The Changing Landscape of Health in Peel

A Comprehensive Health Status Report 2019

Region of Peel
working with you

Indigenous Acknowledgement

Indigenous Peoples have occupied the lands now known as Peel Region for at least 10,000 years. Prior to settler colonization, these lands were the ancestral home of the Wendat, the Haudenosaunee, and most recently, the Mississaugas of the Credit First Nation. Much of the work of Peel Public Health takes place in the Traditional Territory and Treaty Lands of the Mississaugas of the New Credit First Nation. As visitors in this Territory, we at the Region of Peel – Public Health would like to express our gratitude to the Mississauga Peoples of the New Credit First Nation, the descendants of the Credit First Nation. We would also like to respectfully acknowledge the diverse community of Indigenous Peoples, representing a multitude of distinct Nations, who currently live, work, and play in this Territory. As the Region of Peel - Public Health begins its journey toward becoming a culturally safe organization, we would like to express our commitment to honouring the sovereignty of Indigenous Nations across the Territories now known as Canada.

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Message from the Medical Officer of Health

Dr. Jessica Hopkins

Peel Public Health is pleased to share this comprehensive report on the health status of Peel and its residents. This is a fulsome update to the first comprehensive report produced in 2008 to complement our regular analyses on selected population health topics. It represents the state of health, as well as health promoting and risk factors in our community.

This population health assessment helps us better understand trends over the last decade and how they may inform community health in the future. Peel continues to grow in population size and remains one of the most diverse communities in Ontario. While these trends are not expected to change, we anticipate an increasing number of seniors as our community ages. In the last decade, we have had good success in achieving one of the lowest smoking rates in Ontario, as well as improvements in our rates of chronic diseases traditionally associated with tobacco use. However, challenges related to diabetes, healthy eating and physical activity continue. We also see emerging or worsening challenges related to the use of substances, mental health, health inequalities, and the public health impacts of climate change.

The public health sector has a unique role in the health system. We are dedicated to enhancing the health status of the population by promoting and protecting health, and preventing disease and injury. We use an evidence-informed, upstream approach to promote those health priorities that will best protect and promote the health of our community, including our most vulnerable residents. This includes work to address structural determinants of health, healthy public policy, and individual-level interventions to help all of us achieve our optimal health potential.

Information contained in this report will be used to help Peel Public Health design and implement programs that will address the most significant health issues in Peel region. Our hope is that these data will support partner organizations, including health care, social services and others in their future programs and services. Together, we can create a community where the focus is on health over illness and prevention over cure.

INTRODUCTION

Public Health and the Population Health Approach

Public health plays a unique role in Canada's publicly funded health system. While significant attention and resources are directed at treating individuals with illness, public health's three main goals are to:

- promote and protect health, and prevent illness;
- reduce health disparities; and
- respond to emergencies.

To meet this mandate, public health takes a **population health approach**. Central elements of this approach are population health assessment and surveillance including:

- Measuring the health outcomes of a population, including the distribution of such outcomes within a group.
- Describing the interrelationships of conditions and factors that influence the health of populations over the life course, and identifying systematic variations in their patterns of occurrence.
- Applying data and knowledge to develop and implement policies and actions to improve the health and well-being of the populations of interest.[1]

This report describes Peel-specific data as a foundation for public health analysis and strategy development with a goal of improving the health of Peel's population. Each chapter will describe health status indicators about diseases and health behaviours, preventive health practices, and health care utilization in order to demonstrate the magnitude of health issues in Peel's population.

The History of Public Health in Peel

Public health in Peel was first referenced in 1832 in connection with a cholera epidemic. The first local board of health was established in 1862 by the Town of Brampton.[2]

In 1882, a board of health covering the entire province of Ontario was established and by 1884, every municipality in Ontario was required to create a board of health with a medical officer or sanitary inspector.[3]

The scope of work for local authorities and their inspectors in 1884 included:

- preventing and combating epidemic diseases;
- isolating infected persons;
- investigating water contamination and adulteration of foods;
- inspecting town sewage;
- mandating heating and ventilation of buildings;
- examining poisons, chemicals and explosives; and
- compiling vital statistics and climatic data.[3]

Many of these original public health mandates continue to be relevant today.

Determinants of Health

The health of the population is influenced by many factors. While there is no single list of determinants, the "Model of the Determinants of Health" provides some examples.

The relationship between determinants of health, health behaviours and health outcomes is often complex and not well defined. Determinants and individual risk factors may be linked to health outcomes by means of three pathways:

- Risk factors may influence health independently of determinants.
- Determinants may be a direct influence upon outcomes.
- Determinants may influence outcomes in conjuction with risk factors. This is the most common situation; however, determining causation is not as simple.

A Model of the Determinants of Health

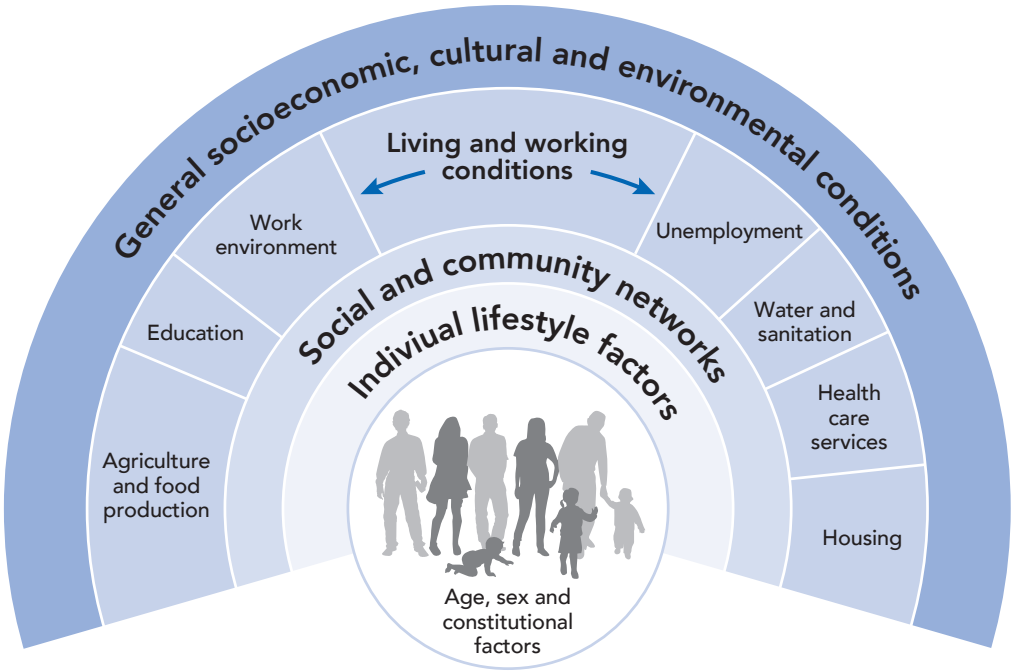


Figure shows one influential model of the determinants of health that illustrates how various health-influencing factors are embedded within broader aspects of society.

Source: Dahlgren, G. and Whitehead, M. (1991). Policies and Strategies to Promote Social Equity in Health. Stockholm: Institute for Futures Studies.

Causation

When we analyze data, we often see associations between a risk factor or determinant and a health outcome. For example, smoking is associated with lung cancer. These assumptions can be deemed as causal when the following criteria are true. There is:

- ***Strong association*** between the risk factor or determinant and the health outcome.
- ***Consistency*** or reproducibility of the findings.
- ***Specificity***, meaning the exposure causes only one disease. It is recognized that some diseases have multiple causes or risk factors.
- ***Temporality***, where the disease occurs after the cause or the exposure.
- ***Biological gradient***, meaning there is a dose response.
- ***Plausibility***, meaning that there are biological models that can explain the association.
- ***Coherence*** between epidemiological findings and laboratory findings.[4]

It can be difficult to determine a causal pathway. Some of these challenges include:

- When a determinant (e.g., income level) has changed over time; that is, not been static.
- Not knowing when or how long the risky determinant has been in place (e.g., how long a person has been in low income).
- Use of cross-sectional data, which restricts the ability to make causal inferences between a determinant and an outcome of interest.

Health Equity and Health Inequality

Definition

Health equity means that all people can reach their full health potential and are not disadvantaged from attaining it because of their race, ethnicity, religion, gender, age, social class, socioeconomic status or other socially determined circumstance.[5]

Health inequalities are the measured differences in health experienced by various groups in the population. Measuring the size of the health inequality and the change in inequality over time is useful to inform action.[6]

Health equity and health inequalities are terms often used when describing the differences in health status or outcomes between groups. Health inequalities refer to measurable differences or variations in health experienced by various population groups in society. Health inequities are those that are considered unfair and/or unjust and:

- have the potential to be changed or decreased by social action;
- are patterned or systematic; and
- are potentially avoidable by improving social and economic conditions.

Measuring Health Inequality

To measure inequalities, data about the outcomes of interest (e.g., health outcome or behaviour) and stratifiers (e.g., age and sex) are necessary. When data are available, health outcome and behavioural inequalities are described throughout this report.

Definition

A ***stratifier*** is a variable used to measure inequality against a particular outcome or health behaviour. Examples of stratifiers include:

- geography or place of residence (e.g., Mississauga)
- sociodemographics (e.g., age, sex, income, education, ethnicity)

Measurement

There are many ways to measure inequality. For the purposes of this report, the following measures are used to describe inequality among selected health outcomes and behaviours:

- Rate ratio: The rate of one health outcome or behaviour in one group compared to another group. Estimates >1 or < 1 indicate higher or lower levels of inequality between subgroups. Estimates closer to 1 indicate lower levels of inequality among groups.
- Rate difference: The difference in the rate of a health outcome or behaviour in one group compared to another group.

How to Read this Report

Data

For this report, Peel data are the preferred source; however, on occasion, data for Peel are unavailable, or the numbers are too small and unreliable to be reported. In these instances, data for Ontario or Canada are provided. Additionally, provincial, federal or international data are used for the purpose of comparison.

Incidence and Prevalence

The terms incidence and prevalence are used throughout this report.

Definition

Incidence refers to the frequency of a newly diagnosed health- or disease-related event. The incidence rate expresses the frequency of new events in a particular population for a specified time period.

Prevalence refers to the total number of individuals who have a disease or condition at a particular time. A prevalence rate would express the frequency of a disease in a particular population for a specific time period. This would include both existing cases and newly diagnosed cases of disease in the population.

Determining and Describing Statistical Significance

The determination of statistical significance is made in this report by using confidence intervals and the rate ratio. The following terms have been used to imply statistical significance between groups: "significantly", "more likely" and "less likely."

Confidence Intervals

In this report, 95% confidence intervals (presented as "95% CI") are used as a conservative method to determine statistical significance regarding differences among groups using survey data (e.g., age groups, immigrant status categories). The confidence interval presents a lower and upper range of values that contain the true value of the estimate for the whole population 95% of the time, or 19 times out of 20.

For example, in Peel 83% of the population aged 12 years and older brush their teeth twice per day. The confidence interval is between 80% and 86%. This means, if we repeated the study 20 times using different samples from the same population, on 19 occasions the estimate would be somewhere between 80% and 86%. On one occasion, however, the estimate would be below 80% or above 86%. In other words, we could say that we are 95% sure the actual percentage of tooth brushing at two times per day in the population is between 80% and 86%, and in this particular study, the sample estimate is 83%. Additional information about confidence intervals can be found in ***Chapter 13 – Data Methods***.

Rate Ratio

A rate ratio is the result of the comparison of one rate to another rate. For example, if the percent of residents receiving the Canada Child Tax Benefit is 13.2% in Peel and 10.7% in Ontario, the rate ratio would be 13.2/10.3=1.23.

- A rate ratio less than or equal to 0.80 means that the rate is lower than the comparison rate.
- A rate ratio between 0.81 and 1.19 means that there is no difference between rates.
- A rate ratio greater or equal to 1.20 means that the rate is higher than the comparison rate.

In this example, the rate ratio would be interpreted as follows: The proportion of Peel residents receiving the Canada Child Tax Benefit is 1.23 times or 23% higher compared to Ontario.

The rate ratio is used to determine higher or lower comparisons with the following data: census, hospitalizations, emergency department visits, live births, stillbirths, mortality, disease incidence and prevalence.

References

There are two types of references used in this report:

- Text references refer to citations from articles, books or other documents, and are defined by a superscript number (e.g., A higher risk of poor oral health was observed[1]).
- Data references refer to the data source for the statistic being presented in the text and are defined by a superscript letter (e.g., In Peel, 15% of the population wears dentures[A]).

Key messages and facts are presented throughout the report by various icons. The following box describes these icons and their meaning.

Definition

Did You Know

Peel Facts

Measurement

Key Messages

Data Gaps

Much of the data used in this report were obtained by Region of Peel – Public Health from external organizations, and we extend our thanks to the following:

- Statistics Canada
- Cancer Care Ontario
- Canadian Institute for Health Information
- Ontario Ministry of Health and Long-Term Care
- Institute for Clinical Evaluative Sciences
- Better Outcomes and Registry Network
- Centre for Addictions and Mental Health
- Institute for Social Research

Sources of data, data limitations and methods of analysis used in this report are described in ***Chapter 12 - Data Sources and Limitations*** and ***Chapter 13 - Data Methods***. For additional details or information, please contact HealthStatusData@peelregion.ca.

Additional health status data are available on the Peel Health Status Data website: *peelregion.ca/health/statusdata/index.asp*

This report is available in hard copy and electronic format. The web version of this report can be found at ***peelregion.ca/health/resources***. An accessible version is available upon request.

chapter 1

Peel's People And Their Physical Environment

Key Messages

- Peel has experienced a 20% population growth in population between 2006 and 2016 (approximately 222,000 people) and is projected to increase by a further 19% (300,000 people) by 2031.
- The physical environment in Peel as it relates to housing and transportation is changing. For example in 2016, 38% of residents lived in medium and high-density housing. Additionally, while there is improved public transportation in Peel, Peel residents have longer commute times compared to Ontario residents.
- Public services in Peel (e.g., sewer, water, waste disposal) are well organized and managed.

Physical determinants of health include elements such as the air we breathe, the food we eat, the water we drink and the land we live on. Within the built environment, factors related to housing, the design of communities and our transportation systems have an impact on our health.[7]

This chapter will describe the number of people living in Peel, the factors related to the built environment, such as housing, transportation and water, sewer and waste infrastructure. Information about Peel's air, water, soil and food quality are described in ***Chapter 10 – Environment and Health***.

Peel's Population

Peel's earliest township, Toronto Township, is now known as the City of Mississauga. Table 1.1 describes additional townships and their population at various points during the 1800s. While the census, which started in Upper Canada in the 1840s, included Indigenous populations, it is unknown to what extent the population counts in Table 1.1 include Indigenous.

? *Did You Know*

Peel Region became a regional municipality in 1974; however, at the time of Confederation in 1867 it was known as Peel County.[8]

Current day Peel, located directly west of Toronto and York Region, includes the cities of Mississauga and Brampton, and the Town of Caledon. At the time of the 2016 Census, almost 1.4 million people lived in Peel, making it one of the largest municipalities in Canada and the second largest in Ontario (Table 1.2).

Since 2006, Peel's population has grown by 20%, adding approximately 222,000 people. In comparison, Ontario's population increased by 4.6% over the same time period.[A1] Looking ahead to 2031, the region's population is projected to exceed 1.7 million people.[B] This equates to an increase of 19% (300,000 people) which averages to approximately 20,000 more people per year.[B]

Table 1.1

Township Population Counts, Peel County Townships, 1821, 1841, 1851

Peel County Townships	Year		
	1821	**1841**	**1851**
Albion	110	2,015	4,281
Caledon	110	1,511	3,707
Chinguacousy	412	3,721	7,469
Gore	412	1,145	1,820
Toronto	803	4,601	7,539
Peel County Total	**1,435**	**12,993**	**24,816**

Source: Explore Peel: An Interactive Timeline [Internet]. Peel Art Gallery Museum and Archives. Cited March 20, 2018. Available from: http://www.peelregion.ca/planning-maps/SettlementHistory/

Table 1.2
Population Characteristics, Peel Municipalities, Peel and Ontario, 2016

Geography	Number	Per cent
Mississauga	721,600	52.2
Brampton	593,640	43.0
Caledon	66,505	4.8
Peel	**1,381,739**	**100.0**
Ontario	**13,448,494**	**–**

Source: Census 2016, Statistics Canada.

The Built Environment

Definition

The ***built environment*** is defined as the external physical environment where we live, work, study and play. It includes buildings, roads, public transit systems, parks and other types of infrastructure. It is linked to how we design, plan and build our communities. This definition only applies to urban and suburban contexts, as rural built environments are inherently different from urban and suburban contexts.[9]

The built environment influences health through:

- population density;
- land use mix and neighbourhood design
- air quality, and
- road and other traffic infrastructure
- land use practices.

This section describes population density and land use mix. ***Chapter 10 – Environment and Health*** describes indicators for air quality.

Measurement

Measuring the Health of Cities
There are several ways to assess the health of our built environment. Some examples include population density, mixed land use and street accessibility. Within this chapter, only population density and land use mix are described.[10] Both higher development densities and a range and mix of land use types (e.g., residential land, employment land, park land) increase the variety of destinations within a community. This facilitates walking and cycling as viable modes of transportation and supports a more compact and efficient urban form.

Population Density

Peel has a land mass of 1,247 square kilometres with a population density per square kilometre of 1,108. Table 1.3 contrasts some features of Peel's land with its neighbours, the City of Toronto and Halton Region. Toronto has almost four times the population density per square kilometre compared to Peel. In the 10 years between 2006 and 2016, Peel's population density increased by 19%.

Population growth and density differ by Peel municipality. Between 2006 and 2016, population growth and density have increased the most for Brampton (Table 1.4).

Table 1.3

Population and Land Features, Halton, Toronto, Peel, 2016

Land Feature	Halton 2016	Toronto 2016	Peel 2016
Population	548,435	2,731,571	1,381,739
Per cent change in population between 2006 to 2016	9.3%	4.5%	19.2%
Land area in square kilometres	964	660	1,247
Population density per square kilometre	569	4,334	1,108

NA – Not applicable
Source: Census 2016, Statistics Canada.

Table 1.4

Population and Land Features, Peel Municipalities, 2006 and 2016

Land Feature	Caledon			Brampton			Mississauga		
	2006	2016	Per cent Change Between 2006 to 2016	2006	2016	Per cent Change Between 2006 to 2016	2006	2016	Per cent Change Between 2006 to 2016
Population	57,050	66,502	17%	433,806	593,638	37%	668,549	721,559	8%
Land area in square kilometres	687	688	0.1%	266	266	0%	288	292	1.4%
Population density per square kilometre	83	97	17%	1626	2,229	37%	2,317	2,469	7%

Source: Census 2006, 2016, Statistics Canada.

Did You Know

Cities comparable to Mississauga and Brampton in terms of population density are Baltimore in the US (2,932 persons per square kilometre) and Calgary in Canada (2,112 persons per square kilometre). Hong Kong has one of the highest population densities at 25,719 persons per square kilometre.[11]

Did You Know

Within the Places to Grow Growth Plan for the Greater Golden Horseshoe report, the target for the region of Peel is to have 200 people and jobs combined per hectare (200 people per 0.1 square kilometres) for downtown Brampton and Mississauga City Centre by 2031. Some examples of other cities with similar targets include Burlington, downtown Hamilton, and downtown Milton.[12]

Land Use Mix

Peel's land use patterns range from agricultural fields and natural green spaces to industrial parks and urbanized areas with high and low residential densities.

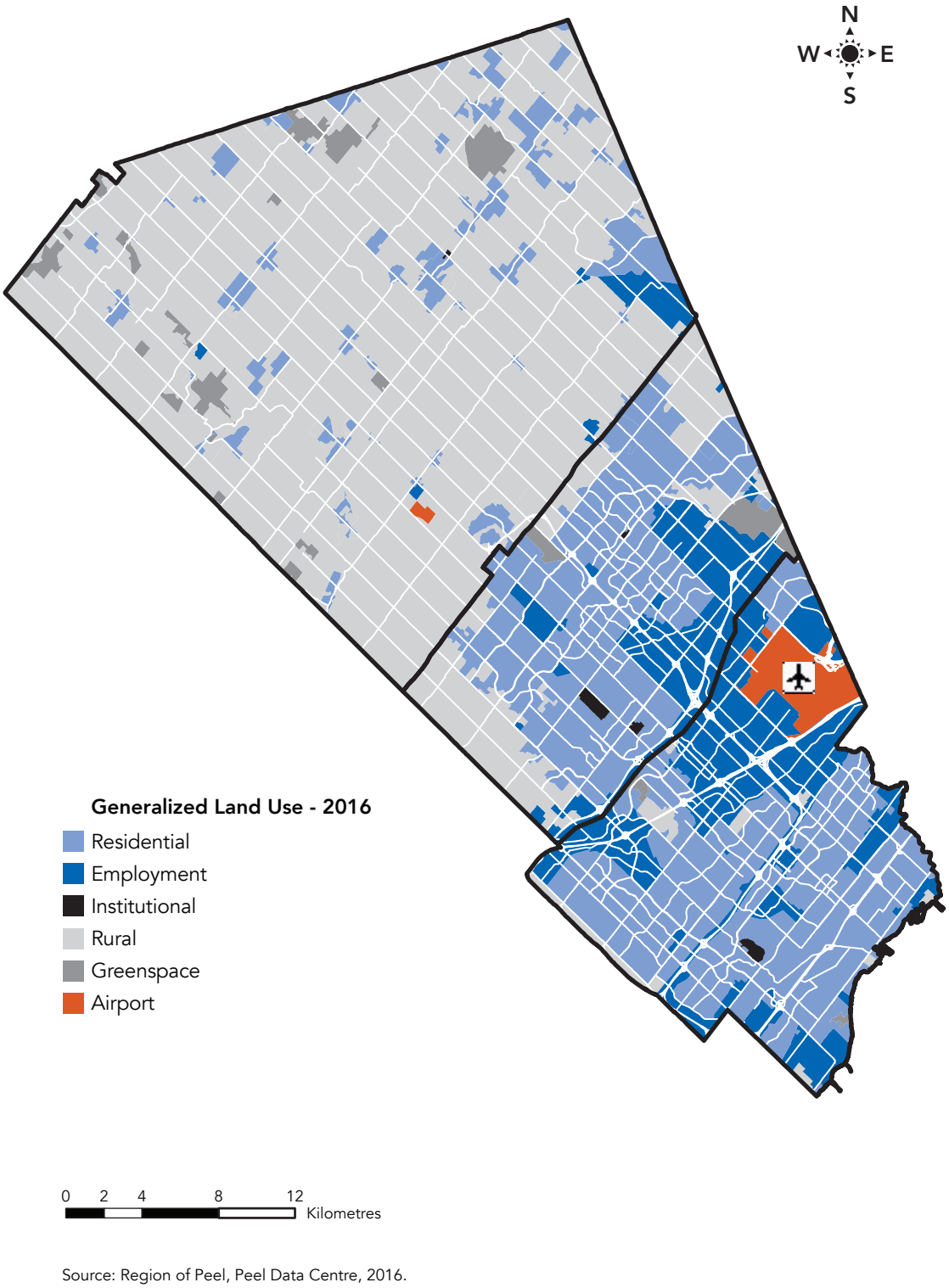
Definition

Land use mix refers to the composition of housing types, services and employment in an area. There is currently no ideal recommendation about the proportion of each type of land use that is associated with improved health outcomes; however, in urban settings, neighbourhoods that offer a mix of employment and institutional, commercial and residential areas within walkable distance are considered health promoting.

Residential areas are found throughout most areas of Mississauga and Brampton, with the exception of the Pearson International Airport, adjacent employment districts, and underdeveloped parts of east, northeast and west Brampton (Map 1.1). Smaller towns and settlements are found in parts of Caledon. Most of Peel's residential areas are suburban and were developed in the post-WWII period.

Map 1.1

General Land Use Classification, Peel, 2016



Source: Region of Peel, Peel Data Centre, 2016.

Planning our Cities

To promote healthier built environments, neighbourhoods can be designed to encourage utilitarian activity (activity to get somewhere or do something), recreational activity (activity during leisure time) or both.

Peel Facts

Approximately 78% of Peel residents live within a five minute (400 m) walk to a park, open green space or natural feature with a trail or path running through it, however this differs by municipality.[A1,C]

Access to parks, open space and greenspace is linked to a variety of health benefits, such as decreased social isolation and decreased stress.[13,14]

Definition

Active transportation is the use of human powered transportation to get places. Examples include biking, walking and public transit which requires people to walk to and from transit stops or stations.

Generally, areas and neighbourhoods with higher density; a mix of residential, commercial, educational and employment land uses; good access to destinations and connected streets; street and neighbourhood attractiveness; and efficient parking increase active transportation and reduce the need for driving. Called compact, complete communities, developments that harness these characteristics encourage active transportation, as well as recreational physical activity.[9]

Peel Facts

On September 1, 2017, the Region of Peel approved by-law 12-2017 that incorporates the Healthy Development Assessment (HDA) into the Regional Official Plan Amendment 27 (ROPA 27).

The HDA is an evaluation tool that assists city planners and developers to create healthy, supportive built environments for Peel residents. It measures the health-promoting potential of a development proposal and produces a score used to determine if the proposal will contribute to building healthy, complete communities. Factors include:

- density
- service proximity
- land use mix
- street connectivity
- streetscape characteristics
- efficient parking

The Infrastructure

The types of infrastructure described in this section include:

- housing
- roads and transportation
- regional services such as water, sewers, waste disposal

Housing

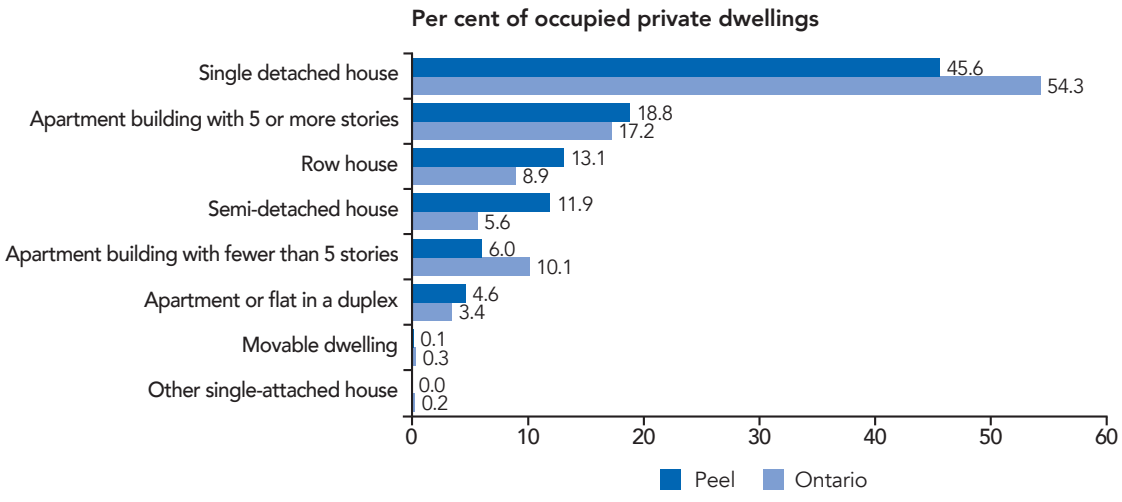
Adequate housing, an important determinant of health, is associated with good physical and mental health and contributes to health outcomes such as respiratory health improvement, lower risk of injury and death, and improved mental health and well-being.[15] The concepts related to housing described in this report include types of housing and housing affordability. Housing affordability is described in ***Chapter 2 – Determinants of Health***.

Type of Housing

Peel offers a variety of housing stock. In comparison with Ontario overall, Peel has a higher proportion of occupied private dwellings that are taller apartment buildings, duplexes, and row and semi-detached houses (Figure 1.1).

Although not shown in Figure 1.1, Toronto has a higher proportion of taller apartment buildings (44%) in comparison with Peel (19%) and fewer single detached houses (24%) than Peel (46%).[A1]

Figure 1.1
Housing Type, Peel and Ontario, 2016



Source: Census 2016, Statistics Canada.

Definition

Low-density housing includes the following types of housing:

- single-detached house
- semi-detached house
- other single-attached house
- apartment or flat in a duplex
- movable dwelling

Medium- and high-density housing is defined as:

- row house
- apartment building

In 2016, 38% of Peel residents lived in medium- and high-density housing, unchanged from 37% in 2006. Mississauga, when compared to Brampton and Caledon, has the highest proportion of residents living in medium and high-density housing. Caledon is primarily zoned for agricultural land.[A1, A3]

The percentage of dwellings by Peel Health Data Zone in 2016 that are classified as medium and high density is described in Map 1.2. There are four Data Zones in Mississauga that have a higher proportion of medium- and high-density dwellings compared to the Peel average. For more information about Peel Health Data Zones, refer to ***Chapter 13 – Data Methods***.

Peel Facts

In 2014, the Region of Peel oversaw the administration of 20,716 housing units, homes and beds including social housing (Peel Housing Corporation and community-based units), shelter and transitional housing, and rent supplement program units. Another 13,380 rent-geared-to-income units are administered by 48 non-profit and co-operative housing providers.[16]

Roads and Transportation

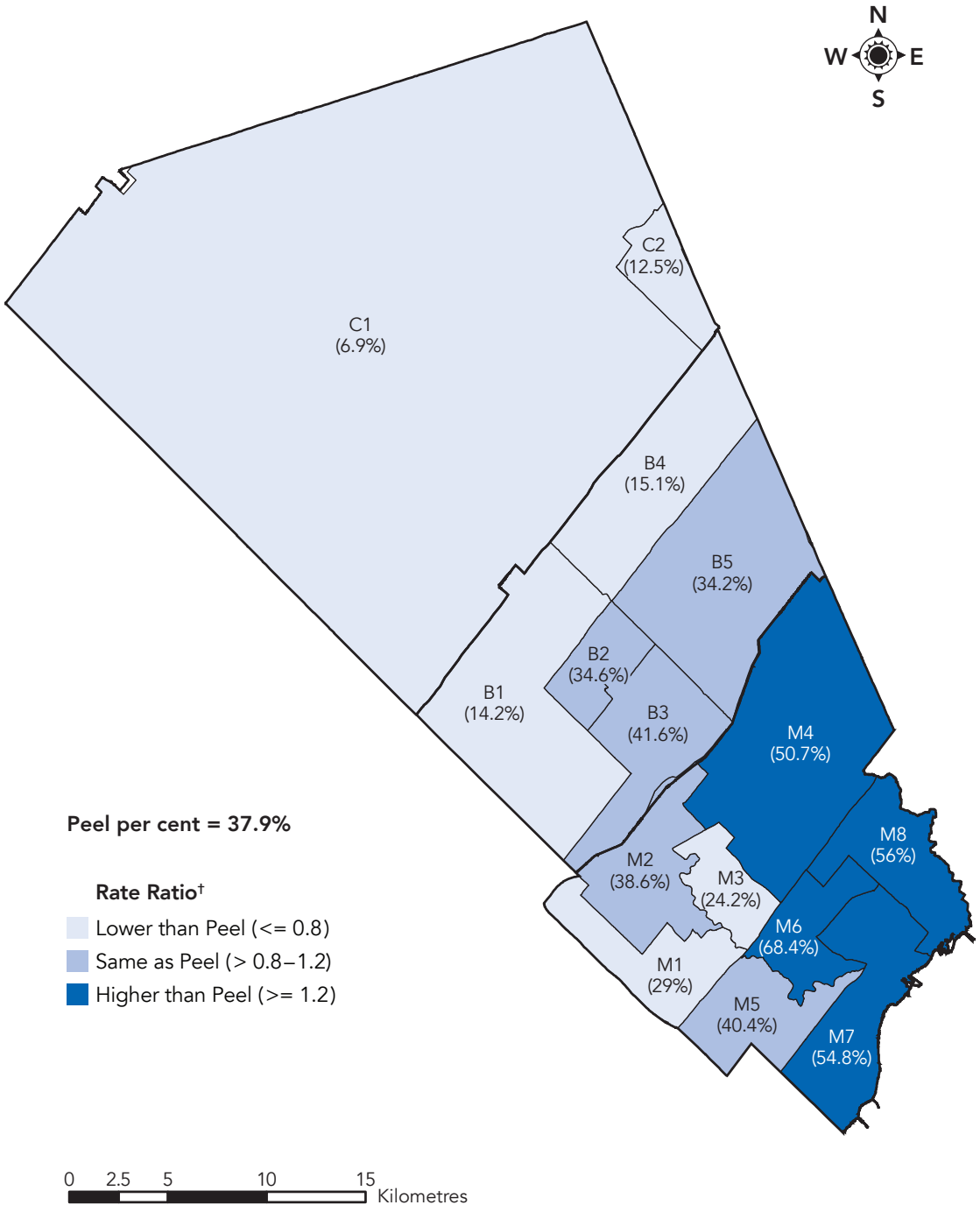
Streets and Roads

In 1884, Peel's roads included two trails across lower Peel. Today, the region has access to:

- six provincial 400-series highways (Highways 401, 403, 407, 409, 410 and 427) and highways 7, 9 and 10;
- the Queen Elizabeth Way;
- twenty-five regional roads, totalling 1,555 lane-kilometres; and
- many more kilometres of municipal roads.

