS: HOUSEHOLD FOOD INSECURITY

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 availibility.[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 Nunagat, 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 Nunagat in 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 Canda.[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 INDIGNEOUS 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

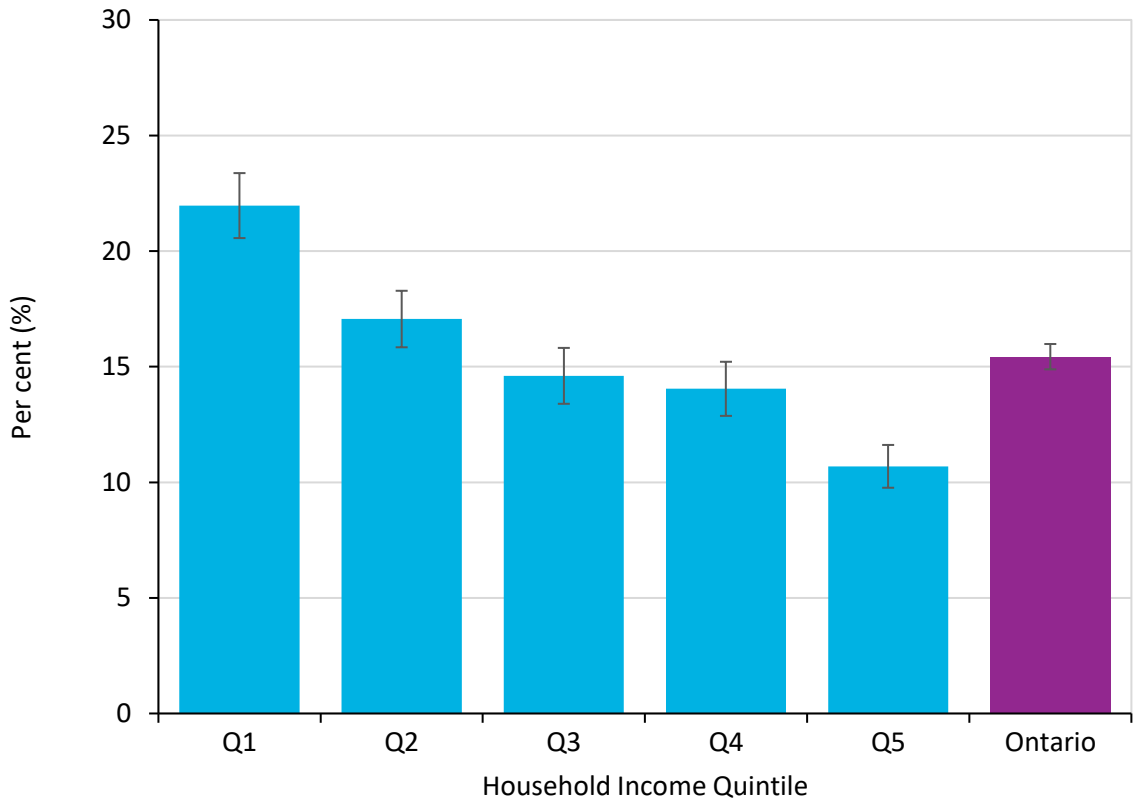
In Ontario, 17.0 per cent of deaths, 8.7 per cent of hospitalizations and 3.4 per cent of emergency department visits from all causes are attributable to smoking.[151] In 2020, the economic burden of tobacco smoking in the province was an estimated $7.0 billion in healthcare, lost productivity, criminal 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.

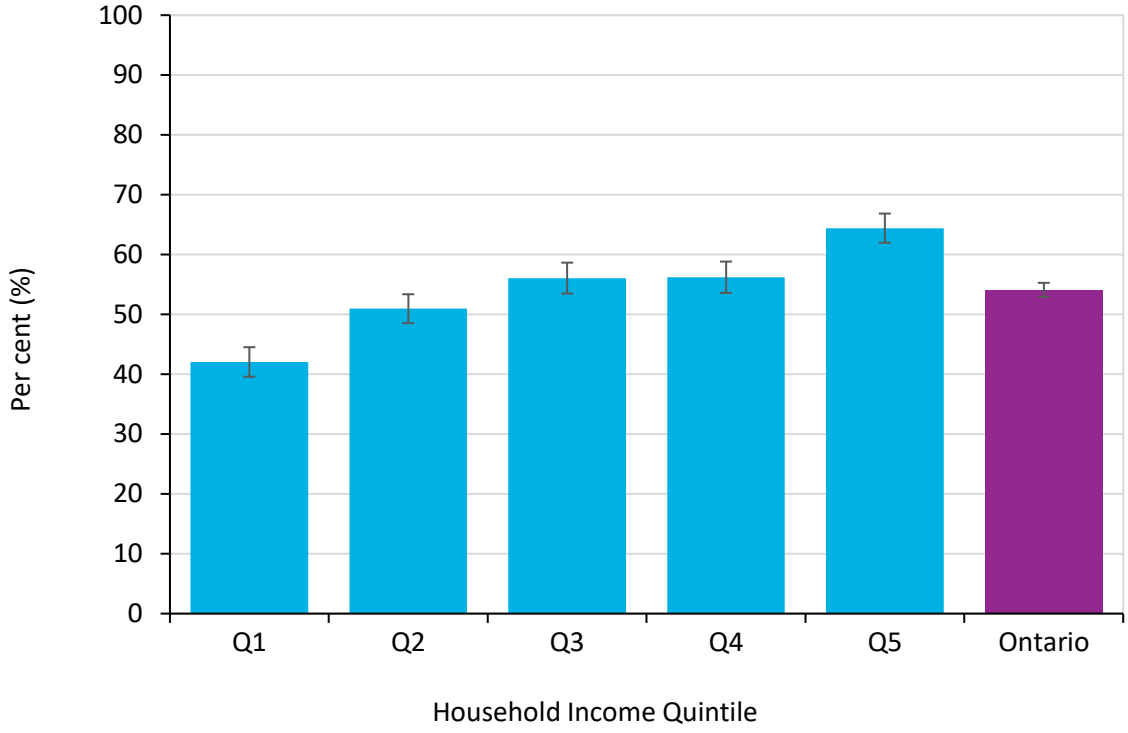
- In 2022, 47.8 per cent of adults in Ontario who smoke made one or more serious attempts to quit smoking in the past 12 months (Supplementary Table S11). Additional analyses by age, sex, income, rural or urban residence, immigration status and racial group are available in Supplementary Table S11.

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).

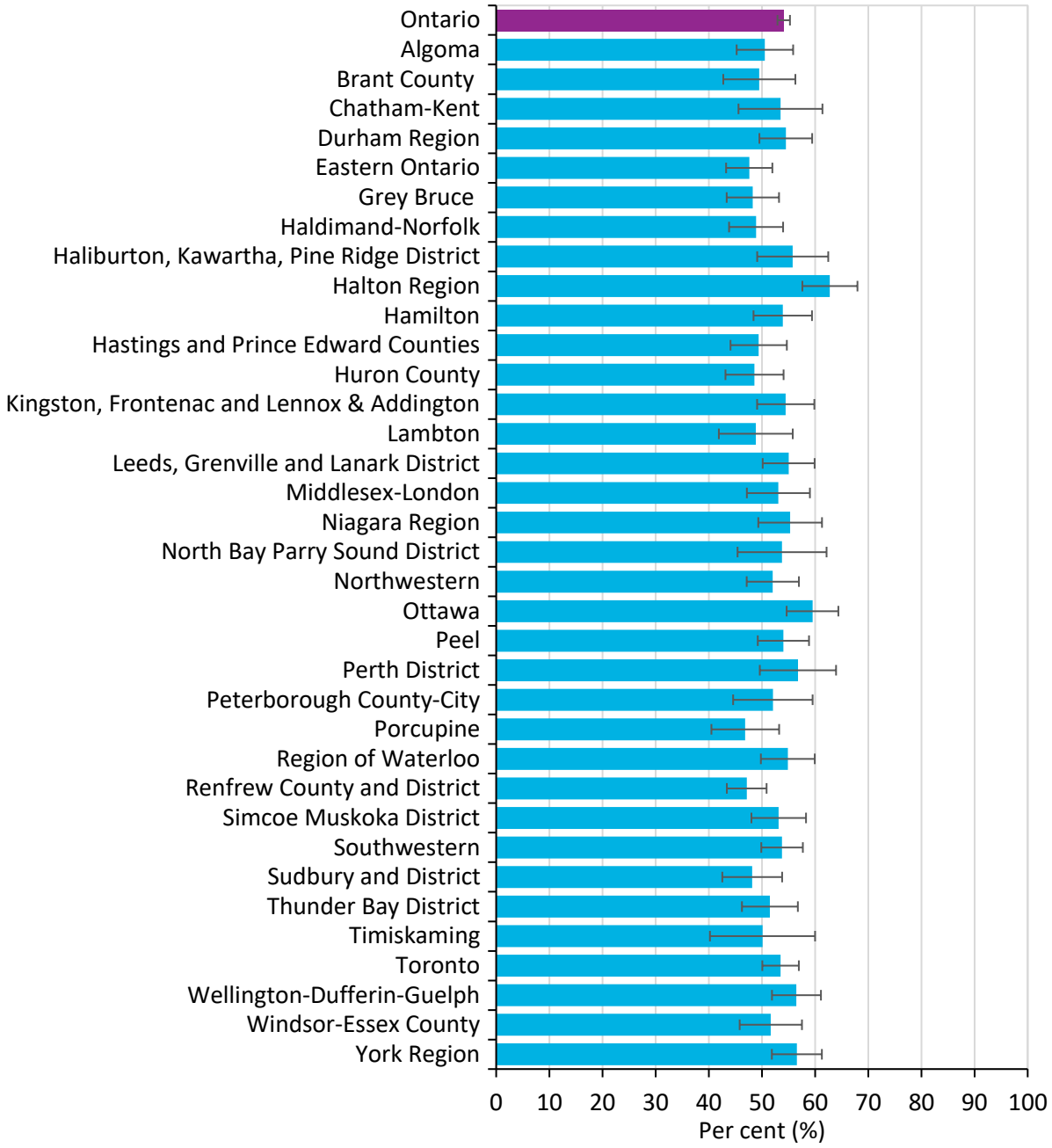
Figure 3: Percentage of adults (age 20 and older) reporting past daily or occasional smoking who stopped smoking completely at least 1 year ago, by household income quintile, Ontario, 2017–2020 combined