Map 1.2

Proportion of Dwellings Classified as Medium or High Density by Data Zone, Peel, 2016



† Rate ratio calculated as the rate of the data zone divided by the rate in Peel which is 37.9%.
Note: Data zones are denoted by the first letter of the municipality, followed by a number (e.g., C1 denotes Caledon data zone 1).
Source: Census 2016, Statistics Canada.

Did You Know

In 1937, the Port Credit cloverleaf, a highway interchange that manages left turns over ramp roads, was completed at the intersection of The Middle Road and Highway 10. This was Canada's first cloverleaf and provided safe and uninterrupted movement for traffic.[17]

Image is from Ontario Ministry of Transportation (copied from http://www.thekingshighway.ca/PHOTOS/QEWphotos.htm (Permission will be required to use)

Good street connectivity is positively associated with walking frequency, distance walked, and physical activity. Continuous grid street patterns typically provide easy orientation and increased connectivity. Curvilinear street patterns, that is loop and cul-de-sac streets, create a disconnected road system that increases the distances between destinations.

To assess street connectivity, the Region of Peel uses intersection density defined as the number of publicly accessible three-or-more-point intersections per square kilometre. Greater intersection density occurs in areas with many street connections and smaller block sizes, which are linked to increased utilitarian walking.[18]

Intersection density throughout Peel is very low. Good intersection density, which facilitates active modes of transportation, requires 75 intersections per square kilometre averaged across a development.[19] Peel's average intersection density is seven intersections per square kilometre. Brampton has the highest at 15 intersections per square kilometre, followed closely by Mississauga with 14. Caledon has one intersection per square kilometre; however this reflects Caledon's rural context.

Trains, Buses and Planes

Railways were an early form of public transportation in the region. The first railway built in Brampton in 1855 reduced a return trip to the City of Toronto from two days down to two hours.

Peel Facts

Between 1855 and 1906, several railway lines were constructed in the region:

- Grand Trunk Railway
- Toronto Grey and Bruce Railway
- Credit Valley Railway
- Toronto Hamilton Railway
- Hamilton and Northwestern Railway
- Toronto Hamilton and Buffalo Railway Incorporated
- Canadian Pacific Railway – Toronto Sudbury line[20]

Public transportation enables residents to engage in sustainable transportation options, while contributing to reduced vehicle emissions. It also increases levels of active transportation.[21,22]

In Peel, approximately 78% of residents live within a five-minute (400 metre) walk to a bus stop, or a 10-minute (800 metre) walk to a higher order bus or rail stop (i.e., GO Bus or Rail). This is higher in Mississauga (88%) compared with Brampton (84%) and Caledon (11%). [D1-D3, E,F]

Residents in northeast and northwest Brampton, Caledon and south-central Mississauga are the most underserved.

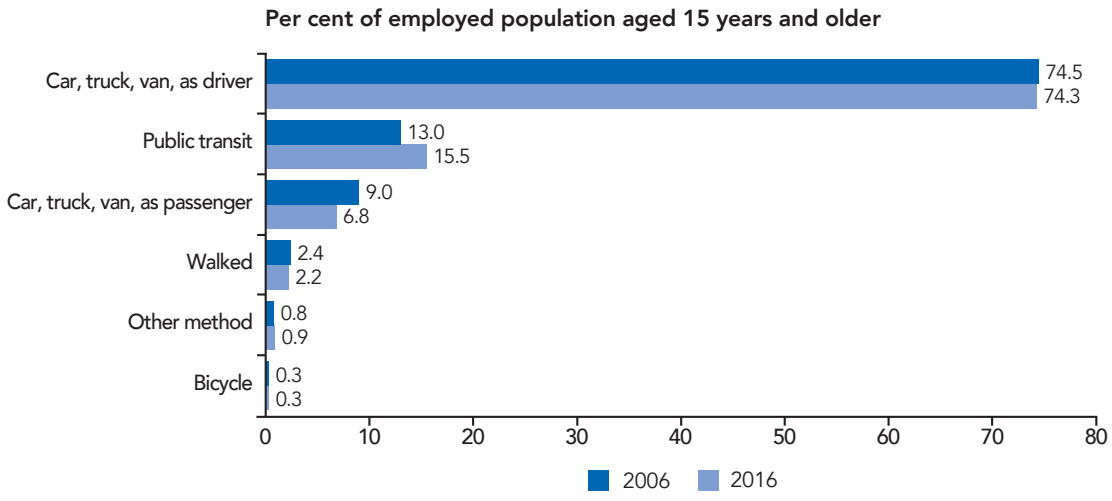
Did You Know

Peel was home to a variety of small airports in the early 1900s. The Malton Airport, built in 1939, has undergone extensive expansions and is now the present-day Toronto Pearson International Airport.[2]

Commuting

For many of the region's residents, commuting to work, school or a shopping destination requires a journey that is too long to choose active transportation. As a result, 81% of the population travels to work in a car, truck or van either as a driver or passenger, a proportion similar in Ontario (78%).[A1] However, since 2006, Peel has seen a slight increase in the proportion of the population using public transit as their mode of transportation to work (Figure 1.2).

Figure 1.2
Mode of Transportation to Work, Peel, 2006 and 2016



Source: Census 2006 and 2016, Statistics Canada.

Commute times, which also influence transit choices, vary by mode of transportation. Peel and Toronto have similar commute times by car, truck or van; however, Peel has a higher average commute time by public transit compared to both Toronto and Ontario (Table 1.5).

Table 1.5

Average Commute Time in Minutes by Mode of Transportation to Work, Peel, Toronto and Ontario, 2016

Transportation Type	Commute Time in Minutes		
	Peel	Toronto	Ontario
Car, truck or van	29.1	29.6	26.3
Active transportation - public transit	54.9	45.8	48.1
Active transportation - walking or cycling	14.2	18.0	15.7

Source: Census 2016, Statistics Canada.

Water, Sewage and Waste Disposal Infrastructure

By the turn of the 20th century many of Canada's waterworks were being managed by municipalities. Peel saw its first system of piped water in the town of Brampton in 1882. By 1916, Brampton and Streetsville had waterworks systems, but only Brampton had a sewer system and a septic tank. In the 1950s, new sewer and water lines were added along with the expansion of sewage facilities at Clarkson and Lakeview.[8]

Peel Facts

In 1913, the Town of Brampton began routine inspections of its waterworks. As a result, the area saw a decline of cases of typhoid fever.[3] Today, all typhoid fever cases in Peel are introduced through travel to countries where typhoid fever is still endemic.

Today, municipally treated water, sewage and waste disposal systems are managed by the Region of Peel. Peel's municipal drinking water comes from the South Peel Drinking Water System, which services residents in the cities of Brampton and Mississauga, and parts of Caledon. It has a distribution system with 13 reservoirs, four elevated tanks and two standpipes. There are four well-based drinking water systems in Caledon with their distribution systems collectively having five reservoirs and two standpipes.

Peel Facts

It is estimated that 11,520 Peel residents (0.8%) have access to private well water.[23]

The Region of Peel has three wastewater treatment plants: the Clarkson Wastewater Treatment Facility, the GE Booth Lakeview Wastewater Treatment Facility and the Inglewood Communal Wastewater Treatment Station.

For waste disposal, the Region of Peel operates six community recycling centres, evenly distributed across Caledon, Brampton, and Mississauga. The Region also runs:

- The Peel Integrated Waste Management Facility site in Brampton, which includes:
  - a material recovery facility for curbside blue bin material;
  - a waste transfer station for curbside waste and community recycling; and
  - six biocell reactors for primary composting of curbside organics, and community recycling of leaf and yard waste.
- The Peel Compost Facility, which is a primary composting site for curbside organics, and leaf and yard waste material.
- The Peel Curing Facility, a secondary composting facility for material from the Peel Integrated Waste Management Facility and the Peel Compost Facility, which uses eight biocell reactors for composting.

Chapter 2

Determinants Of Health

Key Messages

- Peel's population is aging. Implications of this include higher proportions of seniors with activity limitations, chronic diseases, and increased housing needs; and increased dependency on families for support.
- Peel has a well-educated population and is more financially well off in comparison with Ontario.
- There have been improvements in the per cent of senior kindergarten children ready for school in the following domains: language and cognitive development and communications and general knowledge. Additionally, high school graduation rates in Peel have increased over time.
- Living in low income households is higher among those under 18 years in Peel and Peel's population spends more on rent compared to Ontario. Additional work is needed to further understand the distribution of income in Peel.
- Peel has a high proportion of immigrants (52%) compared to Ontario (29%). In 2016, 54% of Peel residents were first generation and 30% were second generation.
- This report presents some new data about Indigenous Peoples and the LGBTQ2S+ community; however, many data gaps still persist.
- While Peel has a diverse population speaking many languages, almost all residents speak English or French. Many of those who do not are seniors (16%), or to a lesser extent, (10%) children aged one to three years.

This chapter expands on data provided in the Introduction to better understand determinants of health, and identify health inequalities between groups or changes in inequality over time.

Genetics – Age and Sex

As a person ages, there are natural biological changes that increase a person's risk of both physical and mental decline. It is unclear how much of the decline in health is attributed to biological aging and how much of it is due to other determinants, including personal health practices, social support and the physical environment.

Sex can be considered both a biological and a social construct. Biologically, there are differences between males and females as a result of genetics and hormone levels. Socially, there are sex differences in terms of roles, norms and values.[24]

In addition to sex, the concepts of gender and sexual orientation will be described in this chapter.

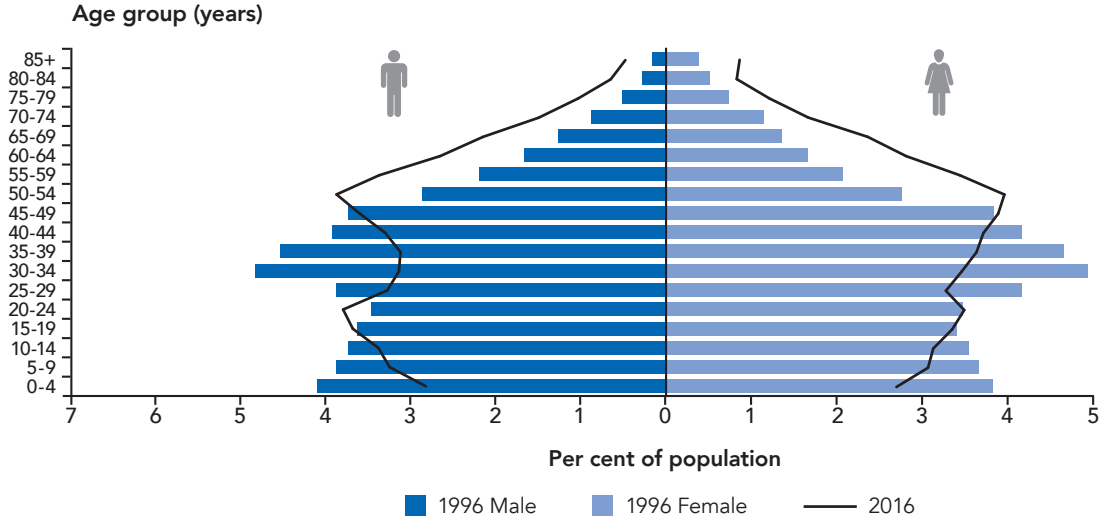
Age and Sex Distribution

The age and sex distribution of Peel's population has changed in the 20 years between 1996 and 2016 (Figure 2.1). In 1996, the region had a higher proportion of young families and children. Today, there are more adults in middle age and fewer children. Although not shown, a similar age and sex distribution was found in Ontario's population in 2016.[A1]

Looking ahead to 2036, Peel's population will have a higher proportion of those aged 65 years and older, and even fewer children (Figure 2.2). This means that working adults will have more senior dependents (i.e., older parents) to support in 2036.

Figure 2.1

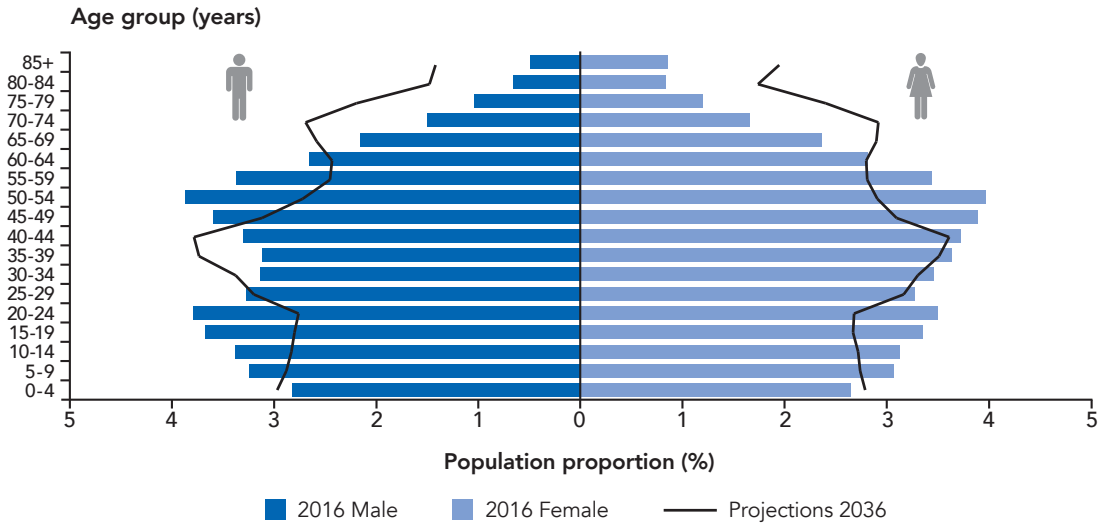
Population Distribution by Age Group and Sex, Peel, 1996 and 2016



Source: Census 1996, 2016, Statistics Canada.

Figure 2.2

Population Distribution by Age Group and Sex, Peel, 2016 and 2036



Sources: Census 2016, Statistics Canada
Hemson Consulting, Population Forecast 2036, Region of Peel

Peel Facts

Peel's Indigenous population is young with 43% under 25 years of age. In comparison, 33% of Peel's population is younger than 25 years.[A1]

Measurement

Colonial systems of knowledge production have resulted in the marginalization of Indigenous ways of knowing and being. As a result of the widespread impacts of intergenerational trauma, there is systematic under-representation of Indigenous Peoples in the Census. Because the Region of Peel – Public Health relies on these sources exclusively for information about individuals who self-identify as Indigenous, we can expect that the Indigenous community in the Territories now known as Peel Region is significantly underrepresented. The extent of this underrepresentation is unknown.

Due to the limitations of the Census in counting Indigenous Peoples, alternative methods to measure the Indigenous population have been initiated. Using a respondent-driven sampling approach, health surveys of Indigenous Peoples have been conducted in the following cities: Ottawa, Hamilton, Toronto, London, Kenora and Thunder Bay.

Results so far:

- Ottawa: The Inuit population was determined to be four times higher in comparison to population counts from the Census.[25]
- Toronto: The Indigenous aboriginal population is undercounted in the Census by approximately two to four times.[26]

Indigenous Peoples across the Territories now known as Canada continue to advocate for information governance systems which honour the principles of Ownership, Control, Access, and Possession, established as a standard by the First Nations Information Governance Centre. The Region of Peel – Public Health is committed to learning about culturally safe methodologies of data collection and analysis to improve and deepen our understanding of the health status of Indigenous Peoples in our community profile.

Dependency Ratio

Definition

Total dependency ratio is a measure used to describe the number of people – youth younger than age 20 and seniors aged 65 years and older – economically dependent on the working age population (those aged 20 to 64 years). The number reflects dependents for every 100 workers.

Youth dependency ratio measures the ratio of the youth population (aged 0 to 19 years) to the working age population (aged 20 to 64 years). A declining youth dependency ratio means that there may not be sufficient numbers of future workers.[27]

Senior dependency ratio measures the ratio of the senior population (aged 65 years and older) to the working age population (aged 20 to 64 years). An increasing senior dependency ratio impacts the well-being of the working population as they must split care between their children as well as their aging parents.[28]

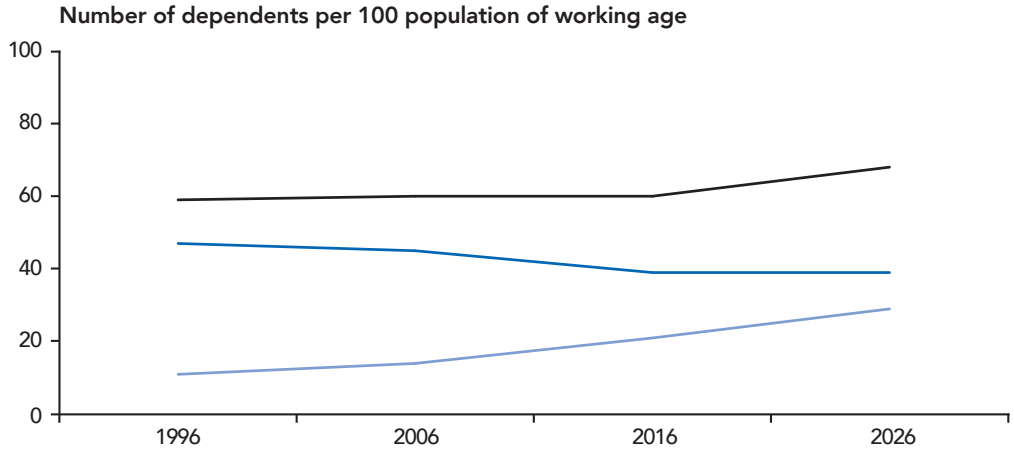
The total dependency ratio has been steady for the past 20 years. However, by 2026 Peel will see an increase in senior dependency, a result of longer life expectancy and higher proportions of those aged 65 years and older in the population (Figure 2.3). Youth dependency, which declined between 1996 and 2016, can be attributed to a reduction in the proportion of youth relative to the total population (Figure 2.3).

Since the dependency ratio is based on age rather than employment status, it does not account for youth or seniors who are working, or for those aged 20 to 64 years who are unemployed or who are not in the labour force.[29]

By 2026, Peel's senior dependency ratio and total dependency ratio will be 1.4 and 1.6 times higher than Ontario, respectively (Table 2.1). Ontario's total dependency ratio (data not shown) is expected to decline over the next 10 years whereas Peel's will increase.[A1,I1]

Figure 2.3

Observed and Projected Youth, Senior and Total Dependency Ratios, Peel, 1996, 2006, 2016 and 2026



Youth	47	45	39	39
Senior	11	14	21	29
Total	59	60	60	68

Sources: Census 1996, 2006, 2016 Statistics Canada.
Population Projections 2026, Ontario Ministry of Finance. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Table 2.1

Projected Dependency Ratio, Peel and Ontario, 2026

	Peel Dependency Ratio (Per cent)	Ontario Dependency Ratio (Per cent)	Rate Ratio†
Youth	39	37	1.1
Senior	29	21	1.4
Total	**68**	**42**	**1.6**

† Rate ratio is defined as the Peel rate divided by the Ontario rate.
Source: Population Projections 2026, Ministry of Finance. Ontario Ministry of Health and Long-Term Care.

Sex, Gender, Sexual Attraction and Orientation

The concepts of sex, gender, sexual attraction and sexual orientation and their distribution in the population are important to health. Freedom from discrimination and stigma due to gender and sexual orientation are increasingly being recognized as fundamental components, if not necessities, to health.

Gender Identity

In Ontario, among students in grades 9 to 12, the majority of biologically born males identify as being male (98%) (Figure 2.4). The same is true for biologically born females, with 98% identifying as females. This is similar in Peel. Data are not shown due to small numbers.

Definition

Sex is the biological attribute of a person, and is typically associated with physical and physiological features such as chromosomes, hormone levels and function, and reproductive or sexual anatomy.[30] This concept is usually measured as male or female.

Gender is defined as socially constructed roles, behaviours or identities and has an influence on how people perceive themselves and others, and even how they act.[30]

Gender identity defines how a person feels about themselves in terms of being male, female or transgender for example.[31]

Sexual attraction defines who a person is attracted to, based on sexual desire.

Sexual orientation is used to describe how a person perceives and defines their sexuality. There are many types of measures that capture this concept. Examples of measures include:

- sexual identity (how a person describes themselves based on their attraction to others (e.g., heterosexual, straight, gay, lesbian, bisexual));
- past year or lifetime sexual behaviour; and
- sexual attraction (who a person is attracted to (e.g., men only, women only, both men and women)).[32]

Measurement

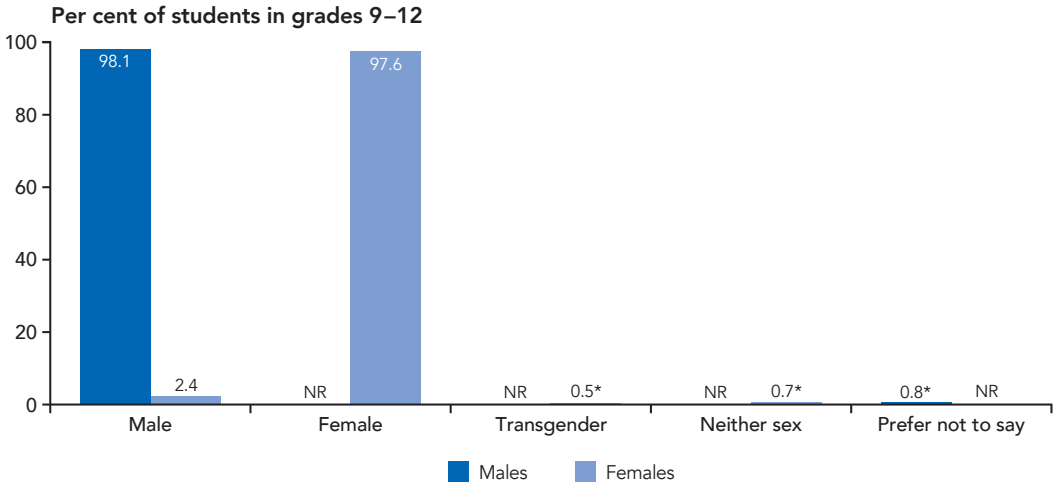
Data about ***gender identity*** and ***sexual orientation*** are available for Peel students in grades 7 to 12 from the Ontario Student Drug Use and Health Survey. Data for adults are currently not available.

Measures about ***sexual attraction*** are collected in the:

- Canadian Community Health Survey for those aged 12 years and older;
- Rapid Risk Factor Surveillance System Survey for those aged 18 years and older; and
- Ontario Student Drug Use and Health Survey for students in grades 7 to 12.

Figure 2.4

Gender Identity Among Students in Grades 9–12, Ontario, 2017



*Use estimate with caution
NR = Not releasable due to small numbers
Source: Ontario Student Drug Use and Health Survey 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.

Sexual Attraction

In Peel, the majority of biologically born males in grades 9 to 12 are attracted to females (93%) (Table 2.2). There is more reported diversity for biologically born females in this cohort where 85% report being attracted to males, and 10% report being attracted to both males and females. These findings are similar across the province. Data are not available about sexual attraction for Peel adults.

Table 2.2

Sexual Attraction Among Students in Grades 9–12, Peel and Ontario, 2017

Sex Attracted to	Student Sex at Birth			
	Peel		Ontario	
	Males Per cent	Females Per cent	Males Per cent	Females Per cent
Males	NR	84.6	1.8	84.8
Females	92.8	NR	92.9	1.9*
Both males and females	3.1*	9.6	2.9*	9.1
Not attracted to anyone	NR	1.7*	0.9*	1.4*
Prefer not to say	NR	2.4*	1.5*	2.8*

*Use estimate with caution.
NR =Not releasable due to small numbers.
Source: Ontario Student Health and Drug Use Survey 2017, Centre for Addiction and Mental Health. Region of Peel - Public Health.

Sexual Orientation

In Peel in 2015/2016, 98% of the population aged 15 years and older report being heterosexual. This is similar to Ontario. A smaller percentage of the province's population reports being homosexual (1.5%) and bisexual (1.7%). These data are not releasable for Peel.[H1]

Education

A number of studies point to the strong association between educational attainment and higher physical and psychological well-being, as well as healthier patterns of behaviour.[33-39]

The association is apparent across the full range of educational and economic circumstances and is not confined to the most disadvantaged.

Peel's educational infrastructure consists of the following:

- 398 English public and Catholic schools
- 10 French public and Catholic schools
- 120 private schools
- 4 colleges
- 1 university

Peel's residents are well educated with 65% having post-secondary education. Between 2006 and 2016, Peel has seen a slight increase in the proportion of residents with post-secondary education (Figure 2.5). Peel has a similar educational rate as Ontario (data not shown).

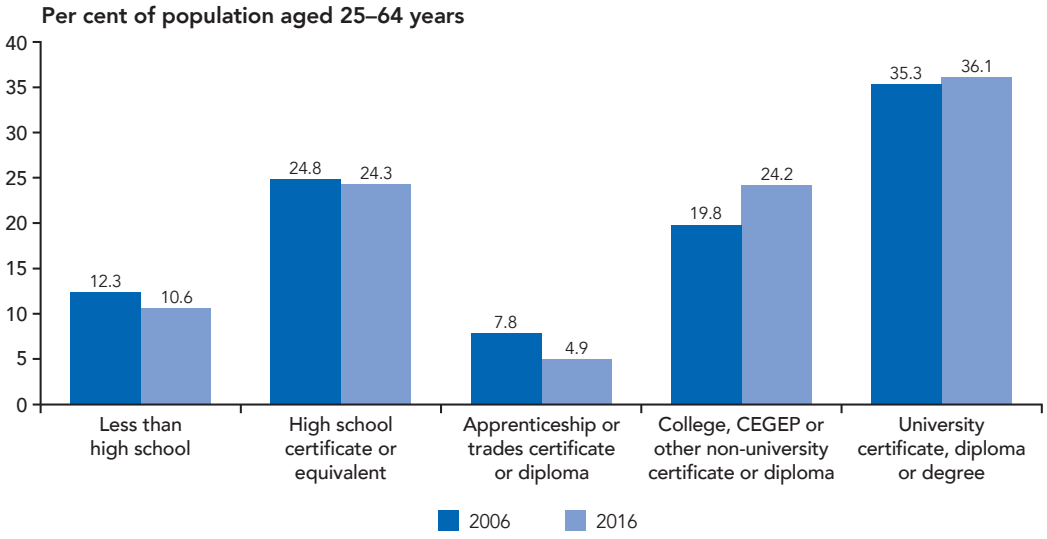
Looking at the number of residents who have attained a post-secondary certificate, diploma or degree from outside of Canada, Peel has a higher proportion (41%) than Ontario (21%). This can be attributed to the high proportion of immigrants in Peel.[A1]

Measurement

One way to measure a person's education level is to assess what a person has learned and knows from formal education in school. Education is a strong determinant of future employment and income.[40]
The concept of formal education is easy to measure in self-administered surveys and tends to yield high response rates as it is relevant to all people.

Educational experience is important to assess by birth cohort. For example, adults with less than high school education today may be different than adults who had less than high school education 50 years ago. It is also important to determine whether a person obtained their education outside of their country of residence as education differs by country depending on its educational infrastructure.

Figure 2.5
Educational Attainment, Peel, 2006 and 2016



Note: University certificate or diploma below bachelor level was included in the College category. In previous years this category was included in with the university category.
Source: Census 2006, 2016, Statistics Canada.

Educational Achievement

Children's readiness to learn as they enter school is considered a predictor of their success in school and later in life.[41]

In 2015, 30% of senior kindergarten (SK) children in Peel were categorized as 'Vulnerable' on one or more Early Development Instrument (EDI) domains which include physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication and general knowledge.[J1] This is similar to Ontario's rate (29%). Vulnerability is defined as being at or below the 10th percentile according to Ontario baseline cut-points.

Peel EDI results by domain indicate the following:

- Physical health and well-being: 15% of SK children are vulnerable and there has been no change between 2007 and 2015;
- Social competence: 11% of SK children are vulnerable and there has been no change between 2007 and 2015;
- Emotional maturity: 11% of SK children are vulnerable and there has been no change between 2007 and 2015;
- Language and cognitive development: 9% of SK children are vulnerable and there has been a 35% reduction in vulnerability between 2007 and 2015; and
- Communication and general knowledge: 11% of SK children are vulnerable and there has been a 27% reduction in vulnerability between 2007 and 2015.[J1-J3]

Peel Facts

The Peel District School Board graduation rate has increased from 89% in the 2011/2012 school year to 94% in 2016/2017.[42]

The Dufferin-Peel Catholic District School Board graduation rate has also increased from 79% in the 2006/2007 school year to 88% in 2015/2016.[43]

A variety of programs and initiatives implemented at both the board and school level have contributed to the increases in graduation rates over time.

Employment

Employment not only provides an income, it also creates a sense of identity and purpose, and allows opportunities for personal and professional growth. Unemployment, underemployment, and stressful or unsafe working conditions are associated with poor physical, mental and social health.[44]

Measurement

Measuring labour force participation, employment status (employed or unemployed), job security and employment type are good indicators of quality of life.[45]

Definition

Participation rate is a measure of the proportion of the population in the labour force, aged 15 years and older, who were employed (including parents on maternity and parental leave), or unemployed (i.e., looking for work, on temporary lay-off, starting a new job in four weeks or less), relative to the overall working-age population.[46]

Unemployment rate measures the number of individuals, aged 15 years and older, who meet the following criteria divided by those participating in the workforce:

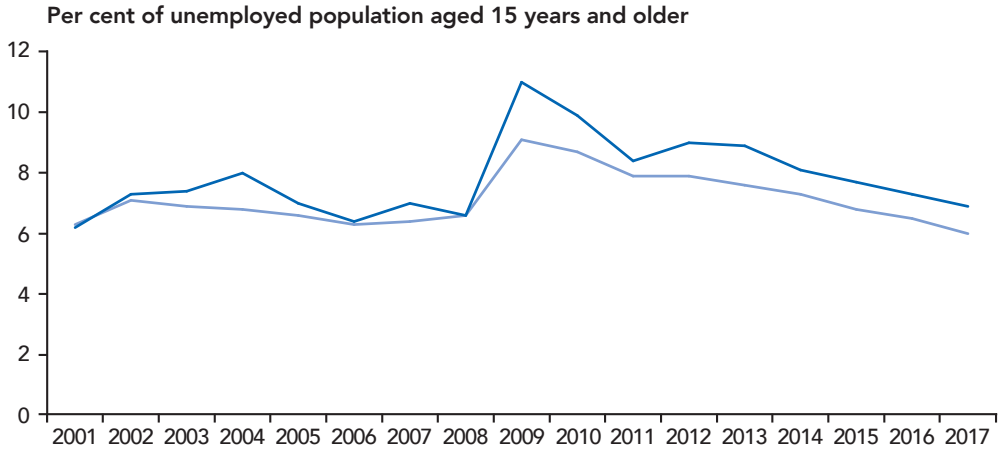
- "On temporary layoff during the reference week with an expectation of being recalled back to work.
- Without work, available to work and had looked for work in the past four weeks.
- Will start a new job within four weeks of the reference week, and were available for work."[47]

Participation in the Labour Force

In 2017, Peel's participation in the labour force was 67%, which was similar to Ontario (65%).[K1] Overall, the region's unemployment rate (7%) in 2017 was also similar to Ontario (6%) (Figure 2.6).