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]

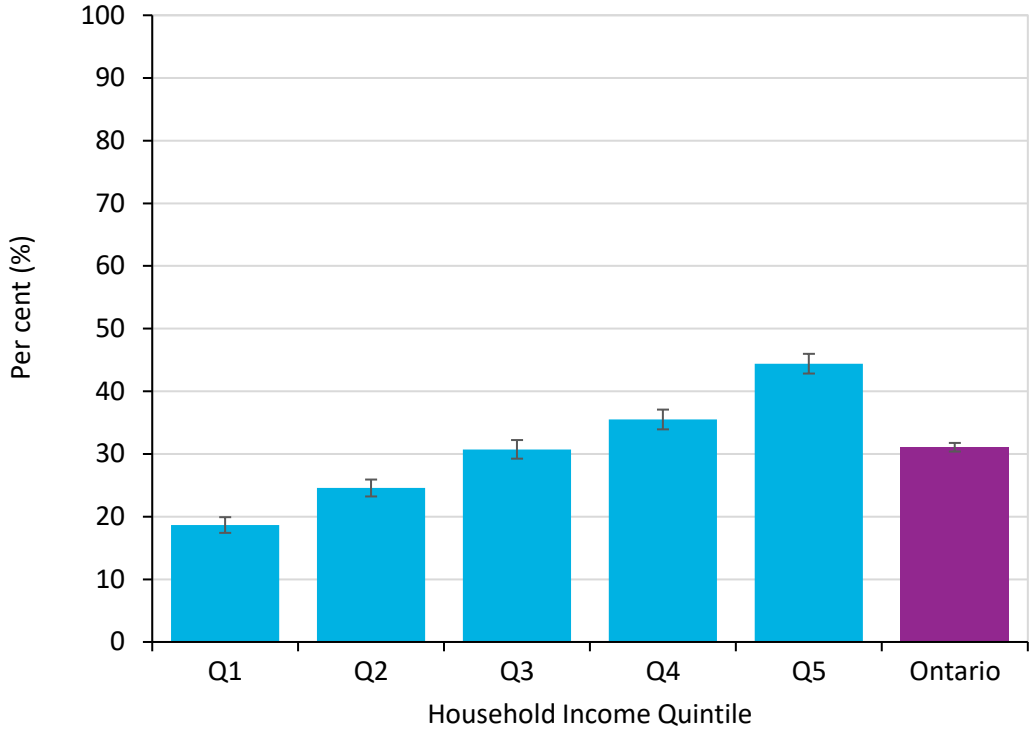
Indicator findings: alcohol drinking in adults

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.