The youth unemployment rate in Peel in 2017 was similar to that for Ontario. Youth unemployment has been higher over the past eight years (2009–2017) compared to the previous decade (Figure 2.7).

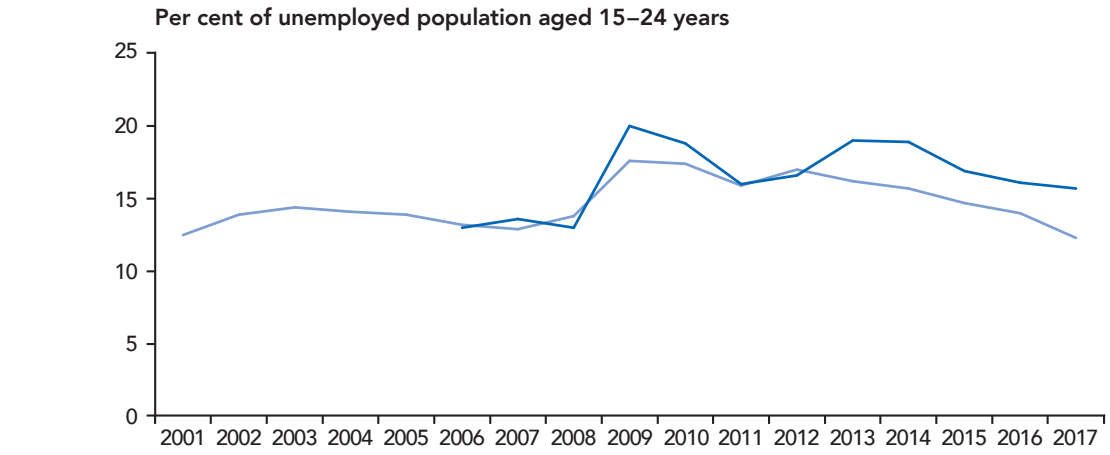
Figure 2.6
Unemployment Rate, Peel and Ontario, 2001–2017



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Peel	6.2	7.3	7.4	8.0	7.0	6.4	7.0	6.6	11.0	9.9	8.4	9.0	8.9	8.1	7.7	7.3	6.9
Ontario	6.3	7.1	6.9	6.8	6.6	6.3	6.4	6.6	9.1	8.7	7.9	7.9	7.6	7.3	6.8	6.5	6.0

Source: Labour Force Survey 2001-2016, Statistics Canada.

Figure 2.7
Youth Unemployment Rate, Peel and Ontario, 2001–2017



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Peel	NA	NA	NA	NA	NA	13.0	13.6	13.0	20.0	18.8	16.0	16.6	19.0	18.9	16.9	16.1	15.7
Ontario	12.5	13.9	14.4	14.1	13.9	13.2	12.9	13.8	17.6	17.4	15.9	17.0	16.2	15.7	14.7	14.0	12.3

NA = Data not available
Source: Labour Force Survey 2001-2017, Statistics Canada.

Type of Work

In Peel in 2016, the proportion of the workforce that was in full-time employment was 85%, which is similar to Ontario (81%). This has been consistent over time between 2001 and 2015.[K2]

Did You Know

In Ontario, the top three reasons for part-time work are:

- going to school (28%);
- personal preference (26%); and
- business conditions, therefore did not look for full-time work in the past month (13%).[48]

Additionally, in 2016, 27% of employed workers aged 18 years and older in Peel were working shift work. Shift work includes working a regular evening shift, regular night shift, rotating shift and split shift, on call, or irregular schedule.[G2]

Income

There is a strong relationship between socioeconomic status and health.[49-51] Income can impact a person's childhood, education, employment, working conditions, housing and food security.

Data presented about income in this section of the report come primarily from the Canada Revenue Agency through the Census from individuals and can be presented in a variety of ways:

- individual income
- private household income
- economic or non-economic family income
- census family or non-census family income

Measurement

Indicators of income are captured for individuals and households. Household income measures combine income for the entire family. This is useful if a family member is not engaged in the workforce, but benefits from the income of others in the family (e.g., a spouse who is not the main income earner).

Some disadvantages of income measures include changes to an individual's income over a short period of time (e.g., loss of a job). In addition, sensitivities around income levels can deter responses in surveys.[40]

All income measures using Census data will be presented using after-tax income. This reflects a family's actual spending power after they pay taxes and receive payment of social benefits such as the Old Age Security benefit. For the 2016 Census, income was obtained solely through administrative data sources, including Canada Revenue Agency's tax and benefit records. Income that came from one-time receipts (e.g., lump-sum withdrawals from registered retirement savings plans (RRSPs) and other savings plans; insurance settlements; pension benefits; capital gains or losses; inheritances; and lottery winnings) were excluded.

For the purposes of this report, the income experiences of individuals, private households and economic families will be described. Figure 2.8 shows the connections between family membership and family status.

Definition

A ***private household*** is defined as a person or group of persons who live in the same dwelling (e.g., single detached home, apartment) and do not have a usual place of residence elsewhere in Canada or abroad. Collective dwellings - those that are commercial, institutional or communal in nature - are not included in this definition (e.g., rooming houses, hotels, nursing homes).[46]

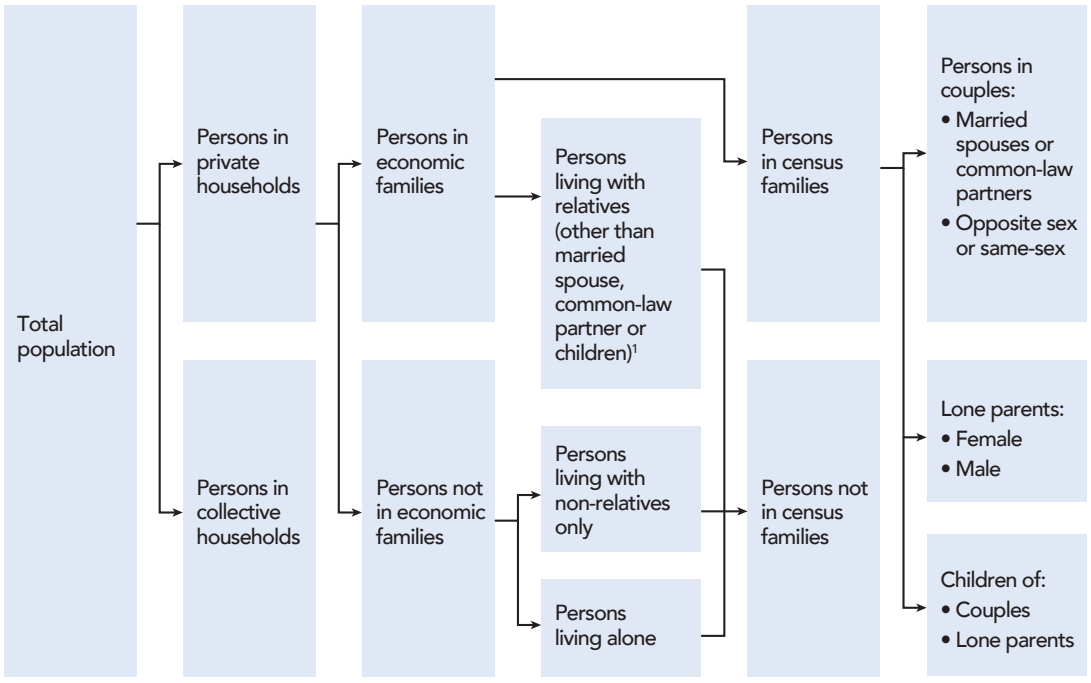
An ***economic family*** is defined as a group of two or more people who live in the same dwelling and are related to each other by blood, marriage, common-law union, adoption or a foster relationship. A couple may be of same or opposite sex.[46]

A ***census family*** is defined as:

- a married couple and the children, if any, of either and/or both spouses;
- a couple living common law and the children, if any, of either and/or both parents; or
- a lone parent of any marital status with at least one child living in the same dwelling.

All members of a census family live in the same dwelling. Couples in this scenario may be of opposite or same sex. Children may be children by birth, marriage, common-law union or adoption regardless of their age or marital status, as long as they live in the same dwelling and do not have their own married spouse, common-law partner or child living in the dwelling. Grandchildren living with their grandparent(s), but with no parents present also constitute a census family.[46]

Figure 2.8
Family Membership and Family Status



1. Foster children are included.
Source: Dictionary, Census of Population 2016. Figure 3.1 Family membership and family status [Internet]. Ottawa, ON: Statistics Canada; [updated October 25, 2017; cited November 27, 2017]. Available from: http://www12.statcan.gc.ca/census-recensement/2016/ref/dict/fig-eng.cfm

Income Distribution

Measurement

The following income categories are included in the measurement of total income:

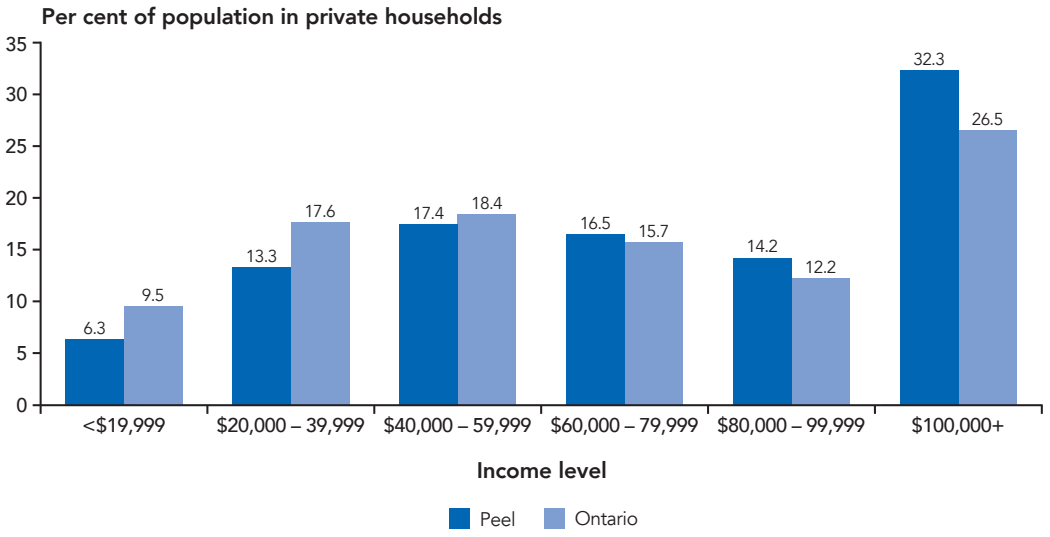
- "employment income from wages, salaries, tips, commissions and net income from self-employment (for both unincorporated farm and non-farm activities);
- income from investment sources, such as dividends and interest on bonds, accounts, guaranteed investment certificates (GICs) and mutual funds;
- income from employer and personal pension sources, such as private pensions and payments from annuities and registered retirement income funds (RRIFs);
- other regular cash income, such as child support payments received, spousal support payments (alimony) received and scholarships; and
- income from government sources, such as social assistance, child benefits, Employment Insurance benefits, Old Age Security benefits, Canada Pension Plan and Québec Pension Plan benefits and disability income."[46]

Peel has a higher proportion of households earning over $100,000 compared to Ontario (Figure 2.9).

The distribution of Peel's private household income between 2005 and 2015 is described in Figure 2.10. Fewer private households are earning less than $40,000 annually. This has not been adjusted to reflect changes to the inflation rate over the past 10 years.

Figure 2.9

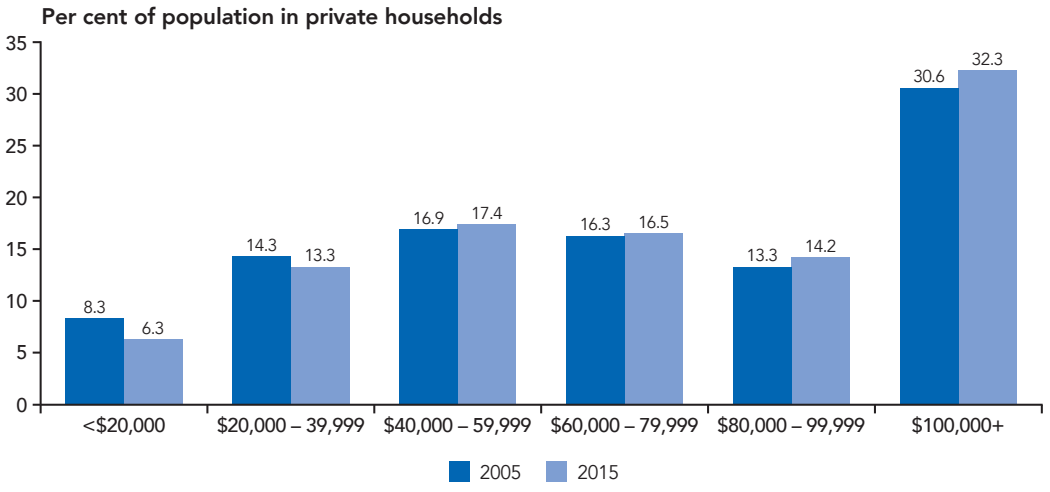
Distribution of After-tax, Private Household Income, Peel and Ontario, 2015



Source: Census 2016, Statistics Canada.

Figure 2.10

Distribution of After-tax, Private Household Income, Peel, 2005 and 2015



Source: Census 2006, 2016, Statistics Canada.

In Peel and Ontario, the majority of income is received from 'market income', a category that includes income from employment, investments, private retirement and other forms. Peel has a lower proportion of individuals who have income from Old Age Security benefits, the Canada Pension Plan and social assistance benefits compared to Ontario. However, a higher proportion of Peel residents obtain their income through a variety of child benefits and the working income tax benefit compared to Ontario (Table 2.3). Historical data are not available for a comparison of trends over time.

? *Did You Know*

In Canada, children who were born between 1970 and 1984 who were from low income families are earning more at age 30 than their parents at age 30 after adjusting for inflation.[52]

Table 2.3

Source of Individual Income†, Peel and Ontario, 2016

Income Source	Peel Per cent	Ontario Per cent	Rate Ratio¥ Peel to Ontario
Market income (employment/self-employment, investment, private retirement, other)	82.8	85.1	0.97 (similar)
Old Age Security	12.4	16.9	0.73 (lower)
Guaranteed income supplement and spousal allowance	5.3	5.3	1.0 (similar)
Canada Pension Plan (CPP) and Québec Pension Plan (QPP) benefits (retirement, disability and survivor benefits)	15.3	22.2	0.69 (lower)
Employment insurance benefits	6.5	6.9	0.94 (similar)
Total child benefits	**15.7**	**13.5**	1.16 (similar)
• Basic Canada Child Tax Benefit	13.2	10.7	1.23 (higher)
• National Child Benefit Supplement	7.0	5.6	1.25 (higher)
• Universal Child Care Benefit	15.5	13.2	1.17 (similar)
• Provincial and territorial child benefits	7.1	5.6	1.27 (higher)
Other government transfers			
• Social assistance benefits	3.1	4.9	0.63 (lower)
• Workers' Compensation Board benefits	1.4	1.7	0.82 (similar)
• Working income tax benefit (WITB)	5.9	4.7	1.25 (higher)
• Goods and Services Tax (GST) credit and Harmonized Sales Tax (HST) credit	38.9	37.1	1.05 (similar)
• Government transfers not included elsewhere	36.7	35.0	1.05 (similar)

Source: 2016 Census, Statistics Canada.
¥ Rate ratio is calculated as the Peel rate divided by the Ontario rate.
† Reflects individuals aged 15 years and older living in private households.

Did You Know

Federal and provincial income security supports can help residents with low or no market income and those with long-term barriers to full employment. Income benefits can include:

- paid contributions to replace earnings (e.g., Employment Insurance and Canada Pension Plan);
- amounts provided for periods of virtually no income (e.g., social assistance programs, like Ontario Works and Ontario Disability Support Program; and seniors programs, such as Old Age Security, Guaranteed Income Supplement); and
- amounts that supplement other income which may relate to a specific purpose (e.g., Canada Child Tax Benefit, Ontario Child Benefit).

Peel Facts

In 2016, the composition of income for Peel seniors was 62% from market income and 38% from government transfers. This is similar to Ontario.[A1]

Median and Mean Income

Definition

The ***median income*** of a population is the level at which half of the population has a higher income and half of the population has a lower income. When the distribution of income is skewed, the median income is the preferred measure to use.

The ***mean income***, also referred to as the average, is computed as the total or aggregate income divided by the number of people in the population. It offers a convenient way of tracking aggregate income while adjusting for changes in the size of the population. A disadvantage is that outliers can have a disproportionate influence on the total. For example, the mean income in Peel is higher than the median because the income distribution is skewed as a result of the 32% of households earning $100,000 or more annually.

The mean and median income is presented in this report for both individuals and households.

Individual Income

In Peel, the median and mean income of individuals aged 15 years and older is similar to that of Ontario. However, there is variation by municipality. Both Brampton and Mississauga have lower mean incomes compared to Peel and Ontario (Table 2.4).

In 2015, among Peel residents aged 15 years and older, the median after-tax income among males was $32,554 compared to $25,077 for females. The median after-tax income for males is 1.3 times higher compared to females with an absolute difference of $7,477 (data not shown).

Private Households

The mean and median after-tax income in private households in Peel is about $10,000 higher than Ontario which might be the result of a higher average number of people per household in Peel compared to Ontario. This is consistent even when looking at municipalities within Peel. Caledon has the highest income overall (Table 2.4). Excluded from this income summary are those living in collective households (e.g., hospitals, rooming houses, nursing homes, jails, group homes).

Table 2.4

Mean and Median, After-tax Income and Average Number of People per Household, Peel Municipalities, Peel and Ontario, 2015

Geography	Individuals†		Private Households¥		Average Number of People per Household
	Median Income	Mean Income	Median Income	Mean Income	
Caledon	$36,733	$45,243	$96,009	$137,519	3.1
Brampton	$27,086	$32,380	$77,156	$85,038	3.5
Mississauga	$28,899	$37,373	$72,657	$87,086	3.0
Peel	**$28,405**	**$42,651**	**$75,667**	**$87,371**	**3.2**
Ontario	**$30,641**	**$47,915**	**$65,285**	**$80,322**	**2.6**

† Reflects individuals aged 15 years and older
¥ Reflects a person or group of persons who occupy the same dwelling
Source: Census 2016, Statistics Canada.

Between 2005 and 2015, there have been increases in median after-tax income among individuals in Peel (from $25,157 to $28,405) and among private households (from $62,181 to $65,285); however this has not been adjusted for the rate of inflation.[A1,A3] This is consistent with Canadian data, which has experienced an 11% unadjusted increase in median income between 2005 and 2015.[53]

Low Income

In this report, low income is described using the after-tax low income cut-off (LICO). It should be noted that the number of people falling below LICO is lower using after-tax income than it is using before-tax income. This difference is a result of progressive tax rates that compress the distribution of income through refundable taxes credits and social benefits.[54]

In Peel, 10% or 138,555 private households were classified as low income, after-tax, in 2015. This is similar to 2005 data for Peel (11%) and Ontario (10%) (Table 2.5). In Canada, the low income rate has been stable between 2005 and 2015.[53]

Definition

In the 2016 Census, ***low-income prevalence*** was defined as the proportion of people or families whose income falls below a specified low-income line.

Low income cut-offs after-tax (LICOs) refer to an income threshold, after taxes, below which individuals or families would likely have to spend a larger share of their income than average on food, shelter and clothing. Defined using 1992 expenditure data, LICOs vary depending on the number of people living in an area and the size of the family (Refer to Appendix 1).

Table 2.5

After-tax, Low-income Prevalence by Household Type, Census Families and Age Group, Peel and Ontario, 2005 and 2015

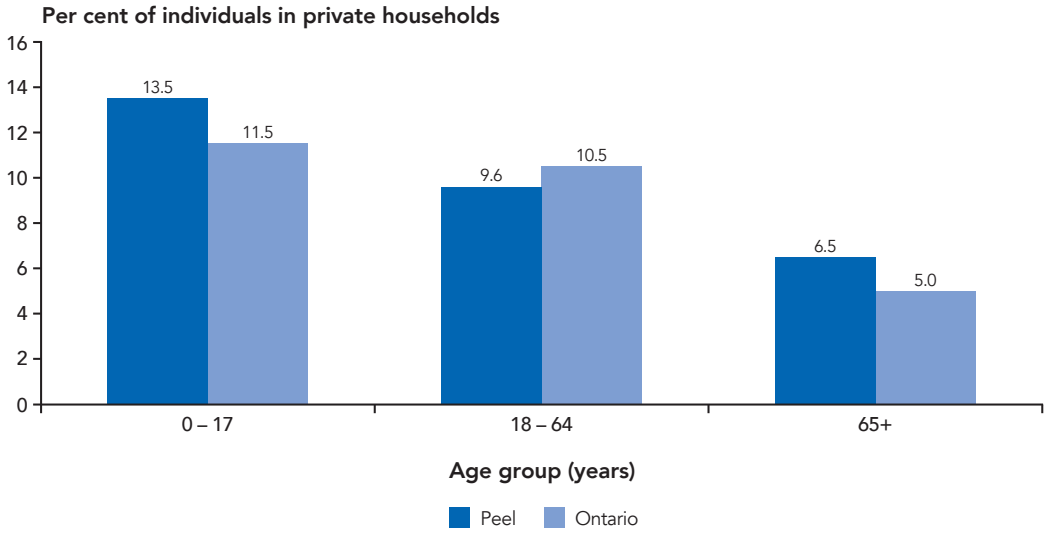
Household Cost	Peel 2005 Per cent	Peel 2015 Per cent	Peel Per cent Change Between 2005 and 2015	Ontario 2015 Per cent	Rate Ratio† Peel Compared to Ontario 2015
Private households	11.0	10.1	-8.2	9.8	1.03 (similar)
Total economic family	9.7	8.4	-13.0	7.0	1.20 (similar)
Persons not in economic families (unattached individuals)	25.7	30.7	19.5	27.7	1.11 (similar)
Census families					
Couple economic families	8.2	6.8	-17.5	5.2	1.30 (higher)
Male lone parent families	11.9	10.0	-16.0	12.1	0.82 (similar)
Female lone parent families	20.9	16.0	-23.4	19.0	0.84 (similar)
Age groups (years)					
0–5	14.6	14.5	-0.68	12.3	1.18 (similar)
6–17	–	13.1	–	11.1	1.18 (similar)
18–24	–	12.1	–	15.7	0.77 (lower)
25–54	–	9.5	–	9.8	0.97 (similar)
55–64	–	7.8	–	9.3	0.84 (similar)
65+	7.4	6.5	-12.2%	5.0	1.30 (higher)

† Rate ratio is calculated as the Peel rate divided by the Ontario rate.
– Data not available
Source: Census 2006, 2016, Statistics Canada.

The prevalence of low income among individuals living in private households varies by age. There are a higher proportion of children younger than 18 years of age living in low income households compared to those in the 18 to 64 years of age, and 65 years and older age groups (Figure 2.11).

Figure 2.11

Prevalence of Low Income† Among Individuals Living in Private Households by Age Group, Peel and Ontario, 2015



† As measured by low income cut-off after-tax.
Source: Census 2016, Statistics Canada.

Did You Know

In Canada, there have been the following trends related to benefits for families with children:

- Increase in federal benefits to single parents and to dual parent families since 1997, although these have stabilized between 2007 and 2014.
- Increase in Provincial benefits for low income two parent families with children since 2004.
- No change in Provincial benefits for low income lone parents with one child since 2000.

Other sociodemographic changes that have occurred over this time period include:

- An increase in the proportion of lone parent females with a college degree or higher from 20% in 1987 to 56% in 2010.
- An increase in the median equivalent income after tax using 2011 dollars for single mothers, single fathers and dual parent families. However, lone parent mothers still have lower median income compared to lone parent fathers.
- An increase in the median equivalent after tax and transfer income for children in lone parent families since about 1994.[55]

Did You Know

The Census has the following reporting rules when it comes to children in joint custody. Children in joint custody should be listed with the household they live in most of the time (i.e., more than 50% of the time). Children who spend equal time with each parent should be included at the address/household where they stayed on the night before the actual Census day. For 2016, this would be the night between May 9 and May 10, 2016.

Additionally, the Census derives household income from the income of the household members living together. This means that regardless of the financial benefit of joint custody and income, none of the household characteristics of the other parent will be taken into consideration.

Due to the complexity of a child in joint custody, it is challenging to interpret the economic welfare of children both in terms of income and low-income status.[56]

Housing

Affordable housing is associated with positive mental and physical health outcomes and more disposable income to buy necessities such as healthy foods and medication. The provision of affordable housing in proximity to services, transit and employment is central to building communities that support active transportation and healthy lifestyles. Other benefits can include improved mental health, reduced violence and social isolation.[15]

Definition

Core housing need is defined as housing where:

- the proportion of tenants or owners spend less than 30% of their household income on either gross rent or on homeowner major payments;
- housing is in adequate condition (i.e., does not require major renovations); and
- housing is of suitable size

Affordable housing is defined as the proportion of tenants or owners spending less than 30% of their household income on either gross rent or on homeowner major payments.[57,58]

In Peel, 45% of Peel renters spend more than 30% of their income on gross rent. The average monthly rent in Peel is $1,264 (Table 2.6). As described in Table 2.6, the average monthly rent is about $150 higher in Peel than in Ontario. The proportion of Peel tenants spending more than 30% of their household income on gross rent is similar to Ontario.

In Peel, 28% of homeowners spend more than 30% of their household income on house payments. Peel homeowners spend about $300 more each month on major payments than those in Ontario.

Table 2.6

Household Value, and Household Owner or Rental Costs, Peel, Peel Municipalities and Ontario, 2016

Household Cost	Peel	Caledon	Brampton	Mississauga	Ontario
Average monthly gross rent*	$1,264	$1,331	$1,225	$1,281	$1,109
Per cent of tenants spending >30% of household income on gross rent	45.3%	8.4%	43.5%	46.3%	45.7%
Average value of owner, occupied, private, non-farm, non-reserve dwellings	$618,409	$737,626	$570,344	$642,468	$506,409
Average monthly owner major payments	$1,774	$1,801	$1,869	$1,697	$1,463
Per cent of owner households spending >30% of household income on owner's major payments	27.6%	19.5%	31.1%	25.7%	19.8%

* Gross rent includes the monthly rent and the costs of electricity, heat and municipal services.
Source: Census 2016, Statistics Canada.

Language, Ethnicity and Immigrant Status

This section describes cultural aspects of Peel residents, including their language, ethnicity and immigrant status.

Language

Low-language proficiency in the official languages of Canada can impact access to health services, create economic difficulties and can reduce social participation. Immigrants with low-language proficiency report higher levels of poor self-reported health.[59]

Language can be measured by various means, two of which are described in this chapter:

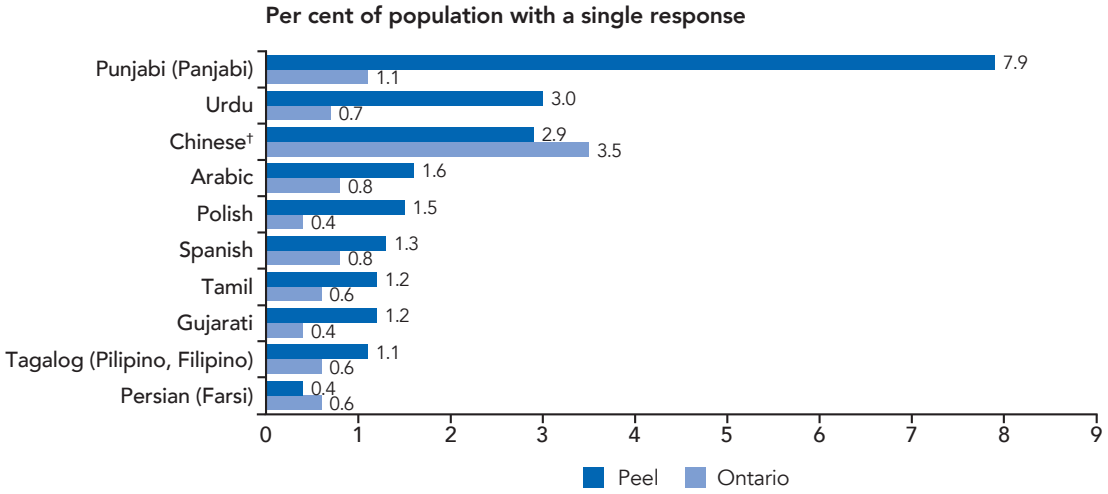
- language spoken at home and mother tongue which are indicators of linguistic diversity; and
- having no knowledge of French or English, which is an indicator that a person cannot conduct a conversation in one of the official languages.

Peel is a diverse population with residents speaking a variety of languages. English is the most common language spoken at home in Peel (70%) and Ontario (83%).[A1] Figure 2.12 describes the top 10 languages other than English spoken in Peel compared to Ontario.

Figure 2.13 shows the proportion of Peel residents by the language they first learned at home (mother tongue) compared to the language they currently speak now.

Figure 2.12

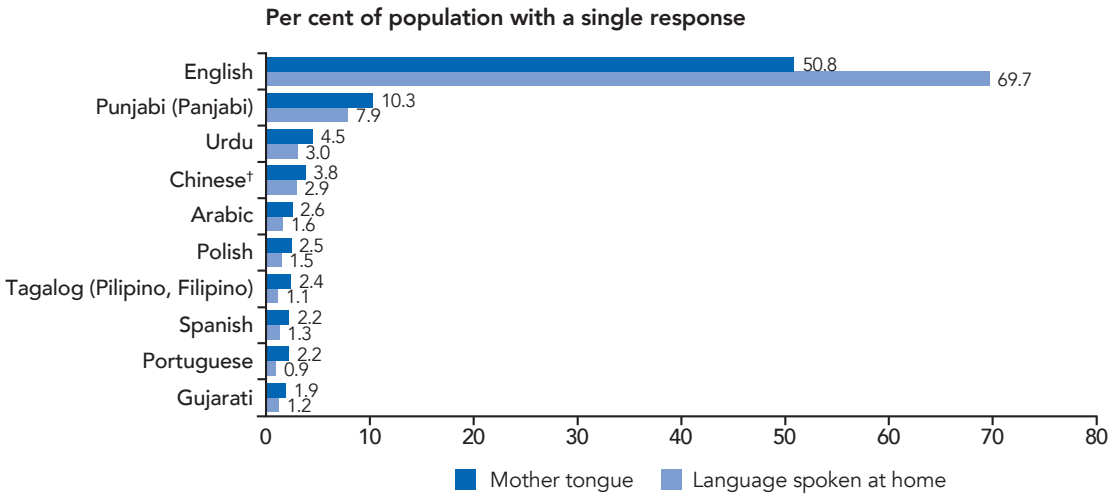
Top 10 Languages other than English Spoken at Home, Peel and Ontario, 2016



† Chinese includes Cantonese, Hakka, Mandarin, Min Dong, Min Nan, Wu, and Chinese languages not included elsewhere.
Source: Census 2016, Statistics Canada.