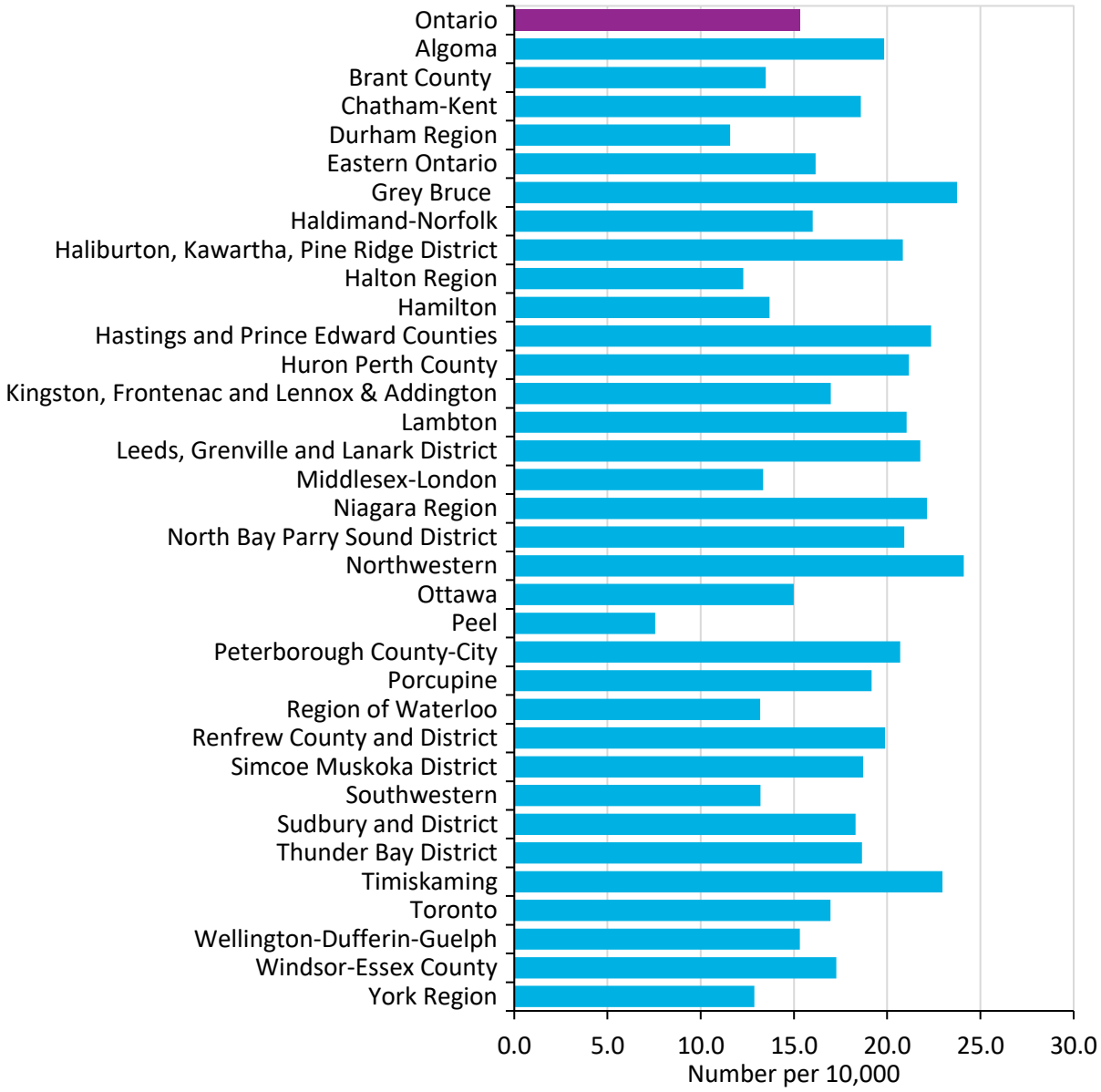
- In 2022, 74.7 per cent of alcohol retail stores in Ontario were privately owned (Supplementary Table S16), which is 4.6 per cent less than in 2019 (79.3 per cent privately owned, from Prevention System Quality Index 2020 data) and 1.2 per cent less than in 2015 (75.9 per cent privately owned, from 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]

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

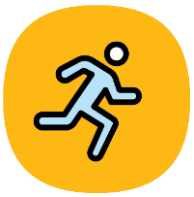
adolescents living in Ontario promote unhealthy foods (i.e., foods that are nutrient poor and energy dense).[305-307] To mitigate this influence, Health Canada has proposed new plans to restrict advertising to children under the age of 13 for food products high in sugar, salt and saturated fats.[308] 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

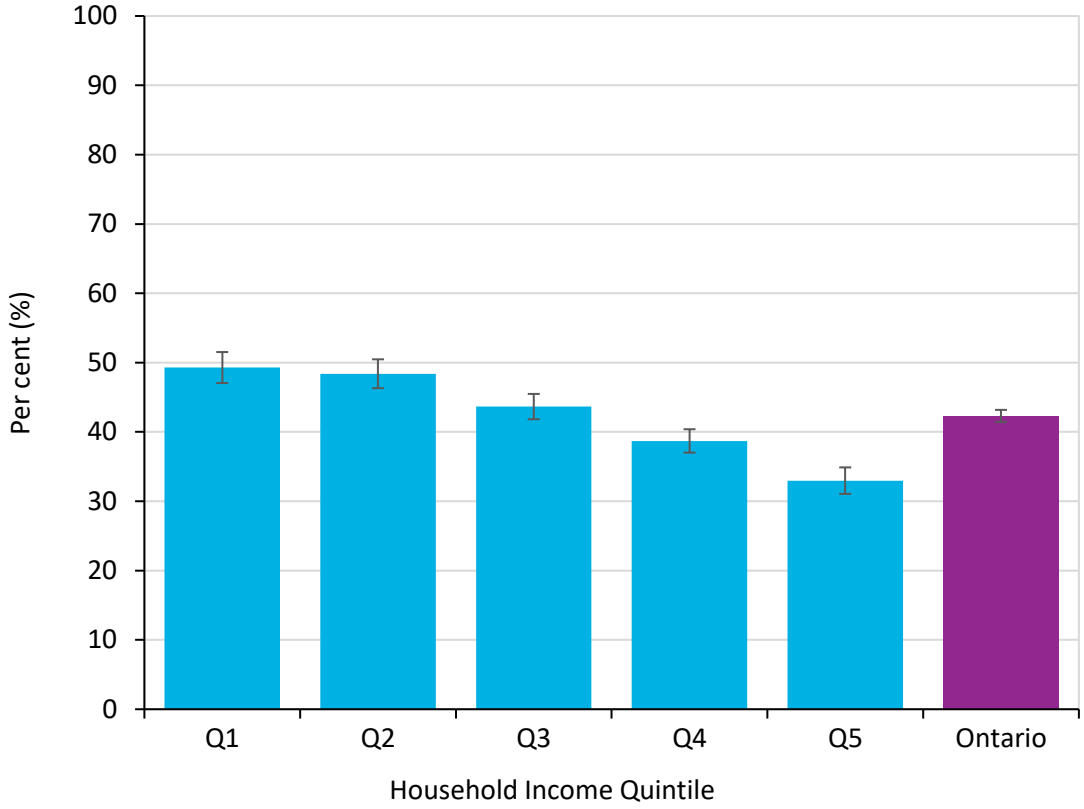
This indicator measures the percentage of adults (age 18 and older) and adolescents (ages 12 to 17) who reported less than the recommended level of moderate-to-vigorous physical activity. It combines Canadian Community Health Survey data for the 2016 to 2018 survey years.

- 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]