Figure 2.13

Mother Tongue and Language Spoken at Home, Peel, 2006

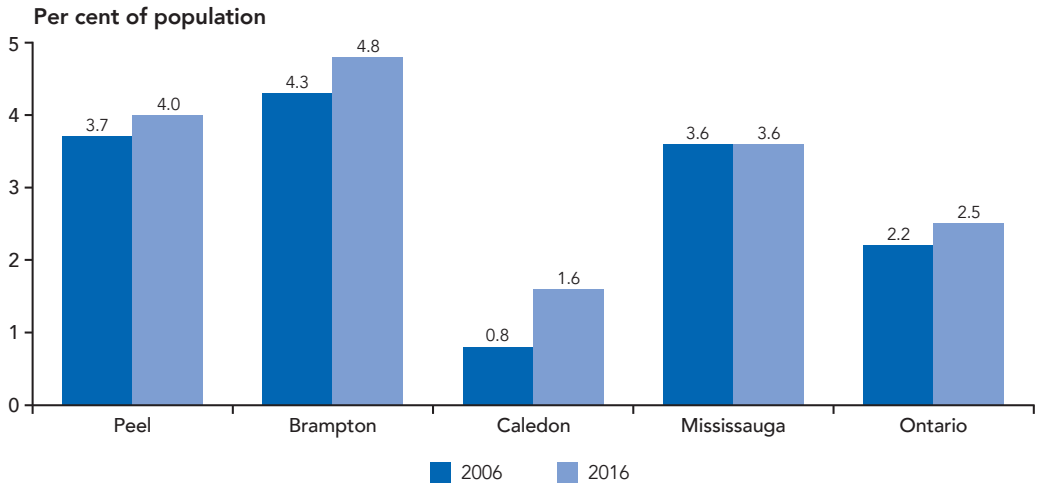


† Chinese includes Cantonese, Hakka, Mandarin, Min Dong, Min Nan, Wu, and Chinese languages not included elsewhere.
Source: Census 2016, Statistics Canada.

In 2016, most of Peel's population (96%) reported knowing English or French. This includes children who have not yet learned to speak or who are learning a language other than French or English at home. However, 55,040 Peel residents do not speak either official language. As shown in Figure 2.14, the proportion of residents who cannot speak either English or French increased slightly in Peel between 2006 and 2016. The increase was highest in Caledon.

Figure 2.14

No Knowledge of Official Language, Peel, Peel Municipalities, Ontario, 2006 and 2016



Source: Census 2006, 2016, Statistics Canada.

Did You Know

In 2016, 16% of Peel seniors did not speak English or French. This is 1.7 times higher than the percentage for Ontario (9%).[A1]

Peel Facts

In 2016, 70 Peel residents reported speaking at least one of the following Indigenous languages:

- Naskapi
- Northern East Cree
- Swampy Cree
- Cree, not otherwise specified
- Mi'kmaq
- Ojibway
- Oji-Cree
- Dogrib (Tlicho)
- Inuktitut
- Mohawk
- Oneida[A1]

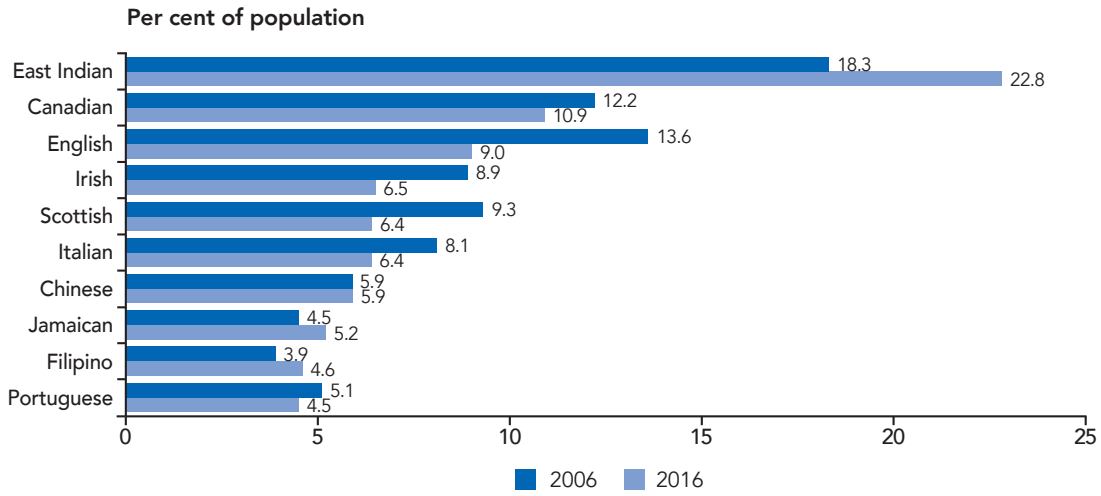
Ethnicity

Definition

Ethnic origin refers to the ethnic or cultural origins of a person's ancestors. An ancestor is usually more distant than a grandparent.[46]

While ethnic profiles differ by municipality, the most commonly reported ethnicity in Peel is East Indian, followed by Canadian and English. Peel's ethnic profile has changed between 2006 and 2016 with a higher proportion of the population reporting their ethnic origin as East Indian (Figure 2.15).

Figure 2.15
Ethnic Origin, Peel, 2006 and 2016



Source: Census 2006, 2016, Statistics Canada.

In 2016, 9,120 Peel residents (0.7%) identified as Indigenous, an increase compared to 2006 figures (0.5% or 5,500 people).[A1,A3] The proportion of people who identify as Indigenous in Peel is lower than Ontario (2.8%).[A1]

Did You Know

Peel Public Health would like to acknowledge that Indigenous Peoples living in the Territories now known as Canada are a diverse population, representing the descendants of hundreds of distinct Nations, each with their own histories, governance systems, and cultures. We understand that being respectful of this diversity of experiences includes honouring the many ways in which Indigenous Peoples choose to express their identity. Recognizing that categorization continues to be mobilized as an instrument of colonialism, the Region of Peel - Public Health strives to be sensitive to concerns around naming and defining Indigenous identity. We would like to be explicit and transparent about the ways in which we understand some commonly used terms, which are frequently deployed by statistical agencies and appear in some sections of this report.

Our understandings of the terms frequently used in defining Indigenous identity are rooted in the Key Definitions of the Relationship with Indigenous Communities Guideline, 2018, developed by the Ministry of Health and Long-term Care in consultation with the Chiefs of Ontario, the Urban Indigenous Health Table, and the Indigenous Primary Health Care Council. Refer to this document to learn more about terms used to express Indigenous identity.[60]

Table 2.7
Indigenous Identity, Peel and Ontario, 2016

Indigenous Identity	Peel		Ontario	
	Number	Per cent	Number	Per cent
First Nations (North American Indian)	5,420	59.4	236,680	63.2
Métis	2,950	32.3	120,585	32.2
Inuk (Inuit)	165	1.8	3,860	1.0
Multiple Indigenous responses	280	3.1	5,730	1.5
Indigenous responses not included elsewhere	310	3.4	7,540	2.0
Total	**9,120**	–	**374,395**	–

Source: Census 2016, Statistics Canada.

Immigrant Status

Definition

An ***immigrant*** is a person who has been granted the right to live in Canada permanently by immigration authorities.

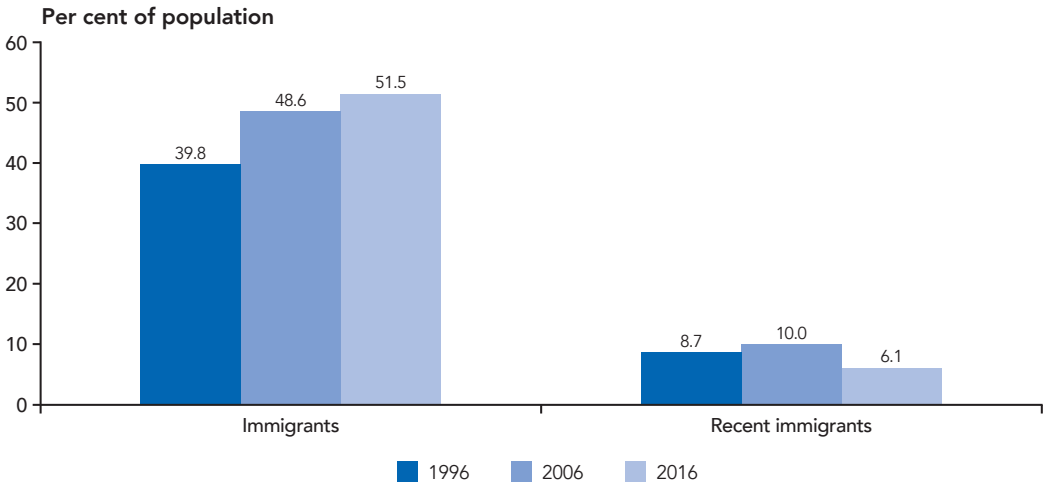
Recent immigrants are those who have been in the country for 10 years or less.

Long-term immigrants have been in the country for more than 10 years.

In 2016, the proportion of immigrants in Peel (52%) was 1.8 times higher than Ontario (29%). Over the past 20 years, the proportion of the population who are immigrants has increased by 29%. Between 2006 and 2016, the proportion of recent immigrants declined from 9% to 6% (Figure 2.16).

Figure 2.16

Proportion of Immigrants and Recent Immigrants, Peel, 1996, 2006 and 2016



Source: Census 1996, 2006, 2016, Statistics Canada.

Did You Know

Immigrants tend to enjoy better health than non-immigrants. This phenomenon is known as the 'healthy immigrant effect'. Examples of the healthy immigrant effect include:

- longer life expectancy[51,61-63]
- lower hospitalization rates[64]
- better mental health[65-67]

The healthy immigrant effect is a result of a number of factors:

- people who immigrate to another country tend to be healthier in general; and
- immigrants tend to have better health behaviours than non-immigrants (e.g., lower rates of smoking and alcohol use, better diets).[68]

However, the healthy immigrant effect is not constant. Within a few years of arrival in a new country, immigrants tend to adopt the behaviours of those found in the new country, resulting in a convergence of health status similar to those in the new country.[64]

Did You Know

Immigration patterns over time are determined by many factors including policy at various levels. Geo-political policies may force people to migrate from a country of origin. In Canada, federal immigration policies can shift the composition of newcomers dramatically depending on a government's eligibility restrictions and allowances for different immigration categories. For example, in 2015, Canada's immigration policy shifted towards economic class and restricted family class. However, since then a change in federal leadership brought policy changes and increased targets for refugees and family class immigrants. Immigration policy may strongly influence the Canadian population profile. For example, increased fees may be limiting naturalization rates (becoming a Canadian citizen) and some prospective immigrants are denied status for medical reasons.

Table 2.8

Per cent of Immigrants† by Admission Category, Peel and Ontario, 2016

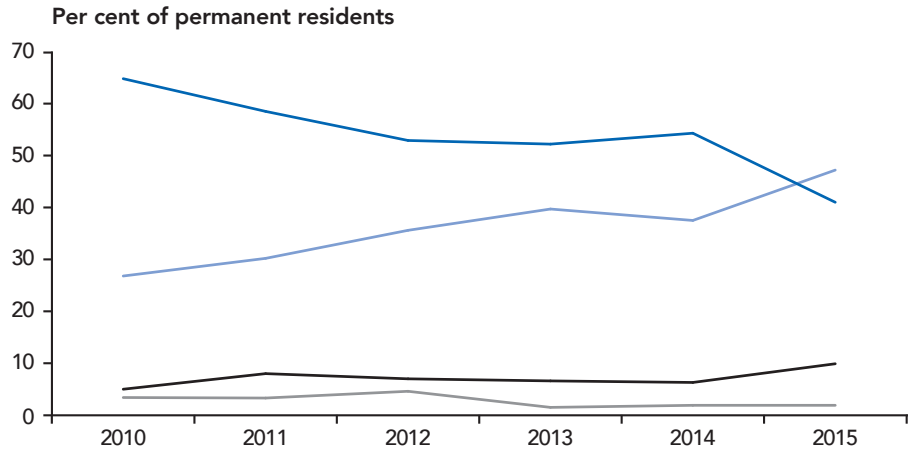
Admission Category	Peel		Ontario	
	Number	Per cent	Number	Per cent
Economic	276,735	47.6	1,364,380	48.2
Sponsored by a family	226,305	38.9	940,405	33.3
Refugee	72,925	12.5	482,665	17.7
Other immigrants	5,605	1.0	38,035	1.3
Total Immigrants	**581,570**	–	**2,825,480**	–

† Reflects immigrants who landed between 1980 and 2016
Source: Census 2016, Statistics Canada.

Figure 2.17 reflects the number and percentage of admitted residents in Canada that intend to reside in Peel. The changes in the numbers over the years are a result of changes in government immigration policy in 2015.[69]

Figure 2.17

Admissions of Permanent Residents to Peel by Immigration Category, Peel, 2010 – 2015



	2010	2011	2012	2013	2014	2015
Economic class	64.8	58.5	52.9	52.2	54.3	41.0
Family class	26.8	30.2	35.6	39.7	37.5	47.2
Refugee	5.0	8.0	7.0	6.6	6.3	9.9
Other immigrants	3.4	3.3	4.6	1.5	1.9	1.9

Source: Source: Permanent Residents – Ad Hoc Immigration, Refugees and Citizenship Canada (IRCC) (Specialized Datasets). Canada – Admissions of Permanent Residents by Province/Territory and Census Division (CD) of Intended Destination and Immigration Category, 2006 – April 2016 [Internet]. Ottawa, Ontario: Government of Canada; cited July 18, 2018. Available from http://open.canada.ca/data/en/dataset/ad975a26-df23-456a-8ada-756191a23695.

Religion

In 2011, Christianity was the most common religious affiliation in Peel (57%) and Ontario (65%). Peel, however, has more people whose religious affiliation is Sikh (10%), Muslim (9%) or Hindu (9%) compared to Ontario.[A2]

Visible Minority

Did You Know

Visible minority is defined as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour" by the Employment Equity Act.

In Peel in 2016, 62% of the population identified as a visible minority. This is more than two times higher than that for Ontario (29%). The proportion of the population identifying as visible minority has increased between 1996 and 2016 in Peel and Ontario (data not shown).[A1,A4]

Generational Status

Definition

Generational status refers to whether or not a person or the person's parents were born in Canada.

First generation reflect persons born outside of Canada.

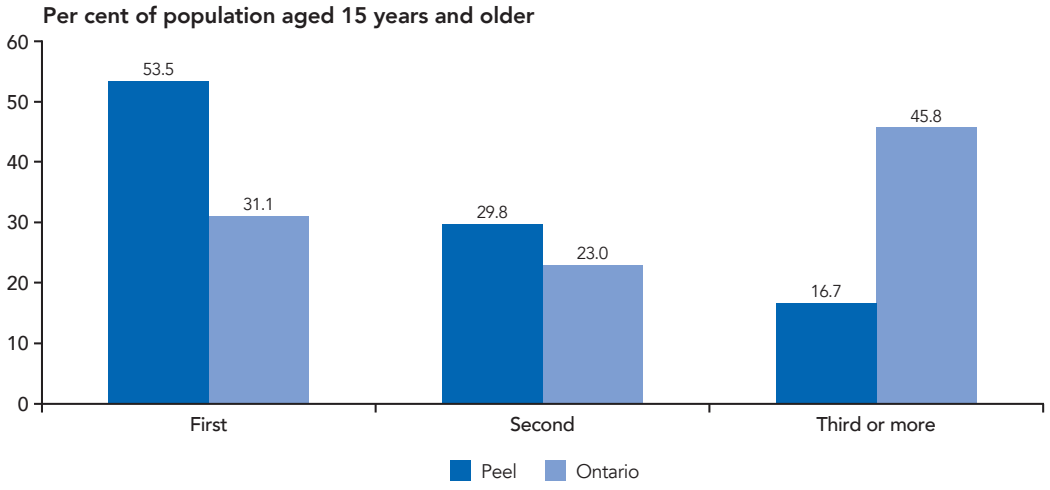
Second generation reflects persons who were born in Canada and had at least one parent born outside Canada. Typically, these individuals are children of immigrants.

Third (or more) generation reflects persons who were born in Canada with both parents born in Canada.[46]

In addition to immigrants having better health outcomes compared to non-immigrants, there are health outcome differences by generational status. For example, by the time a person is of second or third generation, their health outcomes become similar to that of non-immigrants.[64]

In 2016, 54% of Peel's population were first generation residents compared to 31% for Ontario (Figure 2.18). The proportion of residents who are third generation or more has declined over time in Peel, but not Ontario (Table 2.9).

Figure 2.18
Generational Status of Residents, Peel and Ontario, 2016



Source: Census 2016, Statistics Canada.

Table 2.9

Generational Status of Residents†, Peel and Ontario, 2006, 2011 and 2016

Generation status	Peel			Ontario		
	2006 Per cent	2011 Per cent	2016 Per cent	2006 Per cent	2011 Per cent	2016 Per cent
First generation	58.8	51.7	53.5	34.0	29.9	31.1
Second generation	20.5	29.0	29.8	19.5	22.5	23.0
Third generation or more	20.7	19.4	16.7	46.5	47.6	45.8

† Reflects individuals aged 15 years and older
Sources: Census 2006, 2016. Statistics Canada.
National Household Survey, 2011, Statistics Canada.

Social Environment

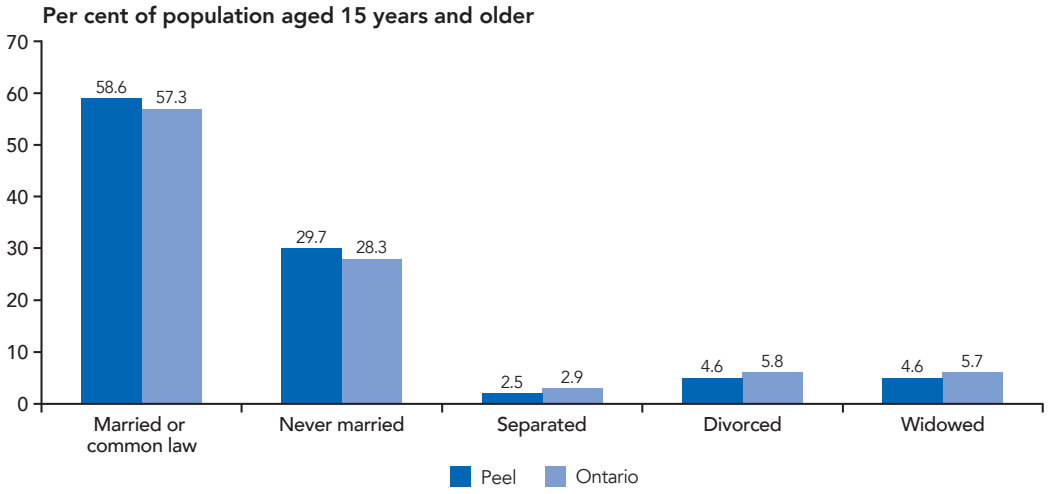
The social environment has an impact on health in a variety of ways. For the purposes of this section, we will focus on indicators of social support as measured through marital status and family structure. Data about violence and crime can be found in ***Chapter 7 – Chronic Diseases***. Other indicators of social support such as community belonging and relationships can be found in ***Chapter 6 – Mental Health***.

Marital Status

In 2016, the majority of Peel's population aged 15 years and older (59%) were living in married or common-law relationships, which is similar to Ontario (57%) (Figure 2.19). There have been no changes since 2006 regarding the distribution of marital status in Peel.

Figure 2.19

Marital Status, Peel and Ontario, 2016



Source: Census 2016, Statistics Canada.

Family Structure

Definition

A ***census family*** is defined as:

- a married couple and the children, if any, of either and/or both spouses;
- a couple living common law and the children, if any, of either and/or both parents; or
- a lone parent of any marital status with at least one child living in the same dwelling.

All members of a census family live in the same dwelling. Couples in this scenario may be of opposite or same sex. Children may be children by birth, marriage, common-law union or adoption regardless of their age or marital status, as long as they live in the same dwelling and do not have their own married spouse, common-law partner or child living in the dwelling. Grandchildren living with their grandparent(s), but with no parents present also constitute a census family.[46]

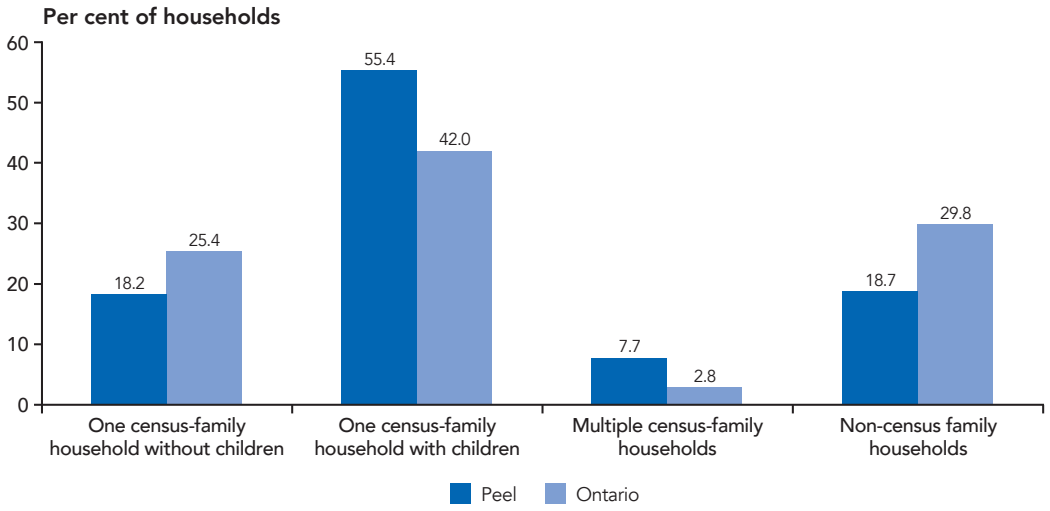
Non-census family is defined as a household containing one person or two or more persons who are not a census family.[46]

Multiple census-family households are households in which two or more census families (with our without additional persons) occupy the same dwelling.[46]

Refer to Figure 2.8 for more details about family membership and family status.

In Peel, the majority of households are classified as one census family household (74%). This is similar to Ontario (67%). Among single census family households, 55% are families with children, which is higher than Ontario (42%). Peel has a higher proportion of multiple census families (8%) compared to Ontario (3%). This varies by municipality with the highest proportion in Brampton (12%), followed by Caledon (5%) and Mississauga (5%) (Figure 2.20).

Figure 2.20
Private Household Types, Peel and Ontario, 2016



Source: Census 2016, Statistics Canada.

Census Families with Children Under 25 Years of Age

In Peel, almost three quarters (74%) of families with children younger than 25 years of age are considered to be intact. This is similar to Ontario (68%) (Figure 2.21).

Definition

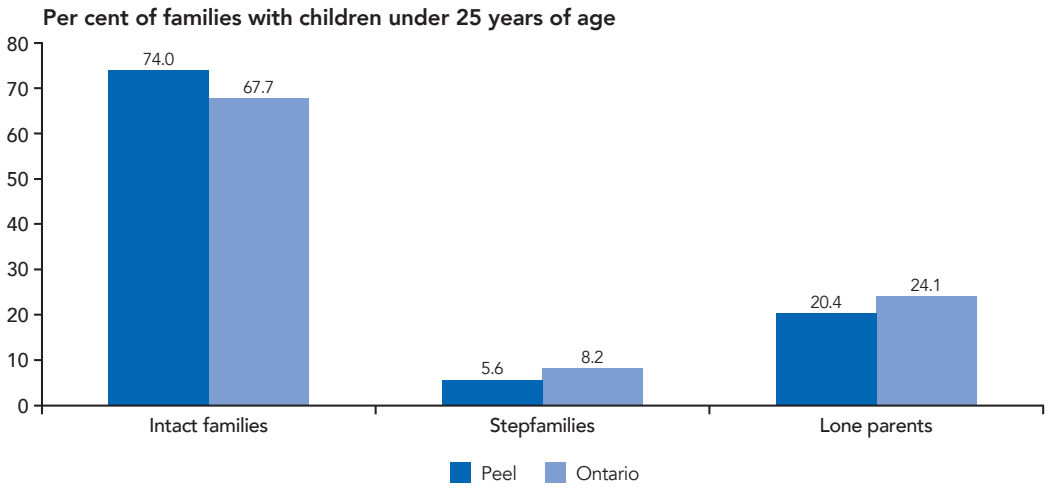
Intact family refers to couple families (married or common-law; opposite or same-sex) with children.

Stepfamily refers to couple families with children that consist of at least one biological or adopted child of only one married spouse or common-law partner whose birth or adoption preceded the current relationship. The family can contain such children of each married spouse or common-law partner. The family can also contain biological or adopted children from the current relationship. If the current married spouse or common-law partner has adopted the child(ren) of the other married spouse or common-law partner then it is no longer a stepfamily.

A ***lone-parent family*** is defined as a family containing only one parent with his or her child(ren) on Census Day. Lone parents are considered to be part of the Census Family.[46]

Figure 2.21

Census Family Structure for Families with Children Under 25 Years of Age, Peel and Ontario, 2016



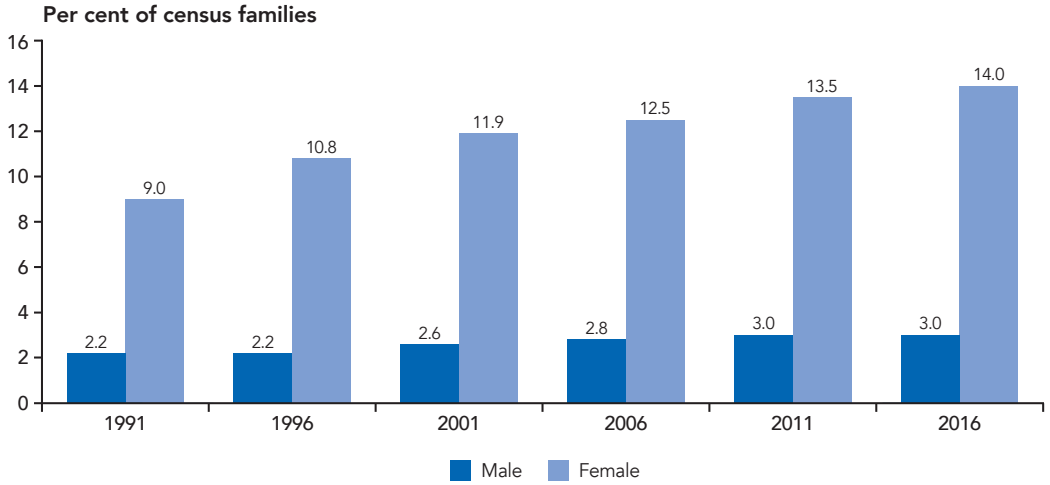
Source: Census 2016, Statistics Canada.

Lone-parent Families

In Peel and Ontario in 2016, 17% of census families were lone-parent families. Lone parents in Peel are 4.6 times more likely to be female. While the proportion of female lone parents has increased over time from 9% in 1991 to 14% in 2016 (Figure 2.22), the ratio of male to female single parents has remained the same.

Figure 2.22

Proportion of Male and Female Lone-parent Census Families, Peel, 1991, 1996, 2001, 2006, 2011 and 2016



Source: Census, 1991, 1996, 2001, 2006, 2011, 2016, Statistics Canada.

Non-census Family Living Arrangements

In Peel, 6% of the total population aged 15 years and older are living alone. This is lower than Ontario (12%). Additionally, 14% of Peel seniors live alone whereas 24% do so in Ontario.[A1]

Did You Know

In 2011, 96% of seniors lived at home and 4% lived in collective dwellings such as nursing homes and residences for seniors. By the year 2037, there will be an estimated 17,400 seniors living in collective dwellings in Peel. If current living arrangements apply, 13,000 seniors will need housing within a nursing home and 4,400 within senior residences.[A2,I1]

Personal Health Practices and Coping Skills

Health behaviours such as smoking, alcohol use and physical activity contribute to overall health and life expectancy. This is further described in ***Chapter 5 – Health and Behaviours***.

Healthy Child Development

Data related to healthy child development is described in ***Chapter 4 – Health in Early Life***.

Chapter 3

General Health Status

Key Messages

- Life expectancy is higher in Peel compared to Ontario and Canada, and has increased since the mid-1980's. Females have a higher life expectancy compared to males, but the difference has decreased from five to three-and-a-half years. Males and females are living the same number of years in good health after adjusting for the duration and quality of life affected by chronic illness.
- The age-standardized death rate in Peel has decreased since the mid-1980s.
- Peel residents categorized in the highest income level are more likely to have access to a regular physician, visit a dentist, have dental insurance and visit an eye specialist compared to those with lower income. In addition, they are less likely to become a high user of health care resources.

This chapter will provide an overview of the general health of the population in Peel, including disability and life expectancy; health care use, such as emergency department visits, hospitalizations and the impact of resource utilization; and deaths. Other chapters in this report will provide details about specific health outcomes and health behaviours.

GENERAL HEALTH STATUS

This section provides an overall picture of the general health status of Peel residents including self-rated health, instrumental activities of daily living, the Health Utility Index (HUI), life expectancy and health-adjusted life expectancy.

Self-rated Health

Definition

Self-rated health is an individual's assessment of his or her general health and can be an important predictor of disability and death.[70-75] This could include overall health, physical health or mental health.

Self-rated general health has remained stable over the past 15 years in Peel and Ontario, with 87% of Peel's population rating their health as excellent, very good, or good.[H9] Self-rated general health becomes less favourable as age increases (Figure 3.1). In addition, long-term immigrants (83%) in Peel are significantly less likely to rate their health as excellent, very good or good compared to recent immigrants (95%), and Canadian born individuals (92%).[H2]

Instrumental Activities of Daily Living

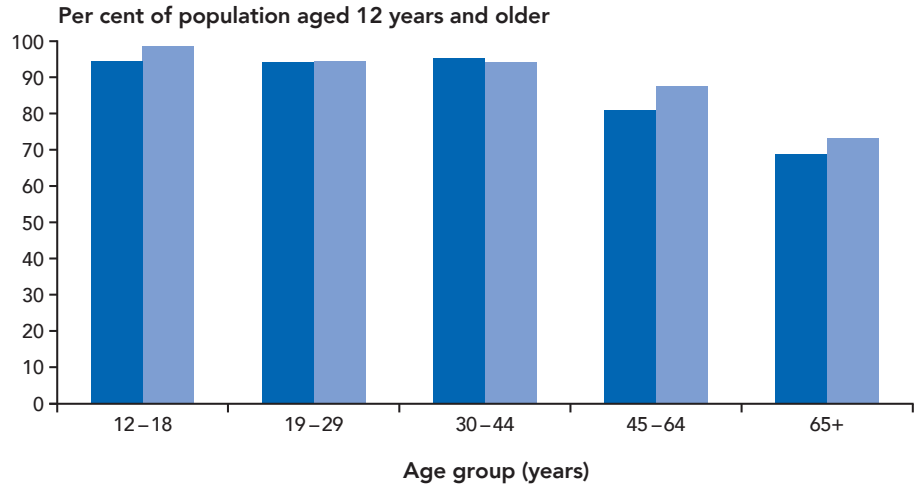
Definition

Instrumental activities of daily living are common activities performed by people each day. These activities include preparing meals, shopping for groceries or other necessities, performing everyday housework, doing heavy household chores (e.g., washing walls, yard work), personal care (e.g., washing, dressing, eating), moving about inside the house, and paying bills.