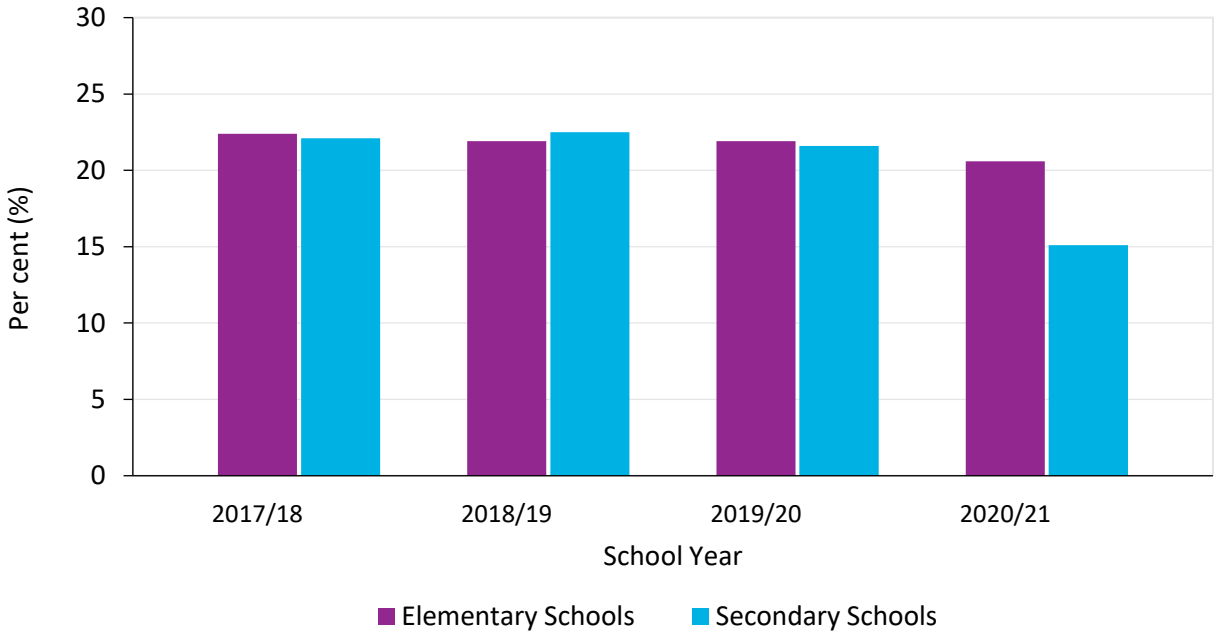
School closures during the pandemic disproportionately affected movement behaviours and promoted sedentary activities in children and adolescents.[348] The 2022 ParticipACTION Report Card on Physical Activity for Children and Youth gave an overall grade of "D" for children and youth physical activity 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]

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.

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).

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/m^3 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/m^3 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/m^3.[377] The current Canadian guideline for radon is 200 Bq/m^3.[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/m^3 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/m^3 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/m^3.[385] The Canadian Ambient Air Quality Standard for $PM_{2.5}$ set an annual average of 8.8 µg/m^3 and a 24-hour maximum of 27 µg/m^3 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/m^3 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 (PM2.5) 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]

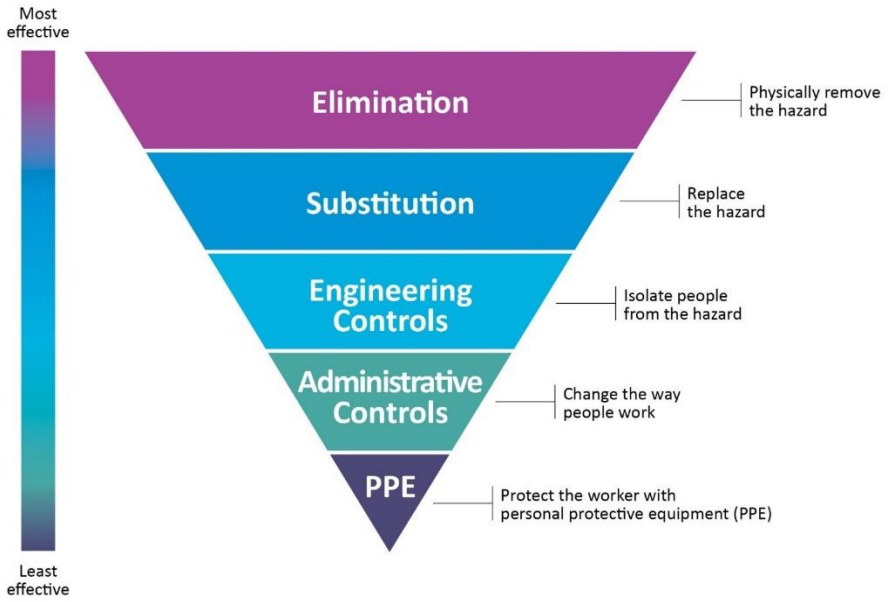
The Ontario Ministry of Labour, Immigration, Training and Skills Development has developed a five-year occupational health and safety strategy called Prevention Works (2021 to 2026).[391] The strategy, among other things, aims to reduce or eliminate hazard exposures that pose the greatest risk for disease 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/

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 lungs[408], 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/m^3 elemental carbon for the mining industry and 5 µg/m^3 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/m^3 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 rivers, 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/m^3 total carbon (reducing to 120 µg/m^3 elemental carbon as of September 1, 2023).[415,416] This limit is significantly higher than the 20 µg/m^3 elemental carbon limit suggested by the Occupational Cancer Research Centre[415] 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/m^3.[417] A further 112,000 are exposed to radon levels that are 100 to 200 Bq/m^3.[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/m^3, which is higher than the World Health Organization's recommendation to reduce radon levels to les than 100 Bq/m^3.[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/m^3 of air by volume for quartz and tripoli (types of silica) and 0.05 mg/m^3 of air by volume for another type of silica, cristobalite.[429] These limits are higher than the limit of 0.025 mg/m^3 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/m^3.
- Adopt the recommended occupational exposure limit of 0.025 mg/m^3 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 first implemented a school-based HPV immunization program delivered by public health units for female students in Grade 8 in 2007-08 using a 3-dose quadrivalent (HPV4) vaccine. A two-dose schedule was introduced in 2015-16 and the program moved to Grade 7 students (12-year-olds) and expanded to include males in 2016-17; a nonavalent (HPV9) vaccine was introduced in 2017-18. A catch-up program offering the vaccine to the end of Grade 12 (approximately 17 years old) was implemented in the 2012-13 school year.[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

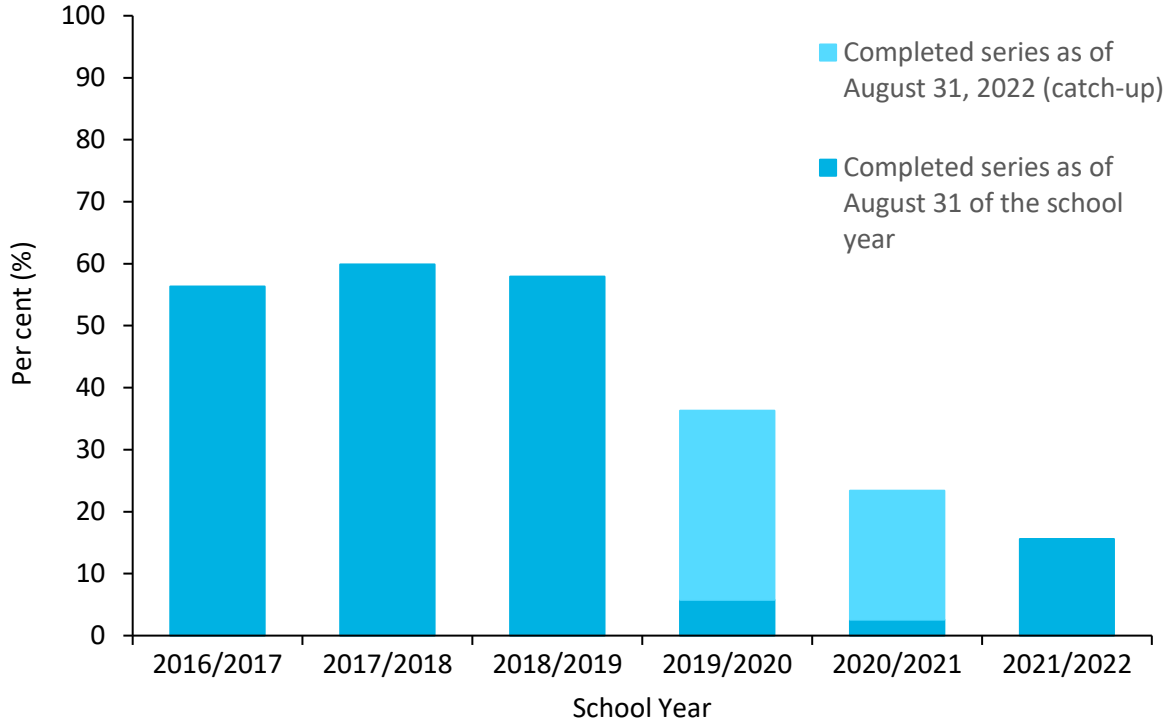
This indicator measures up-to-date immunization coverage for the HPV vaccine among 12-year-olds (Grade 7) with data current as of the 2021/22 school year. These estimates are reported by Public Health Ontario through an analysis of student and immunization record data entered by public health units in 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.

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