Some people are unable to perform one or more instrumental activities of daily living and need assistance. In Peel and Ontario, one in every 10 residents (10%) need help with instrumental activities of daily living. Among individuals aged 65 years and older, almost one-third need help (29%).[H2]

Figure 3.1

Per cent of the Population who Rated Their Physical Health as Excellent, Very Good or Good by Age Group and Sex, Peel, 2013/2014



	12 – 18	19 – 29	30 – 44	45 – 64	65+
Male Per cent (95% CI)	94.6 (88.5 – 97.5)	94.3 (85.0 – 98.0)	95.4 (90.8 – 97.8)	80.9 (71.0 – 88.0)	68.7 (54.1 – 80.4)
Female Per cent (95% CI)	98.6 (94.4 – 99.7)	94.5 (90.4 – 96.9)	94.2 (89.2 – 97.0)	87.6 (82.0 – 91.7)	73.3 (65.0 – 80.2)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Health Utility Index

Measurement

The Health Utility Index (HUI) is a measure of functional health status and health-related quality of life. The HUI measures functional health across eight attributes (Table 3.1). Each attribute score contributes to the overall HUI score and is grouped into four categories:

Category	Score Range	Description
No disability	1.00	All attributes are at their highest functioning level
Mild disability	0.89 to 0.99	At least one attribute is at a reduced level of function that can be readily corrected and/or doesn't prevent any activities
Moderate disability	0.70 to 0.88	At least one attribute is at a reduced level of function and cannot be corrected and/or prevents some activities
Severe disability	Less than 0.70	At least one attribute is at a reduced level of function that cannot be corrected and prevents many activities

Table 3.1

Health Utility Index Attribute by Optimal Category, Peel, 2013/2014

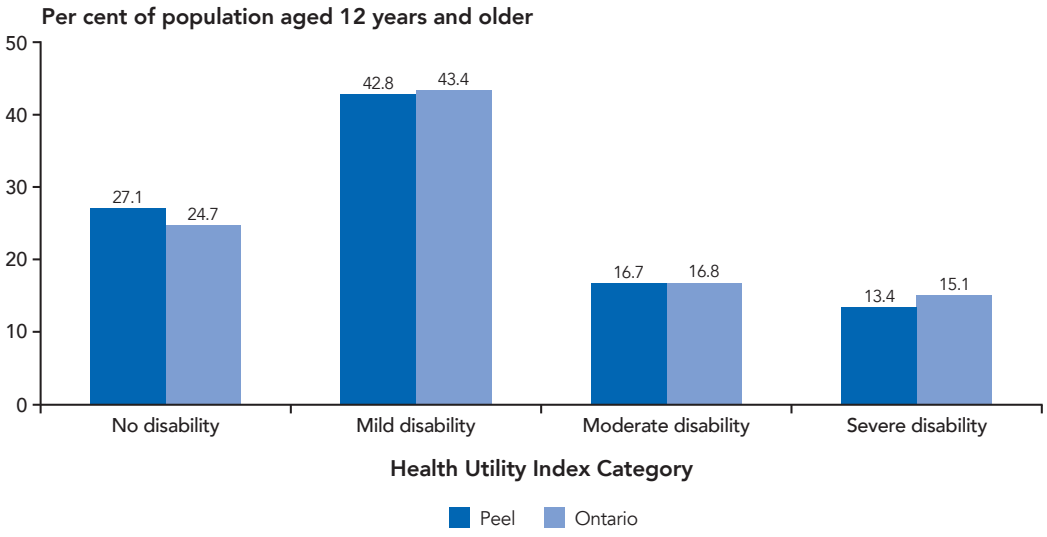
Attribute	Optimal Category	Per cent (95% CI)
Vision	Able to see well (without lenses)	49.2 (45.8–52.6)
Cognition	Able to remember and think	66.9 (63.5–70.1)
Emotion	Happy and interested in life	77.8 (74.9–80.5)
Pain	No pain (degree of pain usually felt)	81.7 (79.1–84.1)
Ambulation	Able to walk without difficulty	96.7 (95.7–97.5)
Hearing	Able to hear well	97.8 (96.7–98.5)
Dexterity	Full use of hands and fingers	99.6 (99.1–99.8)
Speech	Able to be well understood	99.6 (99.3–99.8)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Almost one-third (30%) of the Peel population have a moderate or severe disability defined using the Health Utility Index (17% and 13%, respectively) (Figure 3.2). In Peel, the proportion with a severe or moderate disability is higher among individuals 65 years of age and older (compared to all younger age groups) (Figure 3.3) and long-term immigrants (compared to recent immigrants). In Ontario, the proportion of the population categorized as having a severe disability increases with decreasing income (data not shown).[H2]

Figure 3.2

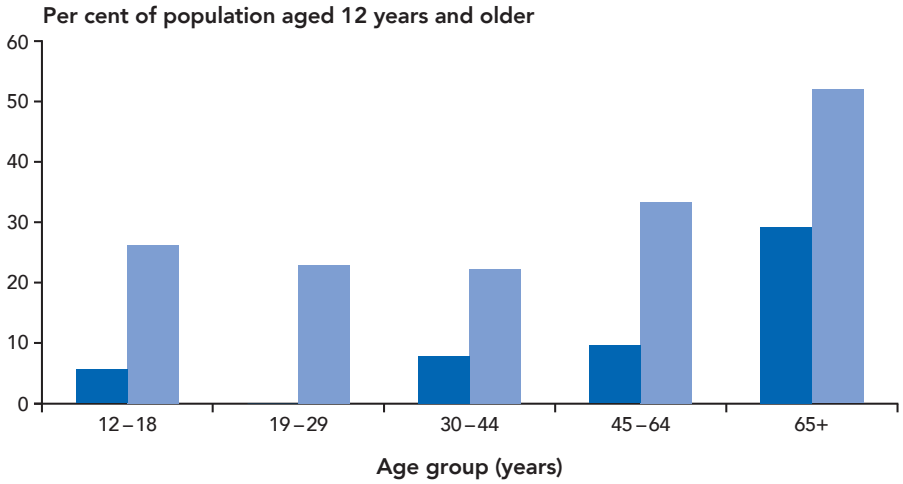
Per cent of the Population by Health Utility Index Category, Peel and Ontario, 2013/2014



Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 3.3

Per cent of the Population that Need Help with Instrumental Activites of Daily Living or Have Moderate to Severe Disability by Age Group, Peel, 2013/2014



	12 – 18	19 – 29	30 – 44	45 – 64	65+
Need help with IADL† Per cent (95% CI)	5.6* (3.2 – 9.7)	NR	7.8* (5.1 – 11.7)	9.6* (6.7 – 13.6)	29.2 (22.7 – 36.6)
Moderate to severe disability Per cent (95% CI)	26.2 (19.9 – 33.6)	22.9 (17.4 – 29.5)	22.2 (17.3 – 28.0)	33.3 (27.2 – 40.0)	52.0 (44.4 – 59.5)

* Use estimate with caution.
† IADL – Instrumental activities of daily living
NR – Not releasable due to small numbers
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Life Expectancy and Health-adjusted Life Expectancy

Definition

Life expectancy estimates the average age at death for a group or cohort at birth. Life expectancy is calculated based on the current mortality rates experienced by all age groups in the population.

Health-adjusted life expectancy is a measure of the burden of chronic illness, especially in old age. It takes into account quality of life as well as duration. Years lived in poor health are counted as equivalent to only part of a full year of good health. This indicator, therefore, is always less than life expectancy.

Life expectancy at birth in Peel between 2010 and 2012 was 82.3 years for males and 85.8 years for females. Peel's life expectancy by sex is higher than that of Ontario and Canada (Table 3.2). For males and females, life expectancy has increased in Peel between 1986 (75.7 and 80.7 years, respectively) and 2012 (82.6 and 86.1 years respectively) with the absolute difference between the sexes decreasing from five years to three-and-a-half years (Figure 3.4).

In Peel, health-adjusted life expectancy was the same for males and females at about 73 years, slightly higher compared to Ontario (70 years for males and 72 years for females) (Table 3.2). While females are living longer than males, they are spending more years in poor health.

Table 3.2

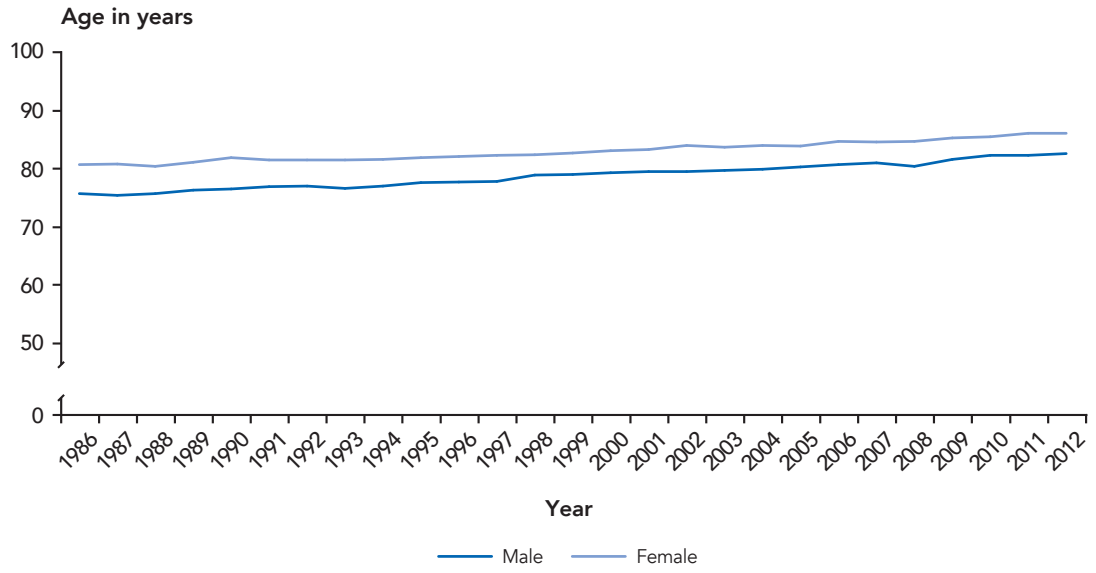
Life Expectancy and Health-adjusted Life Expectancy, Peel, Ontario and Canada

	Life Expectancy	Health-adjusted Life Expectancy	Difference
Geography	**Age in Years**	**Age in Years**	**Age in Years**
Peel (2010–2012)			
Males	82.3	72.7	9.6
Females	85.8	72.9	12.9
Ontario (2010–2012)			
Males	79.8	70.0	9.8
Females	84.2	71.8	12.4
Canada (2011–2013)			
Males	79.6	NA	NA
Females	83.8	NA	NA

NA – Not available
Note: Peel's mean health utility index score for individuals 90 years and older was not reportable due to small sample size; Ontario's mean health utility index score was used for this age group in the calculation of Peel's Health-adjusted Life Expectancy.
Sources: Peel and Ontario: Ontario Mortality Database, 2010-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Canada: Statistics Canada, Table 053-0003 – Elements of the life table, Canada, provinces and territories, annual (number), CANSIM Vital Statistics – Death Database – 3233. Accessed November 9, 2017.
Canadian Community Health Survey Share File, 2009/2010, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 3.4

Life Expectancy at Birth by Sex, Peel, 1986 to 2012



Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 1986-2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

HEALTH CARE UTILIZATION

This section assesses utilization of the health-care system to help inform the health status of Peel. This will include physician visits, emergency department visits, hospitalizations and resource utilization.

Did You Know

The first hospital, Peel Memorial Hospital, was built in Peel in 1925 by Peel County Women's Institute and a group of World War I (WWI) veterans. It was named in memory of those who had fought and died during WWI. On opening, the hospital had a 25-bed capacity with two public wards with three beds each, six private rooms, and a nursery capable of handling three babies at one time.[2]

Today, Peel has three large hospitals:

- William Osler Health System – Brampton Civic
- Trillium Health Partners – Credit Valley Hospital
- Trillium Health Partners – Mississauga Hospital

Physicians and Other Medical Professionals

Physician Visits

In 2013/2014, 81% of Peel residents visited or talked to a family doctor about their physical, emotional or mental health.[H2]

The majority of Peel residents (93%) report having access to a regular physician. However, this differs by sociodemographic factors. Individuals in the low-middle income group (78%) are less likely to report having a regular physician compared to the highest income group (96%). In addition, 86% of recent immigrants (i.e., arriving in the past 10 years) report having a regular physician compared to 96% of long-term immigrants. Among those who do not have a regular physician, 55% said it was because they had not tried to contact one and 10% said it was because their physician left or retired.[H2]

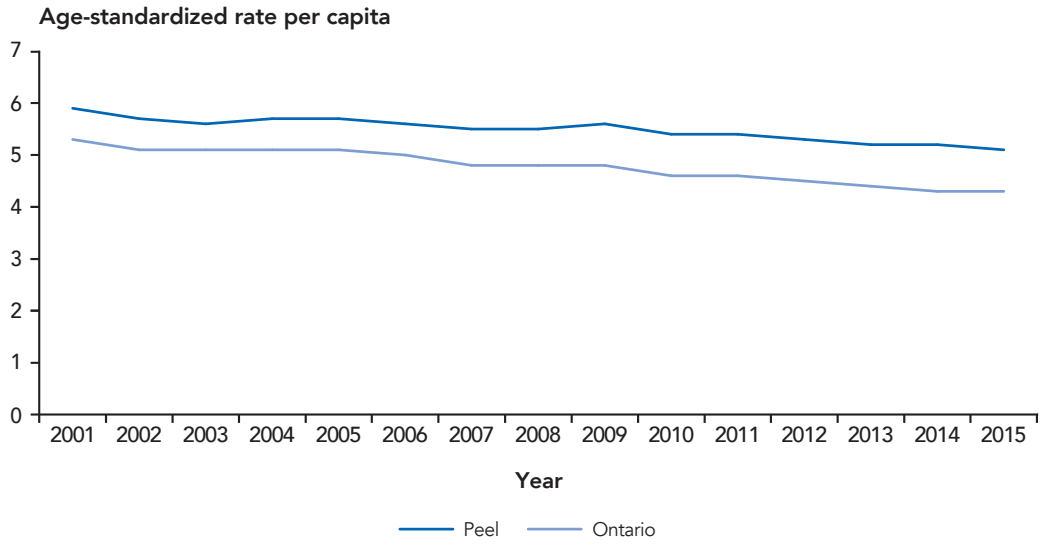
Age-standardized general/family practitioner visit rates in Peel and Ontario have declined between 2001 and 2015. In Peel for 2015, there were just over seven million general/family practitioner visits (five visits per person) (Figure 3.5).

Did You Know

In Peel, 14% of residents usually speak to their physician in a language other than English. This is significantly higher compared to Ontario (8%).[H2]

Figure 3.5

General/Family Practitioner Visits by Year, Peel and Ontario, 2001 to 2015



Sources: Medical Services (Ontario Health Insurance Plan) Database, 2001–2015. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2001–2015, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Dental Visits and Insurance

In 2013/2014, 71% of Peel residents visited a dentist (including a hygienist or orthodontist) in the past year which is similar to Ontario (72%). This proportion has remained stable since 2000/2001. The proportion visiting a dentist was significantly higher among those in the highest income category (81%) compared to all other income categories (45% to 70%) and among non-immigrants (78%) and long-term immigrants (70%) compared to recent immigrants (55%).[H2,H4,H6-H8]

In 2013/2014, 67% of Peel residents had dental insurance. This is similar to Ontario (67%); however, it is significantly lower than in 2003 (74%).[H2,H7] The association between having dental insurance, and social or behavioural determinants are presented in Table 3.3.

After controlling for other factors, not having dental insurance is independently associated with:

- Age: Compared to individuals aged 45 to 54 years, those aged 65 to 75 years are less likely to have dental insurance.
- Sex: Males are less likely to have dental insurance compared to females.
- Income: Compared to the upper-middle income category, those in the middle income category are less likely to have dental insurance.
- Education: Individuals with less than high school education are less likely to have dental insurance compared to those with post-secondary education.
- Ethnicity: Those who are East/Southeast Asian are less likely to have dental insurance compared with those who are White.
- Immigrant status: Recent immigrants are less likely to have dental insurance compared to non-immigrants.
- Marital status: Those who are single, divorced, separated or widowed are less likely to have dental insurance compared to those who are married.
- Employment status: Those who are unemployed are less likely to have dental insurance compared to those who are employed.

Definition

An ***odds ratio (OR)*** estimates the likelihood of an event occurring in one population in relation to the likelihood of it occurring in another population.

- If the OR equals 1, the odds of an event occurring in one population is equal to the odds of an event occurring in another population.
- If the OR is greater than 1, the odds of an event occurring in one population is greater than the odds of an event occurring in another population. For example, if the OR equals two, the odds of the event occurring is twice as high in the one population compared to the other population.
- If the OR is less than 1, the odds of an event occurring in one population is less than the odds of an event occurring in another population. For example, if the OR is 0.50, the odds of the event occurring in one population is 50% lower compared to the other population.

Table 3.3

Association Between Having Dental Insurance and Social or Behavioural Determinants†, Peel, 2009/2010, 2013/2014 Combined

Variable	Adjusted Odds Ratio (95% CI) n=3,569
Age group (years)	
15–18	**11.74 (5.53–24.89)***
19–24	1.74 (0.96–3.15)
25–34	0.97 (0.62–1.52)
35–44	1.44 (0.87–2.36)
45–54	1.0
55–64	1.07 (0.64–1.81)
65–75	**0.42 (0.25–0.73)***
Sex	
Male	**0.61 (0.48–0.78)***
Female	1.0
Household income level	
Low-middle	0.56 (0.26–1.19)
Middle	**0.44 (0.32–0.61)***
Upper-middle	1.0
Highest	**1.66 (1.20–2.30)***
Education level	
Less than high school	**0.56 (0.37–0.86)***
High school graduate	0.90 (0.66–1.21)
Other post-secondary	0.89 (0.52–1.52)
Post-secondary graduate	1.0
Ethnicity	
White	1.0
Black	0.94 (0.62–1.41)
East/Southeast Asian	**0.65 (0.43–0.99)***
South Asian	0.72 (0.50–1.03)
Other	0.85 (0.53–1.36)
Immigrant status	
Recent immigrant	**0.43 (0.28–0.64)***
Long-term immigrant	0.77 (0.56–1.06)
Non-immigrant	1.0
Marital status	
Now married/common-law	1.0
Divorced/separated/widowed	**0.56 (0.36–0.86)***
Single, never married	**0.35 (0.23–0.53)***

Table 3.3 continues...

Table 3.3 continued

Variable	Adjusted Odds Ratio (95% CI) n=3,569
Employment status in past week	
Employed	1.0
Unemployed/permanently unable to work	**0.51 (0.38–0.67)***
Having one or more of one's own teeth	
Yes	1.0
No	0.58 (0.30–1.11)
Children under 18 years of age in household	
None	1.0
One	0.90 (0.61–1.32)
Two or more	0.94 (0.59–1.48)
Rural versus urban residence	
Rural	0.66 (0.36–1.23)
Urban	1.0

† Reflects respondents aged 15–75 years.
* Indicates statistically significant findings ($p<0.05$).
Note: 95% CI reflects the 95% confidence interval of the estimated odds ratio.
Source: Canadian Community Health Survey Share File, 2009/2010, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Eye Exams and Insurance

In 2013/2014, 40% of Peel residents visited an eye specialist in the past 12 months. This is similar to Ontario (43%). The proportion visiting an eye specialist was significantly higher among those aged 65 years and older compared to all other age groups; those aged 19 to 44 were significantly less likely to visit an eye specialist. The proportion visiting an eye specialist was significantly lower in the middle and lowest income categories (compared to the upper-middle and highest categories) and among recent immigrants (compared to long-term and non-immigrants). In Peel, 61% of residents had insurance for glasses or contact lenses. This was lowest among individuals aged 65 years and older, recent immigrants, and those with lower income.[H2]

The Canadian Association of Optometrists recommends that children have at least one comprehensive eye exam between the ages of two and five years.[76] Forty-one per cent of Peel children born in 2008 had at least one eye exam between two and five years of age. This was similar to Ontario (47%).[I2,L] Eye exams for those aged 19 years and younger are part of the Ontario Health Insurance Plan (OHIP) ensured service.

Emergency Department Visits

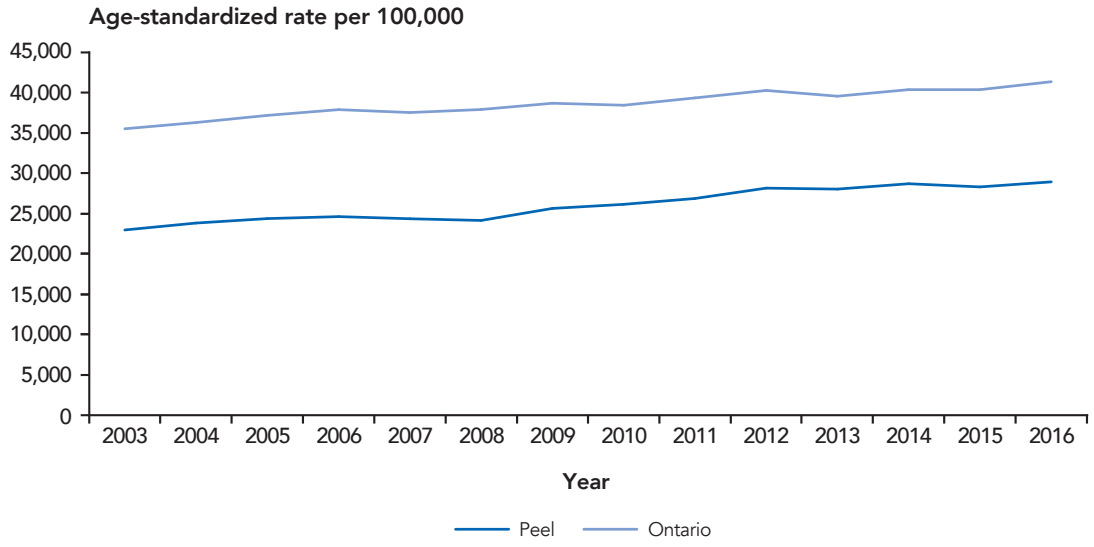
In 2016, there were 415,514 emergency department visits by Peel residents (28,235 per 100,000 residents). The age-standardized rate of emergency department visits among Peel residents has increased since 2003, but continues to remain much lower compared to Ontario (Figure 3.6). The rate of emergency

department visits for Peel males and females was similar between 2009 and 2016. Rates of emergency department visits are highest among those less than four years old and 70 years and older (Figure 3.7).

Injury, poisoning and certain other consequences of external causes are the main reason for emergency department visits (Table 3.4). This is true for all age groups except infants (less than one year) where acute respiratory infections other than influenza or pneumonia are the main reason for emergency department visits (data not shown).[M]

Figure 3.6

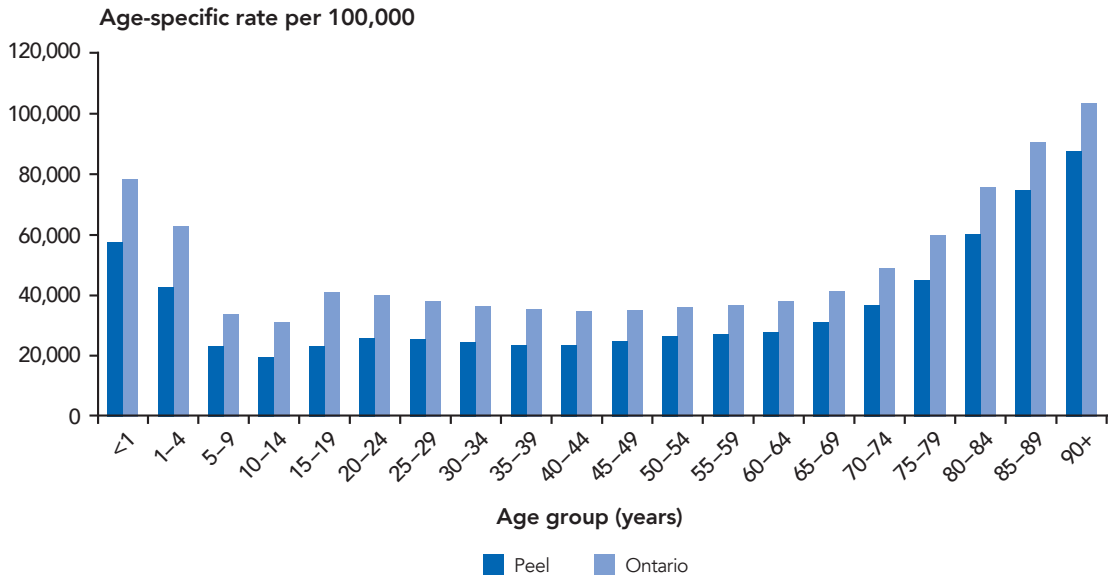
Emergency Department Visits due to All Causes, Peel and Ontario, 2003 to 2016



Notes: Rates are age-standardized to the 2011 Canadian population.
ICD - 10 Chapter 15: Pregnancy, Childbirth and the Puerperium were not included.
ICD - 10 Chapter 21: Factors influencing health status and contacts with health services was not included, as this chapter does not represent diseases or conditions.
Source: National Ambulatory Care Reporting System, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 3.7

Emergency Department Visits due to all Causes by Age Group, Peel and Ontario, 2016



Notes: ICD - 10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD - 10 Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Source: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Emergency Department Visits for Family Practice Sensitive Conditions

While Peel's rate of emergency department visits is lower than Ontario, some emergency department visits are for conditions that could be better addressed in another setting such as primary care. Conditions that would better be addressed in a family physician's office can be referred to as family practice sensitive conditions (FPSC).[77]

Table 3.4

Top 10 Leading Causes of Emergency Department Visits, Peel, 2016

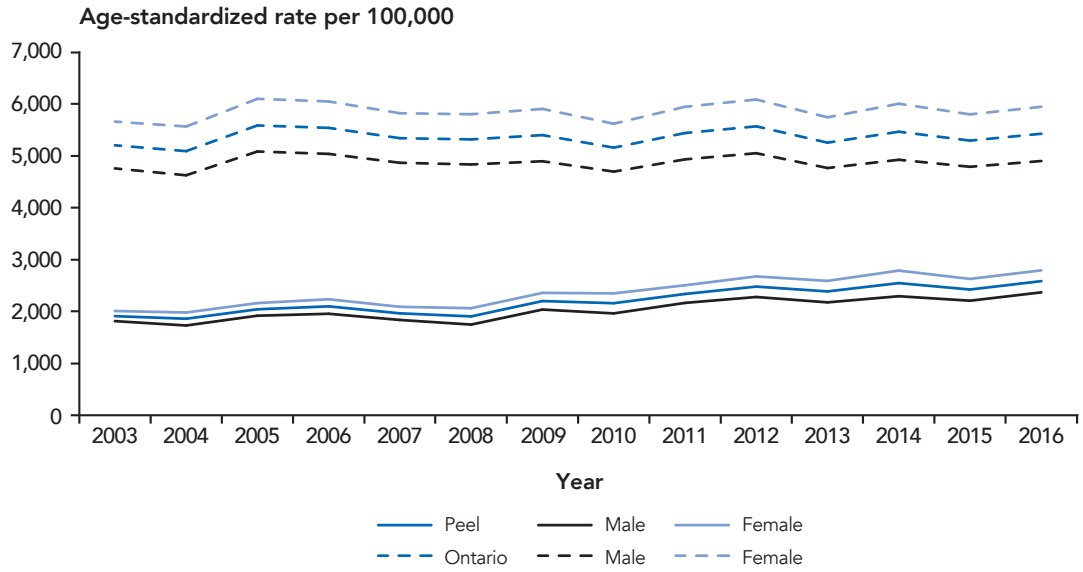
Category	Number	Crude Rate per 100,000
Injury, poisoning and certain other consequences of external causes (e.g., falls, motor vehicle crashes)	99,849	6,785.0
Acute respiratory infections other than flu or pneumonia	16,899	1,148.3
Arthritis/Rheumatism	16,268	1,105.5
Diseases of the urinary system	15,499	1,053.2
Diseases of the skin and subcutaneous tissue	12,821	871.2
Intestinal infectious diseases	9,632	654.5
Diseases of the genital system	8,190	556.5
Influenza and pneumonia	8,081	549.1
Diseases of the ear and mastoid process	7,495	509.3
Diseases of the eye and adnexa (e.g., eyelids)	6,433	437.1
All other causes	214,347	14,565.4
Total	**415,514**	**28,235.3**

Notes: ICD Chapter 15: Pregnancy, Childbirth and the Puerperium was not included. ICD Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In 2016, 38,574 of the 415,514 emergency department visits (9%) in Peel were potentially avoidable by being managed at a family physician's office. The age-standardized FPSC emergency department visit rate in Peel has increased since 2003, but it is much lower compared to Ontario. In Peel and Ontario, the FPSC emergency department visit rate is higher among females compared to males (Figure 3.8) and among individuals less than 10 years of age compared to older age groups (Figure 3.9).

Figure 3.8

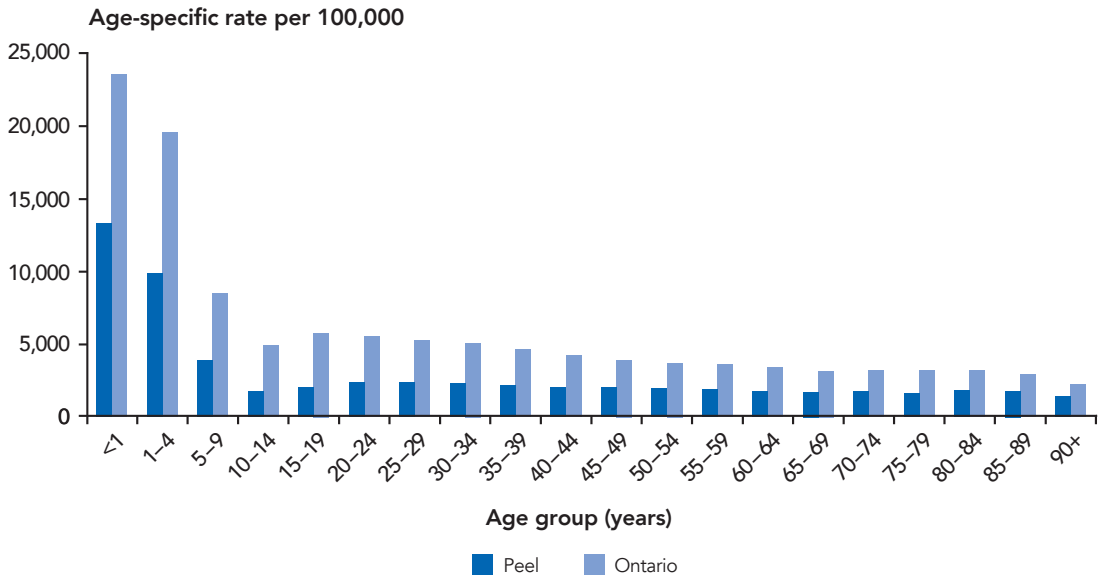
Emergency Department Visits for Family Practice Sensitive Conditions by Sex, Peel and Ontario, 2003 to 2016



Notes: Rates are age-standardized to the 2011 Canadian population.
ICD - 10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD - 10 Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Source: National Ambulatory Care Reporting System, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 3.9

Emergency Department Visits for Family Practice Sensitive Conditions by Age Group, Peel and Ontario, 2016



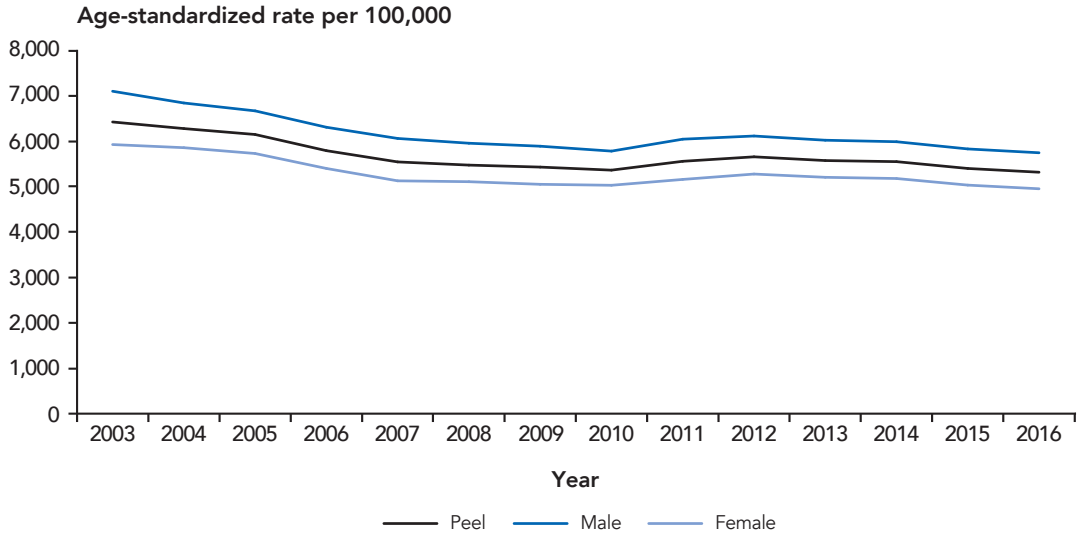
Notes: ICD - 10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD - 10 Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Source: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Hospitalizations

In 2016, there were 71,664 hospitalizations among Peel residents (4,870 per 100,000 residents). Additionally, there were 15,997 hospitalizations related to pregnancy, childbirth and the puerperium that have been excluded from the remainder of the data in this section. The age-standardized rate of hospitalizations in Peel decreased between 2003 and 2007, but has since remained stable (Figure 3.10). Peel's hospitalization rates are consistently lower than Ontario's (data not shown). The rate of hospitalizations is consistently higher among males compared to females in Peel (Figure 3.10). Rates of hospitalizations by age group follow a J-shaped curve (Figure 3.11).

Figure 3.10

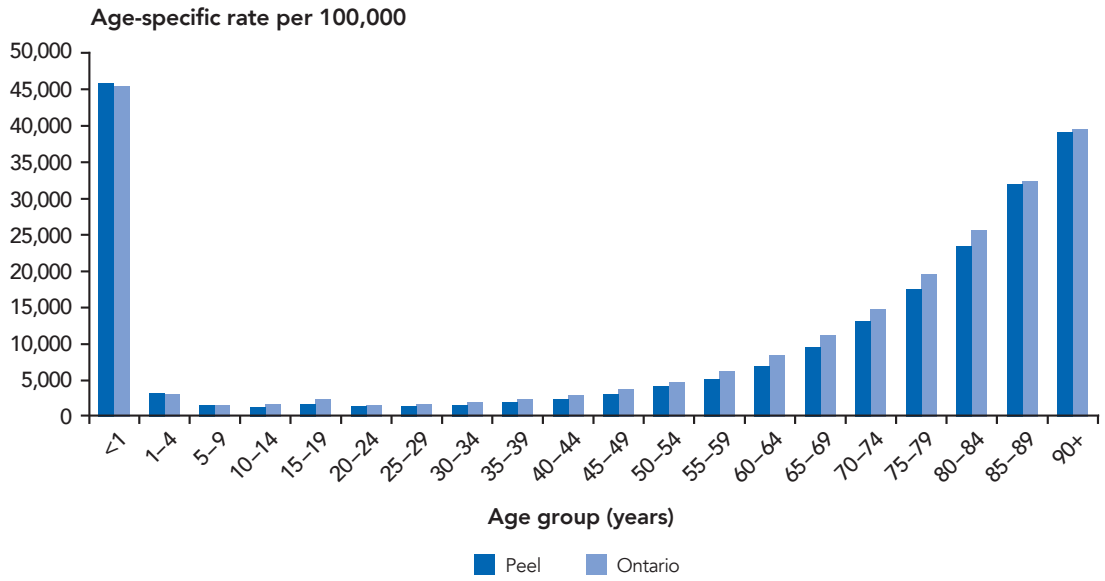
Hospitalizations due to all Causes by Sex, Peel, 2003 to 2016



Notes: Rates are age-standardized to the 2011 Canadian population.
ICD - 10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD - 10 Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Source: Hospital In-Patient Discharges, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 3.11

Hospitalizations due to all Causes by Age Group, Peel and Ontario, 2016



Notes: ICD - 10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD - 10 Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Source: Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

While the leading cause of hospitalization overall is injury, poisoning and certain other consequences of external causes (Table 3.5), the leading cause of hospitalization for males is ischaemic heart disease (data not shown).[N]

The leading causes by age group are:

- Infants <1 year: disorders related to length of gestation and fetal growth
- 1 to 9 year olds: influenza and pneumonia
- 10 to 19 year olds: appendicitus, hernia and intestinal obstruction
- 50 to 59 year olds: ischaemic heart disease
- 60 to 79 year olds: arthritis/rheumatism (data not shown).[N]

Table 3.5

Top 10 Leading Causes of Hospitalizations, Peel, 2016

Category	Number	Crude Rate per 100,000
Injury, poisoning and certain other consequences of external causes (e.g., falls, motor vehicle crashes)	5,689	386.6
Ischaemic heart disease	4,376	297.4
Arthritis/Rheumatism	4,339	294.9
Diseases of the urinary system (e.g., renal failure)	3,223	219.0
Appendicitis, hernia and intestinal obstruction	3,085	209.6
Disorders related to length of gestation and fetal growth	2,844	193.3
Influenza and pneumonia	2,125	144.4
Heart failure	1,758	119.5
Diseases of the genital system (e.g., pelvic inflammatory disease)	1,656	112.5
Cerebrovascular disease	1,639	111.4
All other causes	40,930	2,781.3
Total	**71,664**	**4,869.8**

Notes: ICD Chapter 15: Pregnancy, Childbirth and the Puerperium was not included. ICD Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Hospitalizations for Ambulatory Care Sensitive Conditions

Hospitalizations for conditions that could be treated and managed through ambulatory or primary care may be an indicator of lack of access to these services. In addition, lack of access to appropriate primary care increases the chances of complications, acute episodes and hospitalization.[78]

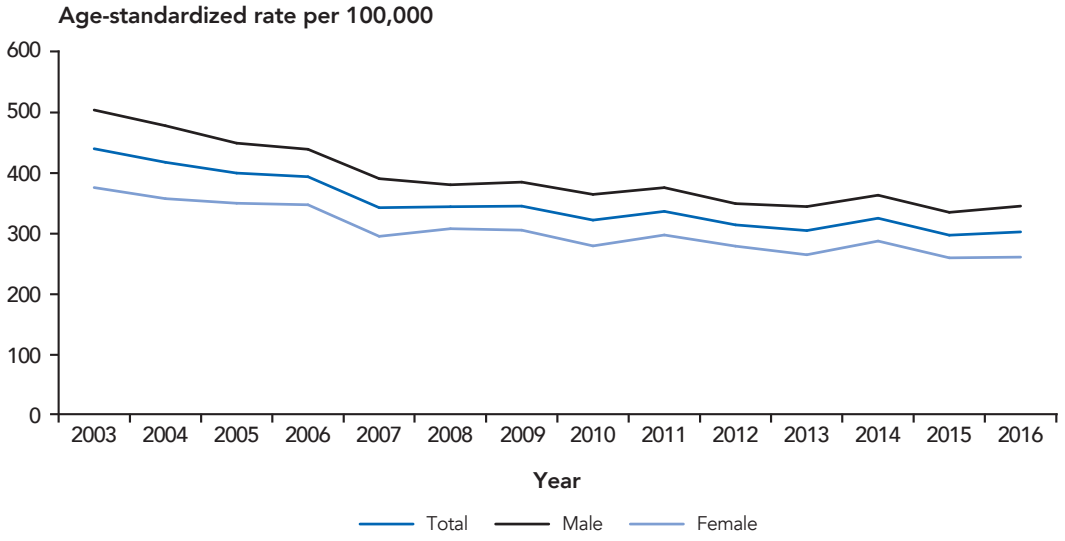
Definition

Ambulatory care sensitive conditions (ACSC) are hospitalizations that would not have occurred if the health condition had been treated effectively in community settings for individuals less than 75 years.[79] Some examples of ACSC include asthma, chronic obstructive pulmonary disease, diabetes and hypertension. Additional details can be found in ***Chapter 13 - Data Methods.***

In Peel for 2016, 4,423 of the 54,260 hospitalizations (8%) were due to ACSC. The age-standardized ACSC hospitalization rate for Peel has decreased since 2003 and is lower compared to Ontario (data not shown). In Peel and Ontario, the ACSC hospitalization rate is higher among males (Figure 3.12) and by age group, follows a J-shaped curve (Figure 3.13).

Figure 3.12

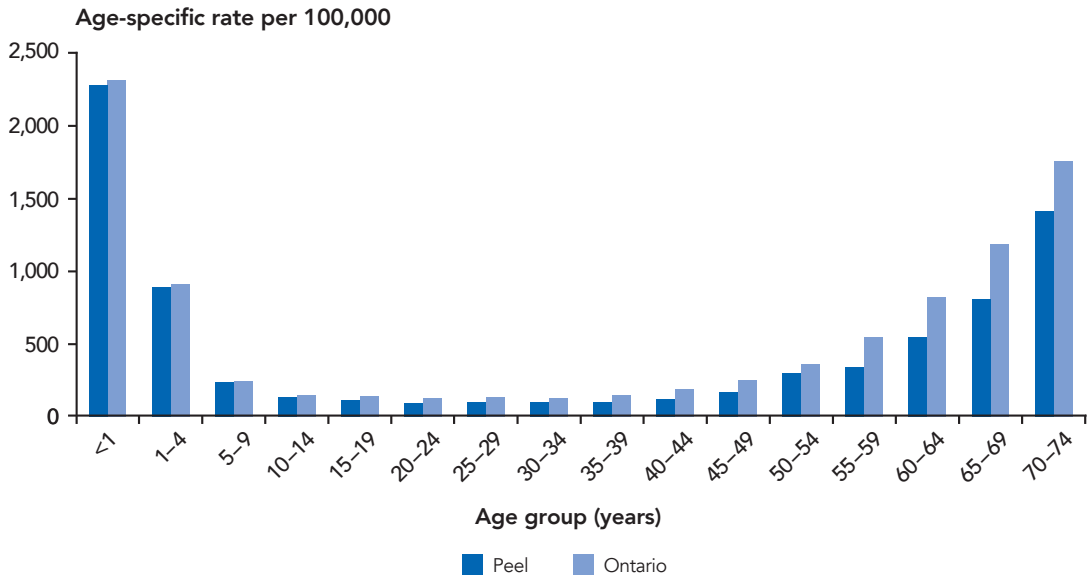
Hospitalizations for Ambulatory Care Sensitive Conditions by Sex, Peel, 2003 to 2016



Notes: Rates are age-standardized to the 2011 Canadian population.
ICD-10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD-10 Chapter 21: Factors influencing health status and contacts with health services was not included, as this chapter does not represent diseases or conditions.
Source: Hospital In-Patient Discharges, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 3.13

Hospitalizations for Ambulatory Care Sensitive Conditions by Age Group, Peel and Ontario, 2016



Notes: ICD-10 Chapter 15: Pregnancy, Childbirth and the Puerperium was not included.
ICD-10 Chapter 21: Factors influencing health status and contacts with health services were not included, as this chapter does not represent diseases or conditions.
Source: Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

High-resource Utilization

In Ontario, the top 5% of health care users account for almost half of health care spending and can be classified as high-resource users.[80] In this section, the five-year probability and estimated number of people who will become a high-resource user (transition into the top 5% of resource utilization) are presented by demographic factors.

Measurement

The probability and number of individuals becoming high-resource users over the next five years was estimated using the High-Resource Utilization Population Risk Tool (HRUPoRT) developed by Rosella, L.C., et al.[80]

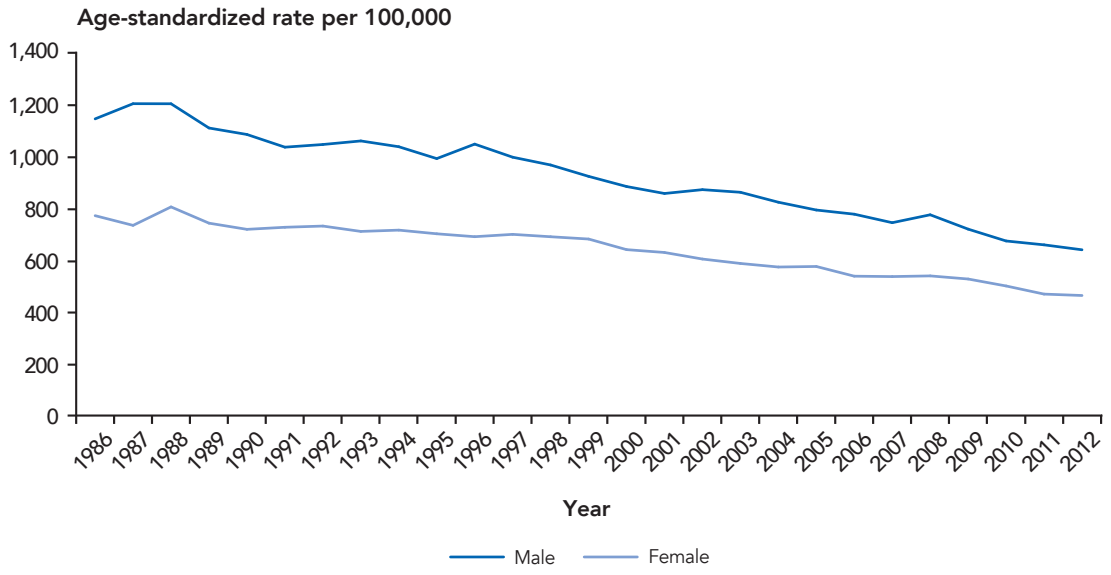
Costs for the high-resource users over the next five years are based on estimates from a study conducted by Rosella, L.C., et al.[81], where the average per person expenditure for a one year period was $53,150 for the top 1% and $13,450 for those in the top 2% to 5%.

Approximately 6% of Peel's population (62,000 people) in 2013/2014 are estimated to become high-resource users by 2018/2019. This will result in over $1.3 billion in estimated health-care costs or about $260 million annually.[H2]
The probability of becoming a high-resource user significantly increases with age. Income is also a determining factor. Individuals in the lowest income quintile (8%) are more likely to become a high-resource user compared to the highest income quintile (3%). Long-term immigrants (8%) are significantly more likely to become a high-resource user compared to recent (2%) and non-immigrants (5%).[H2]

Deaths

In 2012, there were 5,301 deaths among Peel residents (388.4 per 100,000 population). The age-standardized death rate in Peel has decreased since 1986 and is consistently lower than Ontario (data not shown).[O] In Peel, the death rate is higher among males compared to females, although the decline since 1986 has decreased the disparity between the sexes (rate ratio of 1.5 in 1986 and 1.4 in 2012) (Figure 3.14). Between the ages of 15 and 34 years, the death rate for males is over twice that of females (data not shown).[O]

Figure 3.14
Deaths due to all Causes by Sex, Peel, 1986 to 2012



Notes: Rates are age-standardized to the 2011 Canadian population.
Sources: Ontario Mortality Database, 1986-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 1986-2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In Peel, the leading cause of death overall is ischaemic heart disease (Table 3.6). However, this differs by sex. Among females, dementia and Alzheimer's disease is the leading cause of death (Table 3.7).

Did You Know

The top causes of death in Ontario in 1882 were:

1. Phthisis (tuberculosis)
2. Anaemia
3. Old age
4. Pneumonia
5. Diphtheria
6. Heart disease
7. Typhoid fever (from salmonella)
8. Scarlatina
9. Diarrhea (from infected water)
10. Convulsions[8]

Table 3.6

Top 10 Leading Causes of Death, Peel, 2012

Category	Number	Crude Rate per 100,000
Ischaemic heart disease	698	51.1
Dementia and Alzheimer's disease	435	31.9
Bronchus and lung cancer	349	25.6
External causes of morbidity and mortality (e.g., accidents, falls, burns, poisoning, suicide)	335	24.5
Cerebrovascular disease	285	20.9
Cancer of the colon, rectum and anus	174	12.7
Diabetes mellitus	161	11.8
Chronic obstructive pulmonary disease (COPD)	155	11.4
Breast cancer	126	9.2
Influenza and pneumonia	125	9.2
All other causes	2,458	180.1
Total	**5,301**	**388.4**

Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Table 3.7

Top Five Leading Causes of Death by Sex, Peel, 2012

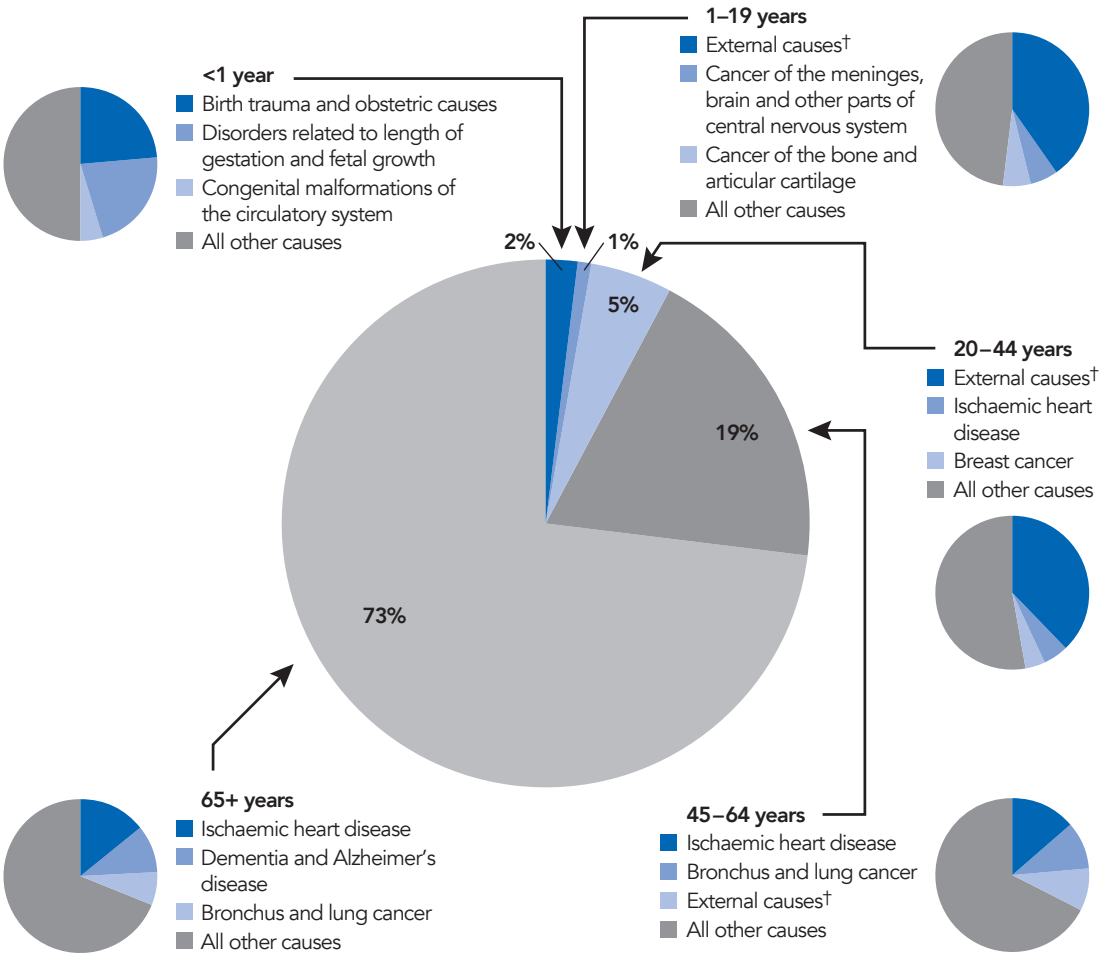
Category	Number	Crude Rate per 100,000
Males		
Ischaemic heart disease	420	62.2
External causes of morbidity and mortality (e.g., accidents, falls, burns, poisoning, suicide)	214	31.7
Bronchus and lung cancer	181	26.8
Dementia and Alzheimer's disease	150	22.2
Cerebrovascular disease	118	17.5
Total	**2,721**	**402.7**
Females		
Dementia and Alzheimer's disease	285	41.4
Ischaemic heart disease	278	40.3
Bronchus and lung cancer	168	24.4
Cerebrovascular disease	167	24.2
Breast cancer	126	18.3
Total	**2,580**	**374.4**

Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The leading causes of death also differ by age group: birth trauma and obstetrics are the leading cause among infants (less than one year old); external causes of injury for individuals aged one to 19 years and 20 to 44 years; and ischaemic heart disease for those aged 45 to 64 years and those 65 years and older (Figure 3.15).

Figure 3.15

Most Common Causes of Death by Age Group, Peel, 2008 to 2012 Combined



† External causes include things such as accidents, burns, falls and poisonings.
Sources: Ontario Mortality Database, 2008-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2008-2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Potential Years of Life Lost

Definition

Potential years of life lost is a measure of premature death. It is the sum of all the years not lived by individuals in a population who die prior to age 75. The calculation weights death at a young age more heavily than death at an old age.

In 2012, there were 2,317 deaths among Peel residents younger than 75 years with 41,480 potential years of life lost (3,175 per 100,000 residents). The age-standardized rate for potential years of life lost in Peel has decreased since 1986 and is consistently lower than Ontario. In Peel, this rate is higher among males compared to females, but the disparity has decreased since 1986 (rate ratio of 1.7 in 1986 and 1.5 in 2012).

The top three leading causes of potential years of life lost include external causes of morbidity and mortality, ischaemic heart disease, and bronchus and lung cancer (Table 3.8). However, for females, the leading cause of potential years of life lost is breast cancer.

Table 3.8

Top 10 Leading Causes of Potential Years of Life Lost, Peel, 2012

Category	Number of Deaths	Number of Potential Years of Life Lost	Crude Rate of Potential Years of Life Lost per 100,000
External causes of morbidity and mortality (e.g. accidents, falls, burns, poisoning, suicide)	209	6,478	495.9
Ischaemic heart disease	280	3,276	250.8
Bronchus and lung cancer	203	2,404	184.0
Disorders related to length of gestation and fetal growth	27	2,025	155.0
Breast cancer	97	1,785	136.6
Birth trauma and obstetric causes	19	1,425	109.1
Cirrhosis and other diseases of the liver	81	1,380	105.6
Cerebrovascular disease	95	1,225	93.8
Cancer of the colon, rectum and anus	79	1,068	81.8
Diabetes mellitus	78	920	70.4
Total	**2,317**	**41,480**	**3,175.2**

Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Table 3.9

Top Five Leading Causes of Potential Years of Life Lost by Sex, Peel, 2012

Category	Number of Potential Years of Life Lost	Crude Rate per 100,000
Females		
Breast cancer	1,785	272.4
External causes of morbidity and mortality†	1,720	262.5
Bronchus and lung cancer	1,108	169.1
Disorders related to length of gestation and fetal growth	1,050	160.2
Ischaemic heart disease	759	115.8
Males		
External causes of morbidity and mortality†	4,758	730.7
Ischaemic heart disease	2,517	386.6
Bronchus and lung cancer	1,296	199.0
Cirrhosis and other diseases of the liver	1,009	155.0
Disorders related to length of gestation and fetal growth	975	149.7

† External causes of morbidity and mortality include things such as accidents, falls, burns, poisoning, and suicide.
Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 1986–2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Chapter 4

Health In Early Life

Key Messages

- Fertility rates in Peel have steadily decreased for teenagers and women younger than 30 years of age and increased for women over 30 years of age.
- One-third (33%* - use data with cauthion) of Peel mothers are overweight or obese as they enter pregnancy. Both gestational diabetes and hypertension during pregnancy increase with increasing pre-pregnancy BMI.
- Caesarean sections increase with both high pre-pregnancy body mass index and gestational weight gain above the recommendation.

Early life experiences set a foundation for health throughout the entire life course. Investing in early child development can influence an individual's academic achievement, economic productivity, health-related behaviours, as well as their physical and mental health.[82] Ultimately, health in early life influences the future health of communities. This health trajectory begins in the preconception period, with the health of the parents.

This chapter will describe the health of families in the preconception, pregnancy, postpartum and early life periods.

FAMILY AND CHILD DEMOGRAPHICS

This section describes the socio-demographics of Peel's children and families.

Data in this section refer to parents aged 15 years and older with at least one child younger than 18 years of age. Parents may also have children 18 years of age or older.

In 2016, there were 332,785 individual parents aged 15 years and older, with at least one child aged 18 years or younger in Peel.[A5]

Family Size and Structure

One quarter (24%) of Peel's population are infants, children and youth (zero to 18 years old), accounting for a total of 330,220 individuals.

In Peel, among the 184,545 census families, 43% have one child, 41% have two children and 15% have three or more children. This is similar to Ontario.[A6,A7]

In 2016, 76% of Peel census families are intact, while 5% are stepfamilies. In Peel, 19% of census families are lone-parent families, with 16% of lone parents being female and 3% being male. Additional information can be found in ***Chapter 2 - Determinants of Health.***

More information about families is available in ***Chapter 2 - Determinants of Health***, which focuses on Peel families with children less than 24 years of age. The structure of families with children less than 24 years of age is similar to those with children younger than 18 years old (intact families-74%, stepfamilies-6%, lone-parent families-20%).[A1]

In Peel, many households with children zero to 18 years old are one-family households consisting of a couple and children, with no additional persons (60%) (Figure 4.1). There are a higher proportion of multigenerational households in Peel compared to Ontario (21% and 11%, respectively).

Definition

A household is considered ***multigenerational*** if at least one person is living with both their parent(s) and their child(ren).

Age of Parents

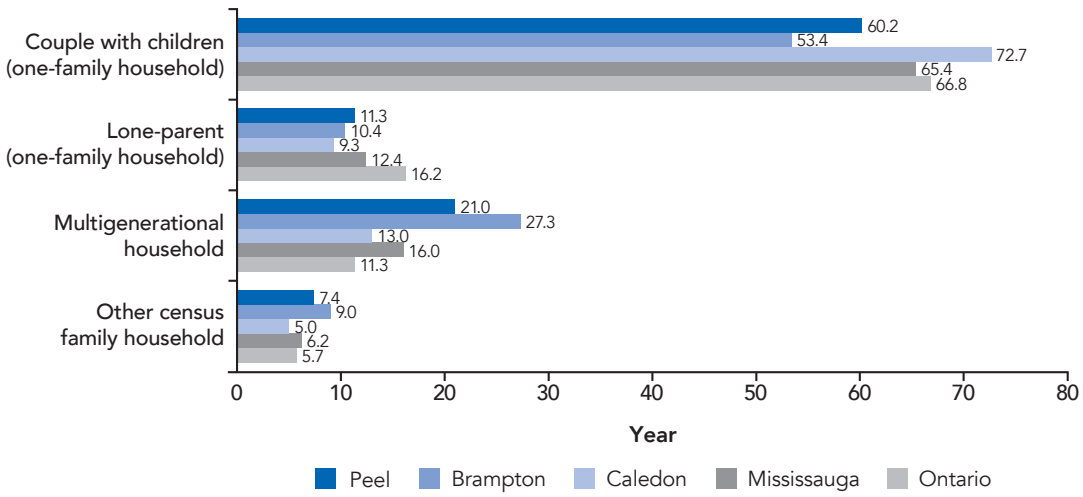
In 2012 in Peel, two-thirds (66%) of mothers were between 25 to 34 years of age and over half of fathers (58%) between 30 to 39 years of age (Figure 4.2).

Immigration

The majority of Peel parents are immigrants (72%). This is higher than Ontario (39%). In Peel, 22% of parents are recent immigrants, having immigrated to Canada within the past 10 years (Figure 4.3).

Figure 4.1

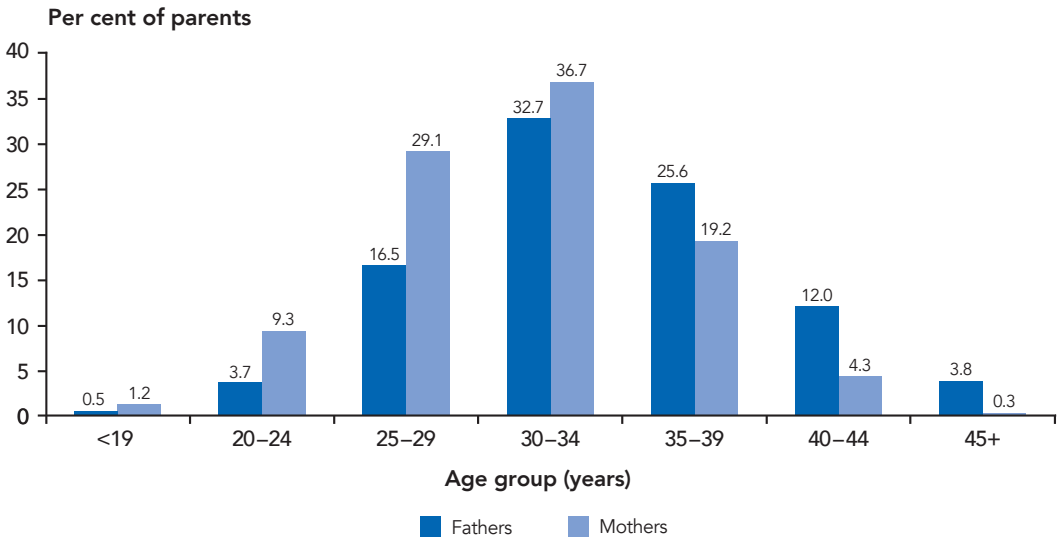
Private Household Type of Census Families With Children Aged 0–18 Years, Peel, Brampton, Caledon, Mississauga, and Ontario, 2016



Source: Census, 2016, Custom Profile of Census Family Size by Number of Children Aged 0 to 18 Years and Census Family Structure and Household Type for Census Families in Private Households with at Least One Child Aged 0 to 18 Years, Statistics Canada.

Figure 4.2

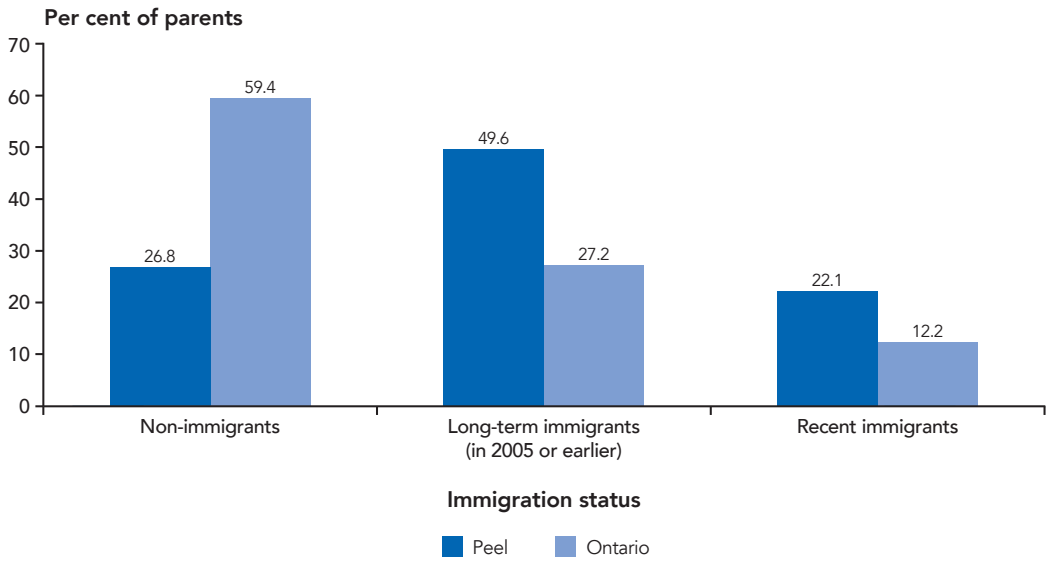
Live Births by Parental Age Group, Peel, 2012



Notes: Parental age was missing for 0.0-3.9% of records. Missing data were included in the calculation of the percentages.
Source: Ontario Live Birth Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 4.3

Immigration Status of Parents of Children Aged 0–18 Years, Peel and Ontario, 2016



Note: Non-permanent resident category not shown.
Source: Census, 2016, Custom Profile of Parents with at Least One Child Aged 0 to 18 Years, Statistics Canada.

Language

While Peel is home to a high percentage of immigrant parents, almost all (99%) speak one of Canada's official languages, English or French. In addition, 16% of parents are multilingual, twice the proportion of Ontario parents (8%).[A5]

In Peel in 2016, 10% of children aged one to three years old had no knowledge of English or French, an important factor for school readiness. This was higher than in Ontario (6%).[A1]

Education

Peel parents are well educated, with 69% having attained a post-secondary degree or diploma. This proportion was similar to both Ontario parents (70%) and the general Peel population (65%).[A5]

Employment

In 2016, Peel parents' participation in the labour force was 84%, which was similar to Ontario (85%). Female parents had a lower participation in the labour force than male parents (76% vs 93%). The unemployment rate of Peel parents was 6%, which was similar to Ontario (5%).

Not including parents on maternity and parental leave, female parents experienced an unemployment rate 2.1 times higher than male parents. In 2015 in Peel, two-thirds (66%) of male parents worked full-time (30 hours or more per week) for the full year (49 weeks and over), compared to 50% of female parents.[A5]

In 2016, among Peel parents who worked outside of the home, 15% worked afternoon or night shifts (i.e., left for work between 12 p.m. and 4:59 a.m.). This may impact family time and child-care arrangements.

For additional details about employment among the general Peel population, refer to ***Chapter 2 - Determinants of Health***.

Maternity and Parental Leave

Measurement

During the Census, parents on ***maternity and parental leave*** are counted as part of the labour force and ***employed***. They are considered absent from a job or business, although the reason for the absence is not collected.[83]

Tax records can be used to measure the proportion of parents who took maternity and parental leave, by determining all individuals with newborns, and how many of them received Employment Insurance (EI) benefits during that time.[84]

In 2012 in Canada, 64% of mothers and 28% of fathers took maternity and parental leave. In Ontario, about 69% of all new parents in Ontario took maternity and parental leave.[84] Data are not available for Peel.

Licensed Child-care Centres

There were 13,591 licensed child-care spaces for children aged zero to 3.8 years and 30,147 licensed child-care spaces for children aged 3.8 to 12 years in Peel as of December 31, 2017. Over the past five years, there has been a 70% increase in total licensed spaces.[85]

Child care is a high cost for families. Among 28 big cities across Canada, Mississauga had the second-highest fees for both infants (median $1,452 per month), and preschoolers (median $1,052 per month) in 2017.[86] In the same year, Mississauga also tied in ranking for the third-most expensive fees for toddlers (median $1,200 per month). Toronto had the highest fees for both infants and toddlers.[86]

Income

In Peel, the median and mean after-tax income of individual parents is similar to that of Ontario. The median individual after-tax income is $37,640 in Peel and the mean after-tax income is $43,898. The median income of parents was higher than the general Peel population.[A5]

Low Income

While 10% of Peel private households had low income, in 2015, 15% of children aged zero to five years old were living in private households classified as low income (after-tax). For children aged six to 17 years old, the proportion was 13%.[A1] For teenage parents 17 years or less of age, low income was 15%.[A5]

In Peel, 3% of parents received social assistance benefits, which was lower than Ontario (5%). For additional details about low income in Peel, please refer to ***Chapter 2 - Determinants of Health***, in particular Table 2.5.

REPRODUCTIVE HEALTH

Births

In 2016, there were a total of 15,735 infants born in Peel. The crude birth rate was 10.7 live births per 1,000 population. This was similar to the provincial rate (10.0 live births per 1,000 population). The number of live births, which had been increasing over time, is now relatively stable. However, the crude birth rate in Peel has been slowly declining (Figure 4.4).

Measurement

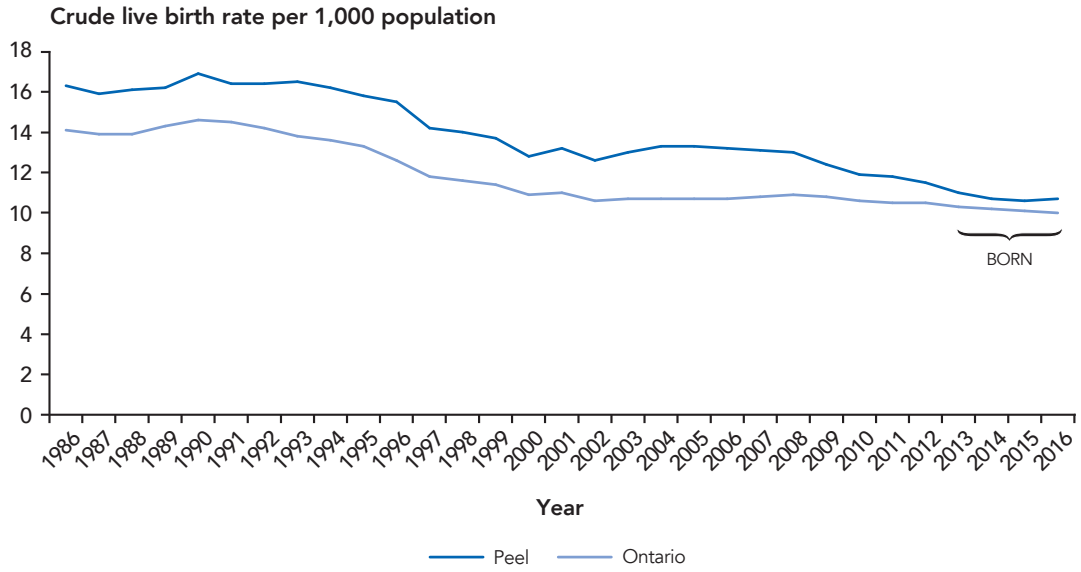
Information regarding live births and stillbirths are collected for Ontario by the Office of the Registrar General (ORG), Service Ontario. Data are available from 1986 to 2012.

The Better Outcomes Registry & Network (BORN) is an Ontario registry that collects birth information from hospitals, birthing centres, and home births. BORN data area available up until the day before the current day in the Cube.

In this report, data from the ORG are presented from 1986 to 2012, and data from BORN are presented from 2013 to 2016.

Figure 4.4

Crude Birth Rate, Peel and Ontario, 1986–2016



Sources: Ontario Live Birth Database, 1986–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Distribution of live births and stillbirths, by public health unit and province (Standard Report), 2013–2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 7, 2017 and September 21, 2018.
Population Estimates, 1986–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Definition

The ***general fertility rate*** is the number of live births to females aged 15 to 49 years old per 1,000 females in the total population aged 15 to 49 years old.

The ***total fertility rate*** is the average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to the age-specific fertility rates for that area and time period.

The ***age-specific fertility rate*** is the number of live births in an age group per 1,000 females in that age group.

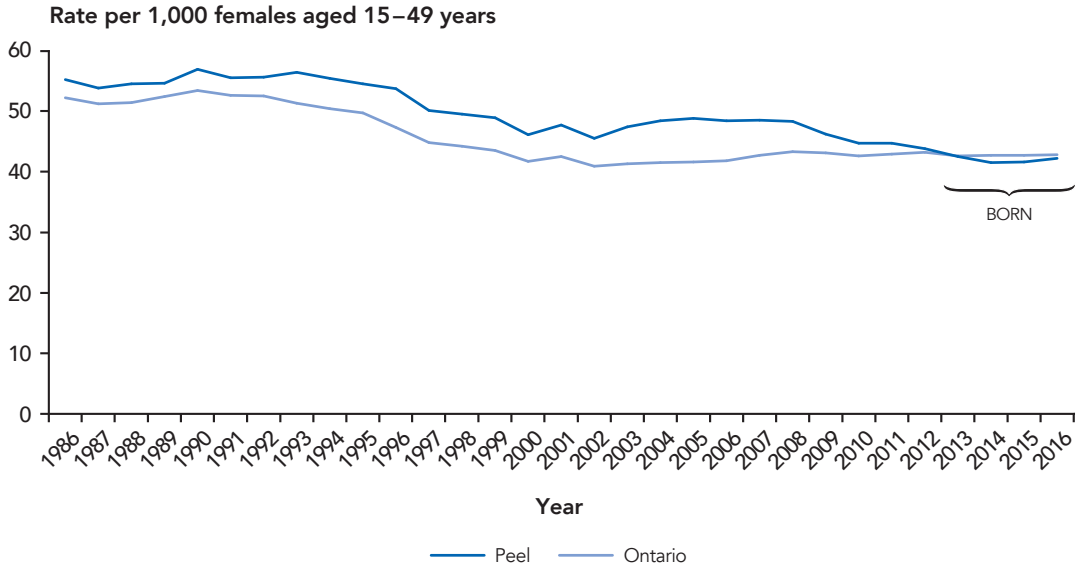
Between 1986 and 2016, the general fertility rate in Peel was similar to Ontario and has declined over the last 30 years (Figure 4.5).

In 1986 in Peel, the total fertility rate was 1.7, decreasing to 1.5 in 2016.[P,Q1,I2] This is less than the 2.1 per 1,000 females required for replacement of the parents' generation, a situation known as below-replacement fertility.

In Peel, the fertility rates have steadily decreased over time in teenagers and women younger than 30 years, while increasing over time for women age 30 years of age and older. In 1986, the highest fertility rate was in the 25 to 29 year old age category. By 2016, the age distribution had shifted, with the 30 to 34 year old age group having the highest fertility rate (Figure 4.6). The same pattern was observed in Ontario (data not shown).

Figure 4.5

General Fertility Rate, Peel and Ontario, 1986–2016

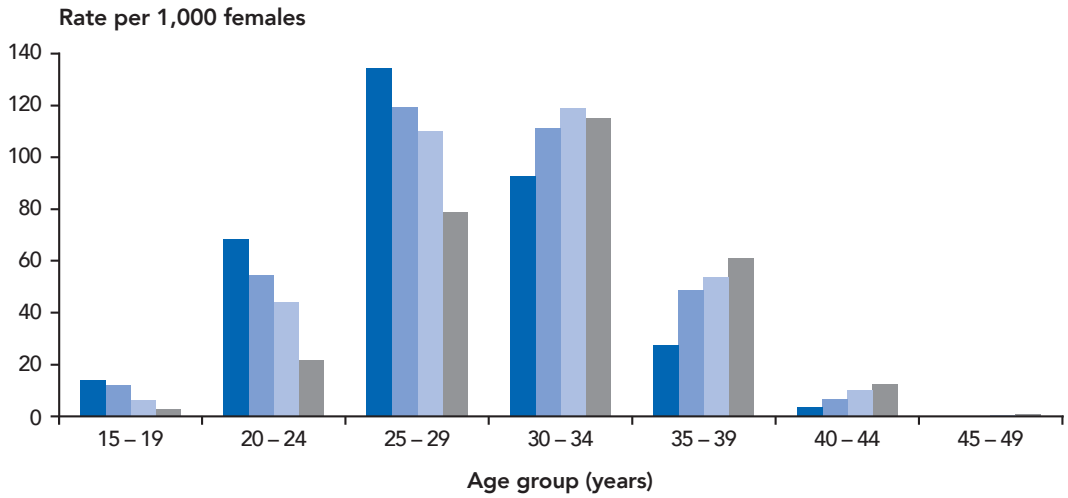


Sources: Ontario Live Birth Database, 1986–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Public Health Unit Analytic Reporting Tool (Cube), 2013–2016, BORN Information System, BORN Ontario. Information accessed on August 30, 2018.
Custom Data Request, BORN Information System (BIS), 2013–2016, BORN Ontario. Information accessed on September 4, 2018.
Population Estimates, 1986–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

This shift is important as older women, specifically women who become pregnant over the age of 35 years, are at increased risk of pregnancy complications.[87] In addition, infants of women over 35 years are at increased risk of having a low birth weight, chromosomal abnormalities and non-genetic malformations.[87]

Figure 4.6

Age-Specific Fertility Rate, Peel, 1986, 1996, 2006, 2016



1986	13.9	68.3	134.0	92.4	27.3	3.7	0.1
1996	11.9	54.6	119.1	110.9	48.5	6.7	0.3
2006	6.3	44.2	110.0	118.8	53.8	10.0	0.4
2016	3.0	21.9	78.6	115.0	61.0	12.7	1.1

Sources: Ontario Live Birth Database, 1986, 1996, 2006, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on August 30, 2018.
Population Estimates, 1986–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Preconception Period

Table 4.1 summarizes the preconception health of mothers and fathers using a framework developed by the World Health Organization to display relevant local data.[88] These data describe some general characteristics of Peel residents who are within the child bearing/parenting years as well as data regarding women who gave birth in 2016.

For additional details about nutrition, physical activity, tobacco, and drug use, refer to ***Chapter 5 - Health and Behaviours***. For additional details about mental health, refer to ***Chapter 6 - Mental Health***. For additional details about sexually transmitted infections and HIV, refer to ***Chapter 9 - Infectious Diseases***.

Table 4.1

Preconception Health and Associated Measurements by Sex, Peel

Preconception Health	Measures	Category	Peel	
			Female	Male
Nutrition, physical activity, diabetes, hypertension	Per cent of women who gave birth taking folic acid prior to pregnancy[ai]	–	25.6%	NA
	Per cent of women who gave birth by pre-pregnancy body mass index (BMI)[aii]	Underweight (<18.5) Normal (18.5–24.9) Overweight (25.0–29.9) Obese Class I (30.0–34.9) Obese Class II (35.0–39.9) Obese Class III (≥ 40.0)	4.4%* 42.2%* 20.0%* 8.4%* 2.8%* 1.5%*	NA
	Per cent of population who are overweight by age group[b]	18–29 years 30–44 years 45–64 years	18.5%* 39.2% 30.2%	32.5% 38.5% 49.9%
	Per cent of population who are obese by age group[b]	18–29 years 30–44 years 45–64 years	8.8%* 24.3% 38.8%	11.5%* 26.7% 30.6%
	Rate of pre-existing diabetes per 1,000 women who gave birth by age group[aiii]	20–29 years 30–39 years 40–49 years	6.0 11.8 26.1	NA
	Rate of pre-existing hypertension per 1,000 women who gave birth by age group[aiii]	20–29 years 30–39 years 40–49 years	5.9 11.2 44.0	NA
	Per cent of population (aged 12 years and older) who consume vegetables and fruits ≥ 5 times per day[b]	–	43.1%	32.5%
	Per cent of population (aged 18 years and older) who consumed fast food ≥ 1 times in the past week[c]	–	48.8%	61.0%
	Per cent of population who are physically active during leisure time by age group[b]	12–18 years 19–29 years 30–44 years 45–64 years	34.1%* 32.3%* 16.5%* 19.3%*	48.1% 50.8%* 24.5%* 14.6*
Tobacco use	Per cent of population who are current cigarette smokers (daily and occasional) by age group[b]	12–18 years 19–29 years 30–44 years 45–64 years	NR 12.8%* 8.5%* 6.4%*	NR 20.7%* 17.1%* 18.9%*
Too-early, unwanted and rapid successive pregnancies	Rate of pregnancies per 1,000 women aged 15 to 19 years old[d]	–	21.1	NA
Sexually transmitted infections (STIs)	Incidence rate of chlamydia per 100,000[e]	–	156.4	107.1
	Incidence rate of gonorrhea per 100,000[e]	–	17.3	29.8
	Age-specific incidence rate of infectious syphilis per 100,000[f]	20–24 years 25–29 years 30–34 years 35–39 years 40–44 years 45–49 years	2.3 1.6 0.4 1.1 0.4 0.7	12.1 18.9 13.7 9.2 7.5 11.0

Table 4.1 continues...

Table 4.1 continued

Preconception Health	Measures	Category	Peel	
			Female	Male
Human Immuno-deficiency Virus (HIV)	Age-specific incidence rate of HIV per 100,000 [f]	20–29 years 30–39 years 40–49 years	3.4 4.2 3.5	9.3 8.5 8.2
Mental Health	Per cent of mothers giving birth (who had a previous birth) with a history of postpartum depression[g]	–	2.1%	NA
	Per cent of population who consulted with a medical professional about their mental health[b]	–	14.2%	6.5%*
	Age-specific rate of emergency department visits due to mental health disorders (per 100,000)[h]	15–19 years 20–24 years 25–29 years 30–34 years 35–39 years 40–44 years 45–49 years	2,865.5 2,002.5 1,884.0 1,307.0 1,177.5 1,024.7 978.6	1,926.4 2,973.6 2,720.9 2,298.0 1,760.6 1,540.2 1,295.5
	Rates of deliberate self-harm and suicide (per 100,000): Crude rate of emergency department visits[h] Crude rate of hospitalization[i] Crude rate of mortality[j]	–	63.8 19.5 2.5	37.7 10.7 8.0
Substance use	Per cent of population (aged 12 years and older) by type of drinker (alcohol)[b]	Regular drinker Occasional drinker No drink in the past 12 months	38.4% 20.1% 41.5%	55.9% 13.7% 30.4%
	Per cent of population (aged 12 years and older) who reported using marijuana, cannabis, or hashish in the past 12 months[k]	–	5.1%	11.2%

* Use data/estimate with caution.
NR – Not releasable due to small numbers.
NA – Not applicable.
Sources: [a] Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on:
i October 30, 2017.
ii March 23, 2018.
iii July 24, 2018.
[b] Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[c] Rapid Risk Factor Surveillance System, 2010, Region of Peel – Public Health.
[d] Ontario Live Birth and Stillbirth Databases, 2011, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Ontario Therapeutic Abortion Data, 2011. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2011, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[e] Integrated Public Health Information System (iPHIS), 2016, Region of Peel – Public Health. Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[f] Integrated Public Health Information System (iPHIS), 2012-2016, Region of Peel – Public Health. Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[g] Frequency of mental health concerns during pregnancy, by public health unit and province (Standard Report), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on October 17, 2017.
[h] National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[i] Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[j] Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[k] Canadian Community Health Survey Share File, 2011/2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

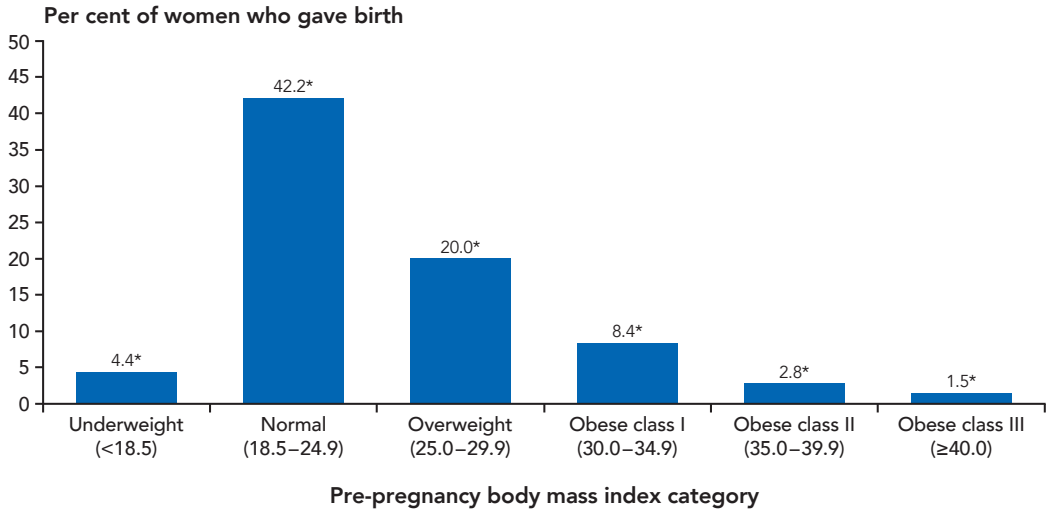
Pre-pregnancy Body Mass Index (BMI)

A woman's weight before and during pregnancy can influence both her health and the health of her infant. When a woman enters pregnancy with a normal BMI, both mother and infant have better health outcomes.[89]

Being in the overweight or obese pre-pregnancy BMI categories is a risk factor for gestational diabetes, gestational hypertension in pregnancy, as well as preterm birth.[90,91] In 2016, 42%* (*use data with caution) of Peel mothers entered pregnancy with a normal BMI and 33% of Peel mothers were overweight or obese upon entering pregnancy (Figure 4.7).

Figure 4.7

Pre-pregnancy Body Mass Index Category, Peel, 2016



*Use data with caution, as pre-pregnancy body mass index category was missing for 20.7% of records.
Notes: Missing data were included in the calculation of the percentages. Women with triplets or more are excluded as there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 25, 2018.

Pre-existing Conditions: Diabetes and Hypertension

In 2016, among women who gave birth, the rate of pre-existing diabetes and hypertension increased with age (Table 4.2). This is the same trend seen in the general female population (data not shown).

Table 4.2

Pre-existing Diabetes and Hypertension by Age Group, Peel, 2016

Age Group (years)	Pre-existing Diabetes		Pre-existing Hypertension	
	Number	Rate per 1,000 Women who Gave Birth	Number	Rate per 1,000 Women who Gave Birth
20–29	32	6.0	31	5.9
30–39	111	11.8	105	11.2
40–49	19	26.1	32	44.0
Total	**162**	**10.5**	**168**	**10.9**

Note: Pre-existing diabetes and hypertension were missing for 4.3% of records. Missing data were included in the calculation of the rates.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on July 24, 2018.

Infertility

The prevalence of current infertility among Canadian couples is estimated to range from 12% to 16% depending on the method used to determine infertility.[92] Additionally, the prevalence of current infertility has increased over time and is directly associated with increasing age of the mother.[92] Currently, there are no available data on infertility in Peel.

Definition

Couples were considered currently ***infertile*** if after 12 months the couple did not become pregnant, and did not use any form of birth control and/or reported having sexual intercourse and/or reported having tried to become pregnant.[92]

The majority of Ontario women who gave birth in 2014–2015 and 2015–2016 conceived spontaneously (96%). Assisted reproductive technology (e.g., in vitro fertilization, intrauterine insemination) accounted for 4% of births among Ontario women this time period.[93]

PREGNANCY

This section presents local data on pregnancy rates, folic acid intake, neural tube defects, gestational weight gain, gestational diabetes, gestational hypertension, substance use, including tobacco, alcohol and drugs, as well as mental health and maternal infections.

Definition

The ***total pregnancy rate*** is the number of pregnancies (sum of live births, stillbirths, and therapeutic abortions) per 1,000 women of reproductive age (15 to 49 years old) but excluding miscarriages. Data are from 2011, as that is the last year stillbirth data are available.

Folic Acid Intake and Neural Tube Defects

Folic acid supplementation helps reduce the risk of an infant being born with neural tube defects.[94] The Public Health Agency of Canada recommends that all women who are pregnant, or who could become pregnant, take a multivitamin with 0.4 milligrams of folic acid daily.[94]

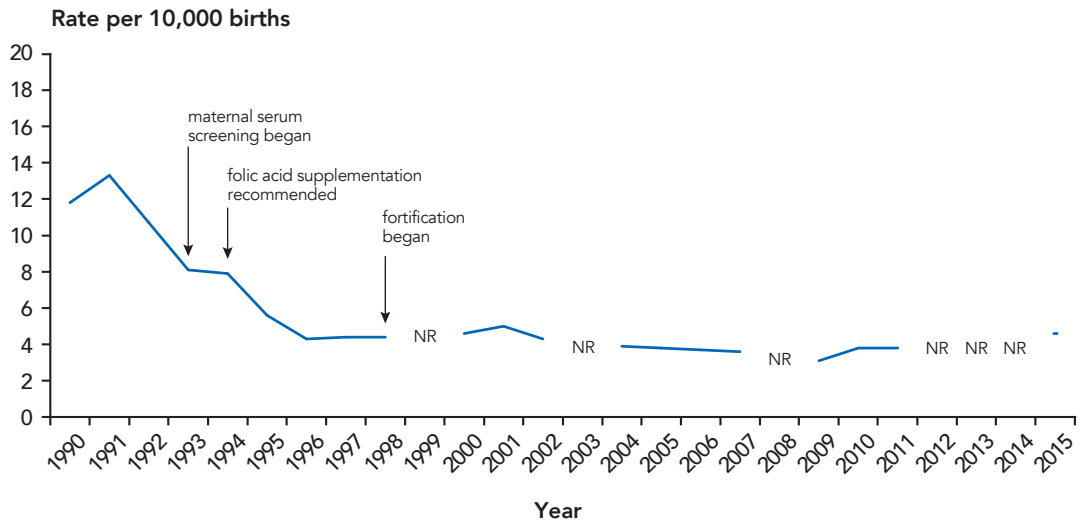
Of Peel women who gave birth in 2016, 14% had no supplementation, 54% took supplements during pregnancy only, 23% took them preconceptually and prenatally, and 3% preconceptually.[Q1]

The rate of neural tube defects has declined with the use of folic acid supplements and food fortification (Figure 4.8). In 2012 to 2015 combined, the rate of neural tube defects in Peel was lower than Ontario.[T]

? *Did You Know*

Folic acid fortification of white flour, enriched pasta and cornmeal has been mandatory in Canada since 1998, with the intention of raising the daily intake at the population level. Nationally there was a 46% reduction in the incidence of neural tube defects after fortification was implemented.[95] Folic acid fortification is widely considered a Public Health success story.

Figure 4.8
Neural Tube Defects, Peel, 1990–2015



NR – Not releasable due to small numbers.
Source: Canadian Congenital Anomaly Surveillance System (CCASS), 1990-2015. Public Health Agency of Canada.

Gestational Weight Gain

Gestational weight gain (GWG) is the amount of weight a woman gains during her pregnancy.[92] The Institute of Medicine recommends weight gain ranges of 11 to 40 pounds for a singleton pregnancy, based on a woman's pre-pregnancy BMI. Recommendations for twin pregnancies are also available.

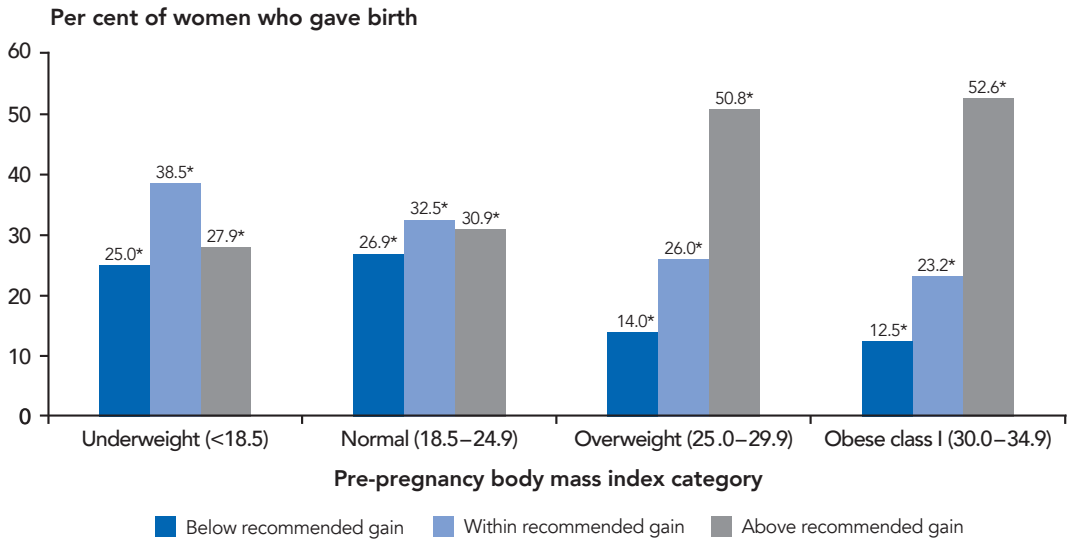
In Peel, 24%* of women who gave birth in 2016 met the weight gain recommendation, while 30%* exceeded it and 17%* were below it (*use data with caution).[Q1]

Gestational Weight Gain and Pre-pregnancy Body Mass Index

In 2016 in Peel, over half of the women in the overweight (51%*) and obese categories (53%*) gained above the recommended amount of weight, compared to about one-third of the women in the underweight (28%*) and normal weight (31%*) (*use data with caution) categories (Figure 4.9).

Figure 4.9

Gestational Weight Gain Group by Pre-pregnancy Body Mass Index Category, Peel, 2016



*Use data with caution, as gestational weight gain group was missing for 29.2% of records and pre-pregnancy body mass index category was missing for 20.7% of records.
Notes: Missing data were included in the calculation of the percentages. Women with triplets or more are excluded as there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 23, 2018.

Postpartum Weight Retention

Women who retain excess weight postpartum and enter subsequent pregnancies overweight or obese are at a higher risk of adverse maternal and infant health outcomes.[89]

In Peel in 2016, 49%* of first time mothers entered pregnancy at a normal BMI, which was higher than the 38%* (*use data with caution) of mothers having their second or subsequent child (Figure 4.10).

Definition

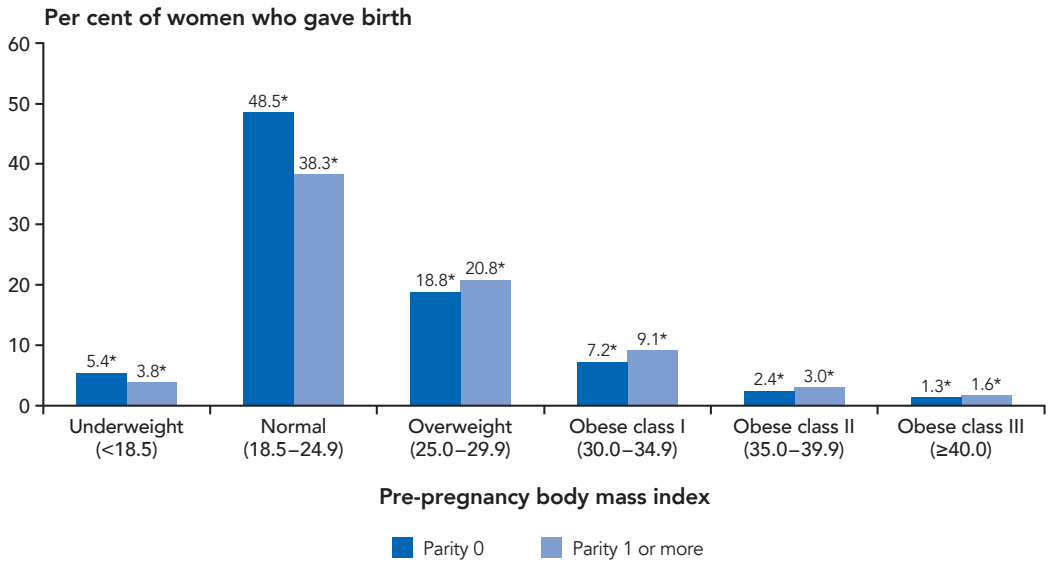
Parity is the number of previous births a woman has experienced (including both live births and stillbirths).

Mothers who have not previously given birth and are first-time mothers are termed ***primiparous*** (parity 0).

Mothers who have given birth previously are termed ***multiparous*** (parity 1 or more).

Figure 4.10

Pre-pregnancy Body Mass Index Category by Parity, Peel, 2016



*Use data with caution, as pre-pregnancy body mass index category was missing for 20.7% of records.
Notes: Missing data were included in the calculation of the percentages. Women with triplets or more are excluded as there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 23, 2018.

Gestational Diabetes

The evidence is inconclusive regarding the relationship between gestational weight gain and gestational diabetes[96]; however, pre-pregnancy weight is a recognized risk factor for gestational diabetes.[97]

In 2016, 9% of Peel women who gave birth developed gestational diabetes. This represents 1,416 women.[Q1] In 2016 in Peel, the rate of gestational diabetes increased as the maternal pre-pregnancy BMI category increased (with the exception of obese class II and III, which had the same rate of gestational diabetes). The rate of gestational diabetes in both the obese II and III categories was almost 2.5 times the rate of the normal weight category (17* per 100 women who gave birth compared to 7* per 100 women who gave birth respectively) (*use data with caution) (Table 4.3).

Table 4.3

Gestational Diabetes by Pre-pregnancy Body Mass Index, Peel, 2016

Pre-pregnancy Body Mass Index	Gestational Diabetes	
	Number	Rate per 100 Women who Gave Birth
Underweight (<18.5)	25*	3.6*
Normal (18.5–24.9)	444*	6.8*
Overweight (25.0–29.9)	347*	11.1*
Obese class I (30.0–34.9)	188*	14.4*
Obese class II (35.0–39.9)	71*	16.5*
Obese class III (≥40.0)	39*	16.5*

* Use data with caution.
Notes: Gestational diabetes was missing for 1.7% of records. Pre-pregnancy body mass index was missing for 20.7% of records. Missing data were included in the calculation of the rates.
Women with triplets or more are excluded; there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 23, 2018.

Gestational Hypertension

Definition

Gestational hypertension includes preeclampsia, preeclampsia requiring magnesium sulfate, pre-existing hypertension with superimposed preeclampsia, eclampsia, gestational hypertension and HELLP syndrome (Hemolysis Elevated Liver enzymes Low Platelets).

Increased pre-pregnancy BMI is a risk factor for gestational hypertensive disorders during pregnancy.[91] In 2016, 4% of Peel women who gave birth experienced gestational hypertension.[Q1]

In 2016, the Peel gestational hypertension rate increased with maternal pre-pregnancy BMI category. The rate of gestational hypertension in the obese class III category was approximately five times the rate of the normal weight category (Table 4.4).

Table 4.4

Gestational Hypertension by Pre-pregnancy Body Mass Index, Peel, 2016

Pre-pregnancy Body Mass Index	Gestational Hypertension	
	Number	Rate per 100 Women who Gave Birth
Underweight (<18.5)	10*	1.5*
Normal (18.5–24.9)	172*	2.6*
Overweight (25.0–29.9)	156*	5.0*
Obese class I (30.0–34.9)	109*	8.3*
Obese class II (35.0–39.9)	43*	10.0*
Obese class III (≥40.0)	33*	13.9*

* Use data with caution.
Notes: Gestational hypertension was missing for 2.2% of records. Pre-pregnancy body mass index was missing for 20.7% of records. Missing data were included in the calculation of the rates.
Women with triplets or more are excluded; there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 23, 2018.

Substance Use During Pregnancy

Data on substance use during pregnancy are self-reported, and may be under reported, due to social desirability bias (i.e., the tendency to not report a true answer because it may not be deemed socially acceptable).

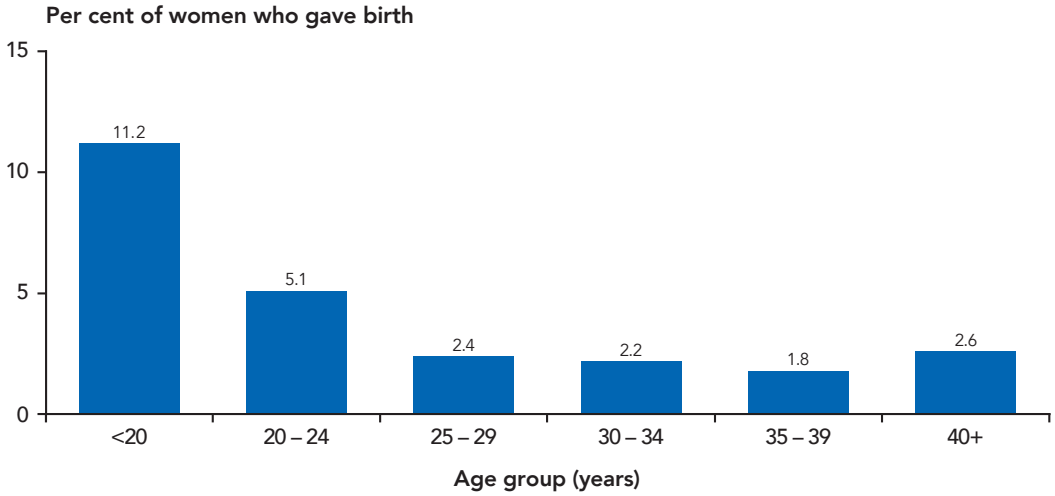
Tobacco Use

Smoking tobacco during pregnancy can lead to serious health impacts, including increased risk of low birth weight, stillbirths, premature births, and sudden infant death syndrome (SIDS).[98] In 2016, 3% of pregnant women in Peel were smokers at the time of birth, reflecting 384 women. This was lower than in Ontario (7%). In both Peel and Ontario, the proportion of pregnant women who smoked remained constant between 2013 and 2016.[Q2] In 2016 in Peel, the proportion of pregnant women who were smokers was greatest among those aged less than 20 years (11%) and those aged 20 to 24 years old (5%) (Figure 4.11)

Pregnant smokers in Peel smoke fewer cigarettes compared to Ontario. In 2016, 2% of Peel pregnant smokers were heavy smokers, defined as smoking more than 20 cigarettes per day compared to Ontario (5%).The proportion of pregnant smokers who were heavy smokers has remained stable between 2013 and 2016, in Peel and Ontario.[Q2]

Figure 4.11

Self-Reported Smoking at Time of Birth by Age Group, Peel, 2016



Notes: Smoking status was missing for 5.5% of records. Missing data were included in the calculation of the percentages.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on October 17, 2017.

Exposure to Environmental Tobacco Smoke at Home During Pregnancy and Childhood

In 2016, 12% of pregnant woman in Peel resided at the time of birth with a smoker and did not report smoking themselves, while an additional 2% resided with a smoker and were also smokers (Table 4.5). These proportions have remained constant between 2013 and 2016.[Q1]

The home is an important location for environmental tobacco smoke exposure for children. In 2013/2014, 2% of Peel households with children (less than 18 years of age) had someone who smoked inside the home daily or almost daily. This was lower than Ontario (4%).[H2]

For more information on tobacco use and exposure to environmental tobacco smoke, refer to ***Chapter 5 - Health and Behaviours***.

Table 4.5

Residing With a Smoker at Time of Birth, Peel, 2016

Residential Smoking Status	Women Who Gave Birth	
	Number	Per cent
Does not reside with smoker	12,080	77.7
Resides with smoker and does not smoke	1,922	12.4
Resides with smoker and smokes	272	1.7
Only pregnant woman smokes	109	0.7
Missing	1,167	7.5
Total	**15,550**	**100.0**

Note: Missing data were included in the calculation of the percentages.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on October 18, 2017.

Alcohol and Drug Use During Pregnancy

Measurement

Alcohol use during pregnancy includes less than one drink per month, one drink per month, two to three drinks per month, one drink per week, more than one drink per week, episodic excessive drinking (binging), exposure prior to pregnancy confirmed, amount unknown (response chosen if mother drank in first trimester and/or until she learned of her pregnancy), and exposure amount unknown (prior to April 2015).

Drug use during pregnancy includes the use of street drugs, and the inappropriate use of prescription and non-prescription drugs.

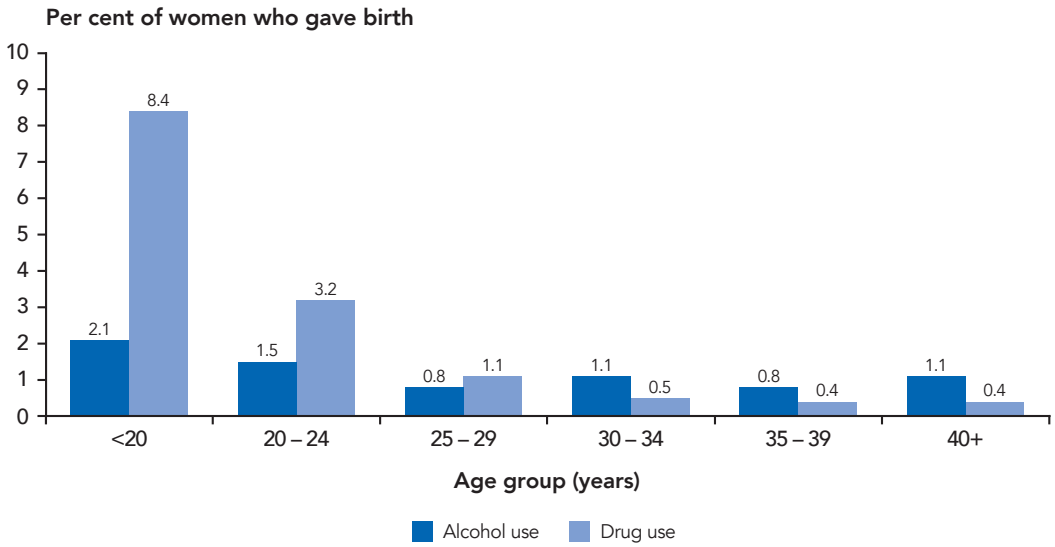
In 2016, 1% of pregnant women in Peel reported drinking alcohol during their pregnancy. This was lower than Ontario (2%). These proportions were the same for pregnant women who used drugs.

In 2016, the proportion of Peel pregnant women who drank alcohol was slightly higher among women aged 24 years and younger compared to older women. The proportion of Peel women who used drugs during pregnancy was greatest among those less than 20 years of age. This declined with increasing age (Figure 4.12). There were no differences in substance use by parity.[Q1]

In 2016, 1% of Peel pregnant women reported using drugs, and among these women, marijuana was the most commonly used drug. In 2016 in Ontario, 14% of the reported drug exposures among pregnant women were for opioid use. This per cent is not releasable for Peel.[Q2]

Figure 4.12

Self-Reported Alcohol and Drug Use During Pregnancy by Age Group, Peel, 2016



Notes: Alcohol and drug use were missing for less than 4% of records. Missing data were included in the calculation of the percentages.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on October 18, 2017 (alcohol use) and October 19, 2017 (drug use).

Mental Health

Mental illness, including depression and anxiety, during pregnancy or the postpartum period can disrupt the development of a secure attachment relationship between mother and baby at a time when an infant is fully dependent on caregivers and is most vulnerable. In 2016, anxiety was the most frequent mental health concern reported by pregnant women in Peel (6%), followed by depression (5%) (Table 4.6). The proportion of pregnant women who reported these conditions in Peel was lower than in Ontario (10% and 8%, respectively). In 2016, 10% of pregnant Peel women experienced at least one mental health concern. This was lower than in Ontario (16%).

In 2016 in Peel, 8% of infants had a parent or parenting partner with a history of depression, anxiety or other mental illness. This was lower than in Ontario (17%).[99]

Table 4.6

Maternal Mental Health Concerns During Pregnancy, Peel and Ontario, 2016

Maternal Mental Health Concern	Peel		Ontario	
	Number	Per cent	Number	Per cent
None	13,173	84.7	107,933	78.2
Anxiety	850	5.5	13,371	9.7
Depression	710	4.6	10,668	7.7
History of postpartum depression†	204	2.1	3,020	3.8
Addiction	20	0.1	675	0.5
Bipolar	39	0.3	747	0.5
Schizophrenia	NR	NR	84	0.1
Other	84	0.5	1,846	1.3
Missing	856	5.5	8,082	5.9
Total women with concerns	**1,521**	**9.8**	**21,935**	**15.9**
Total women who gave birth	**15,550**	**NA**	**137,950**	**NA**

NA - Total does not add to 100 as mothers can have more than one mental health concern during pregnancy.
† For history of post-partum depression, the denominator was the total number of pregnant women who gave birth that had a previous birth.
Notes: Missing data were included in the calculation of the percentages.
Source: Frequency of mental health concerns during pregnancy, by public health unit and province (Standard Report), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on October 17, 2017.

Maternal Infections

Routine prenatal care, including screening and testing for sexually transmitted infections (STIs), is recommended for all pregnant women. The Canadian Guideline on Sexually Transmitted Infections outlines specific recommendations for screening and treatment during pregnancy.[100]

During her first trimester, a pregnant woman should be screened for:

- Hepatitis B
- Syphilis
- Human Immunodeficiency Virus (HIV)
- Neisseria gonorrhoeae (gonorrhea)
- Chlamydia trachomatis

The Society of Obstetricians and Gynaecologists of Canada (SOGC) also recommend that women be screened for Group B Streptococcus at 35 to 37 weeks into their pregnancy.[101] In addition to testing for STIs and Group B Streptococcus, the SOGC advises that the mother's immunization records be discussed. If necessary, some vaccines can be administered safely during pregnancy, while others, such as rubella, can only be given postpartum.[102]

Throughout pregnancy, the health-care provider may recommend additional testing when clinically indicated.[103] Note that infections that are not routinely screened for may be underreported.

? *Did You Know*

All women should be offered HIV antibody testing with appropriate counselling and informed consent.[100] A diagnosis of HIV during pregnancy presents a need for complex care and requires consultation with experts as soon as possible to optimize the health of the mother and reduce the risk of transmission to the baby.

The most common pathogen identified among pregnant women was Group B streptococcus (GBS) (Table 4.7). This infection can be transmitted from mother to infant both during the pregnancy and birth. Mothers can be treated with antibiotics during labour to prevent transmission to their infant.[104] In Peel between 2012 and 2016 combined, neonatal GBS was the third-most common infection in infants (<1 years old) with 35 cases diagnosed and a crude incidence rate of 43.5 per 100,000.[BB] GBS can be a life-threatening disease and infants who develop GBS may experience deafness and developmental disabilities.[105]

Table 4.7

Infection During Pregnancy†, Peel, 2016

Infection	Number	Rate per 100 Women who Gave Birth
None	11,383	73.2
Group B streptococcus	2,409	15.5
Urinary tract infection (UTI)	413	2.7
Seasonal influenza	220	1.4
Herpes simplex virus	97	0.6
Hepatitis B	80	0.5
Chlamydia	33	0.2
Syphilis (all types)	28	0.2
Human papillomavirus (HPV)	16	0.1
Human immunodeficiency virus (HIV)	11	0.1
Hepatitis C	9	0.1
Gonorrhea	NR	NR
Other‡	289	1.9
Missing data	803	5.2
Total	**15,551**	**NA**

† Infections during pregnancy can be reported by a health care provider and be self-reported by the mother.
‡ Includes Trichomonas, Hepatitis A, Methicillin - resistant staphylococcus aureus (MRSA), C-difficile as well as other infections and virus.
NR - Not releasable due to small numbers.
NA - Total does not add to 100 as mothers can have multiple infections during pregnancy.
Note: Missing data were included in the calculations of the rates.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 13, 2017.

LABOUR AND BIRTH

Location of Birth and Type of Attendant

In 2016 in Peel, 99% of births took place in a hospital. This is similar to Ontario (97%).[Q2]

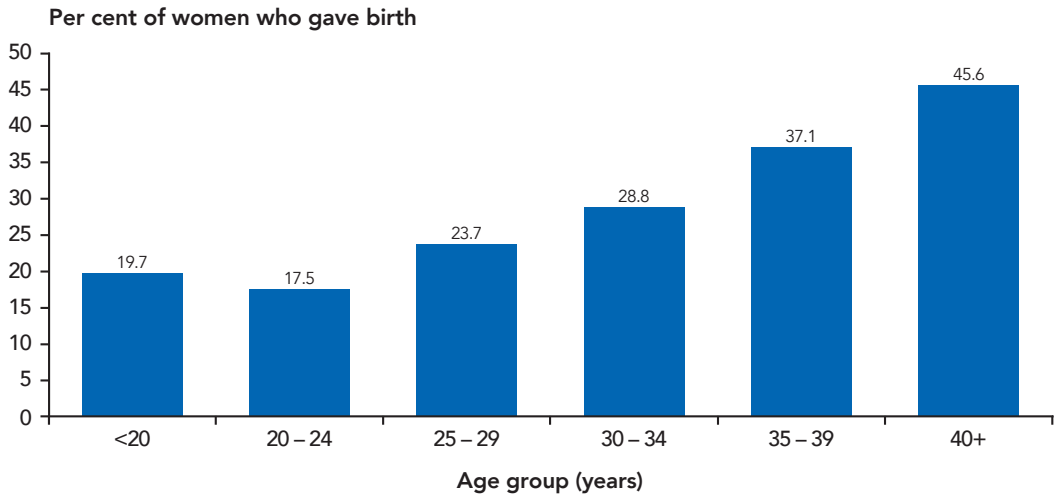
In 2016 in Peel, 88% of births were attended by an obstetrician, compared to 76% in Ontario. In Ontario in 2016, the second-most common birth attendant was midwives at 10% of births, compared with 5% in Peel. In Peel, 5% of births were attended by family physicians.[Q2]

Type of Birth

In 2016 in Peel, 29% of pregnant women gave birth by caesarean section. This was similar to Ontario (28%). The proportion of pregnant women who had a caesarean section has remained stable between 2013 and 2016 in both Peel and Ontario.[Q2] Increased maternal age, pre-pregnancy weight and gestational weight gain are among the risk factors for caesarean birth. In 2016 in Peel, the proportion of women who had caesarean sections increased with age (Figure 4.13).

Figure 4.13

Caesarean Birth by Age Group, Peel, 2016



Notes: No records were missing for caesarean births.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 7, 2017.

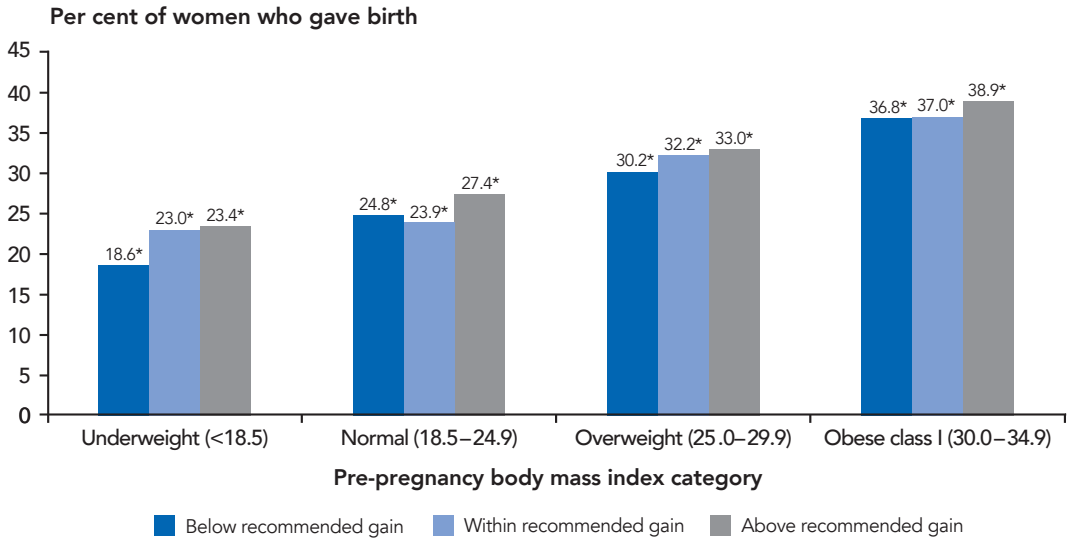
Gestational Weight Gain (GWG) and Caesarean Birth

In 2016 in Peel, underweight women who gained the least amount of weight during pregnancy (below recommendation) had the lowest proportion of caesarean births (19%*), compared to obese women who gained the most weight (above recommendation) (39%*) (*use data with caution) (Figure 4.14).

The method of birth (vaginal or caesarean) affects recovery times and health-care costs. The recovery from a caesarean section is longer, and there is an increased risk of infection compared to a vaginal birth.[87] In 2014, the average cost of caesarean births in Ontario ranged from $2,997 to $5,047. In comparison, the average cost of a vaginal birth was between $1,755 and $3,040.[106]

Figure 4.14

Caesarean Births by Gestational Weight Gain Group, within Pre-pregnancy Body Mass Index Category, Peel, 2016



*Use data with caution, as gestational weight gain group was missing for 29.2% of records and pre-pregnancy body mass index category was missing for 20.7% of records. No records for caesarean births were missing.
Notes: Women with triplets or more are excluded as there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 23, 2018.

General Birth Outcomes

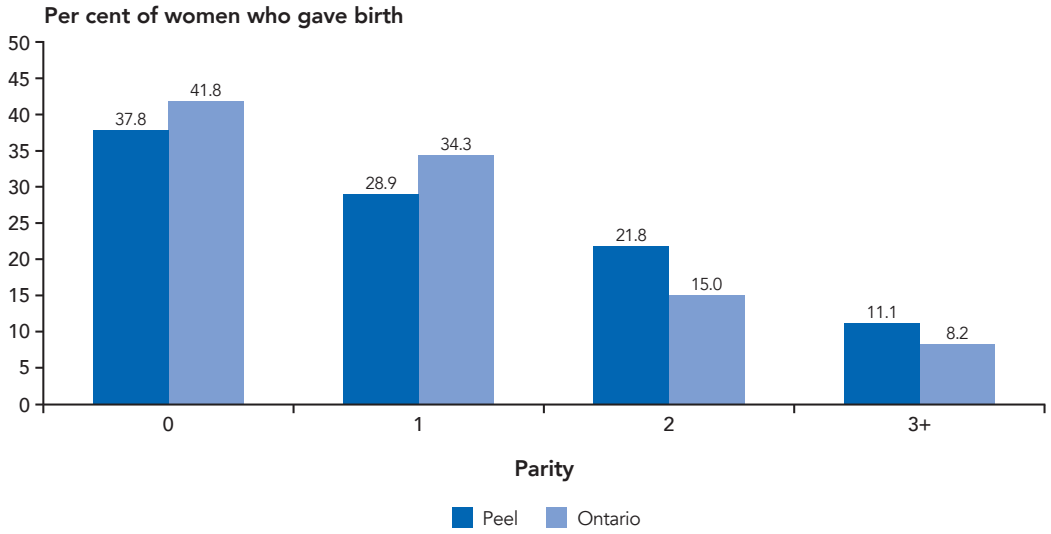
In 2016 in Peel, 38% of women were first-time mothers, compared to 42% in Ontario (Figure 4.15).

Multiple Births

The occurrence of multiple births has increased over time (Table 4.8). Older maternal age and fertility treatments are associated with multiple births, both of which have also increased over time in Peel (Table 4.8).

Figure 4.15

Parity,
Peel and Ontario, 2016



Parity was missing for 0.3%-0.7% of records. Missing data were included in the calculation of the percentages.
Source: Distribution of Parity, by Public Health Unit and Province (Standard Report), 2016,
BORN Information System (BIS), BORN Ontario. Information accessed on October 17, 2017.

Table 4.8

Singleton and Multiple Birth Rate,
Peel, 1986, 1996, 2006, 2016

Year	Singleton		Multiple	
	Number	Rate per 100 Live Births	Number	Rate per 100 Live Births
1986	9,858	98.0	202	2.0
1996	13,257	97.6	323	2.4
2006	15,481	96.9	501	3.1
2016	15,236	96.8	499	3.2

Notes: No records were missing for singleton and multiple births.
Sources: Ontario Live Birth Database, 1986, 1996, 2006, Ontario Registrar General, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on April 27, 2018.

Gestational Age

In 2016, 91% of Peel births had a gestational age of 37 to 41 weeks, indicating that these pregnancies reached term (Table 4.9). This was similar to Ontario (92%). Between 2013 and 2016, the proportion of term births in both Peel and Ontario was similar.[Q2]

Definition

An infant's ***gestational age*** is determined by the amount of time since the mother's last menstrual period to the time of birth. During pregnancy the best estimate of date of birth is determined by ultrasound.

Table 4.9

Live Births by Gestational Age, Peel and Ontario, 2016

Gestational Age (Weeks)	Peel		Ontario	
	Number	Per cent	Number	Per cent
<24	27	0.2	220	0.2
24–25	33	0.2	215	0.2
26–27	33	0.2	247	0.2
28–29	55	0.3	360	0.3
30–31	83	0.5	601	0.4
32–33	169	1.1	1,290	0.9
34–36	930	5.9	8,262	5.9
37–41	14,379	91.4	127,778	91.5
42+	26	0.2	606	0.4
Missing	0	0.0	0	0.0
Total	**15,735**	**100.0**	**139,579**	**100.0**

Source: Distribution of gestational age at birth in completed weeks, by public health unit and province (Standard Report), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 8, 2017.

Preterm Birth

The preterm birth rate in Peel in 2016 was 8.5 per 100 live births, which was similar to Ontario (8.0 per 100 live births). Between 1986 and 2016, the preterm birth rate increased in both Peel and Ontario (Table 4.10).

Preterm Birth and Age Group

In 2016, the oldest mothers (40 years and older) and the youngest mothers (less than 20 years) had the highest and second highest preterm birth rates, respectively (Figure 4.16).

Table 4.10

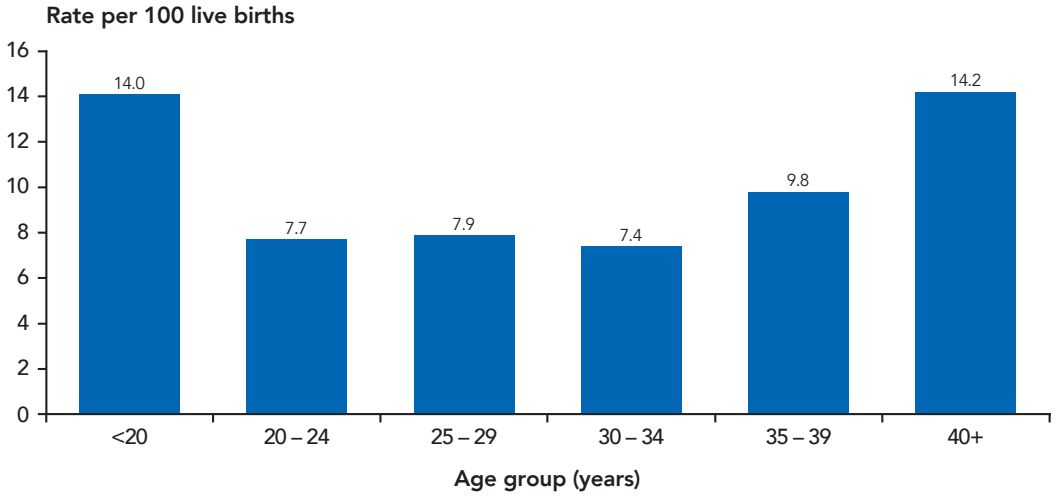
Preterm Birth Rate, Peel and Ontario,1986, 2006, 2016

Year	Peel		Ontario	
	Number	Rate per 100 Live Births	Number	Rate per 100 Live Births
1986	563	5.6	7,646	5.7
2006	1,205	7.5	10,444	7.7
2016	1,330	8.5	11,195	8.0

Notes: Data from 1996 are not shown due to administrative changes that affected data collection.
Across years, preterm birth was missing for 0.0%-0.3% of records. Missing data were included in the calculations of the rates.
Source: Ontario Live Birth Database, 1986, 2006, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Distribution of gestational age at birth in completed weeks, by public health unit and province (Standard Report), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 8, 2017.

Figure 4.16

Preterm Birth Rate by Age Group, Peel, 2016



Note: No records were missing for preterm birth.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 9, 2017.

Preterm Birth and Mother's Body Mass Index (BMI)

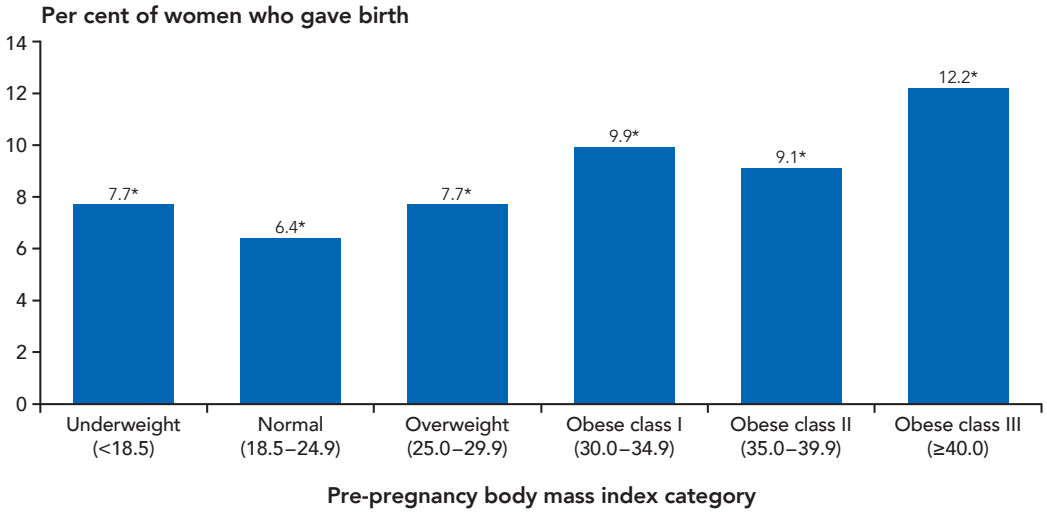
Increased pre-pregnancy BMI is associated with preterm birth.[107] The obese class III preterm birth rate was almost two times that of the normal weight preterm birth rate (Figure 4.17).

Preterm Birth and Multiple Birth

Births with multiple fetuses are more likely to be delivered preterm. In 2016, the preterm birth rate was over eight-times higher for multiple births compared to singleton births in Peel (Table 4.11). Ontario data were not available. Between 1986 and 2016, the rate of preterm birth for multiple births increased. The singleton preterm birth rate also increased, but not as dramatically (Table 4.11).

Figure 4.17

Preterm Birth Rate by Pre-pregnancy Body Mass Index Category, Peel, 2016



*Use data with caution, as pre-pregnancy body mass index category was missing for 20.7% of records.
Notes: No records were missing for preterm birth. Women with triplets or more are excluded as there is not enough evidence to make a weight gain recommendation.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 23, 2018.

Table 4.11

Preterm Birth Rate by Type of Birth, Peel, 1986, 2006, 2016

Year	Singleton		Multiple	
	Number	Rate per 100 Singleton Live Births	Number	Rate per 100 Multiple Live Births
1986	482	4.9	81	40.1
2006	915	5.9	290	57.9
2016	1,038	6.8	292	58.5

Notes: Data from 1996 are not shown due to administrative changes that affected data collection.
Across years, preterm birth was missing for 0.0%–0.1% of records. No records were missing for singleton and multiple birth. Missing data were included in the calculations of the rates.
Sources: Ontario Live Birth Database, 1986, 2006, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on April 27, 2018.

Birth Weight

In 2016, 91% of Peel live births had a normal birth weight (2,500 to 4,499 grams) (Table 4.12). This was similar to Ontario.

Low Birth Weight

Definition

Low birth weight is a birth weight below 2,500 grams regardless of gestational age.

Table 4.12

Live Births by Birth Weight Group, Peel and Ontario, 2016

Birth Weight Group	Peel		Ontario	
	Number	Per cent	Number	Per cent
<500g	13	0.1	144	0.1
500g–999g	80	0.5	484	0.3
1,000g–1,499g	97	0.6	754	0.5
1,500g–2,499g	1,075	6.8	7,834	5.6
2,500g–4,499g	14,261	90.6	127,934	91.3
≥4,500g	116	0.7	2,067	1.5
Missing data	93	0.6	915	0.7
Total	**15,735**	**100.0**	**140,132**	**100.0**

Note: Missing data were included in the calculation of the percentages.
Source: Custom data request, BORN Information System (BIS), 2016, BORN Ontario. Information accessed on March 6th, 2018.

Low birth weight is associated with infant morbidity and mortality, as well as poorer health outcomes later in life. Between 2002 and 2016, the low-birth-weight rate in Peel was consistently higher than Ontario's rate (Figure 4.18).

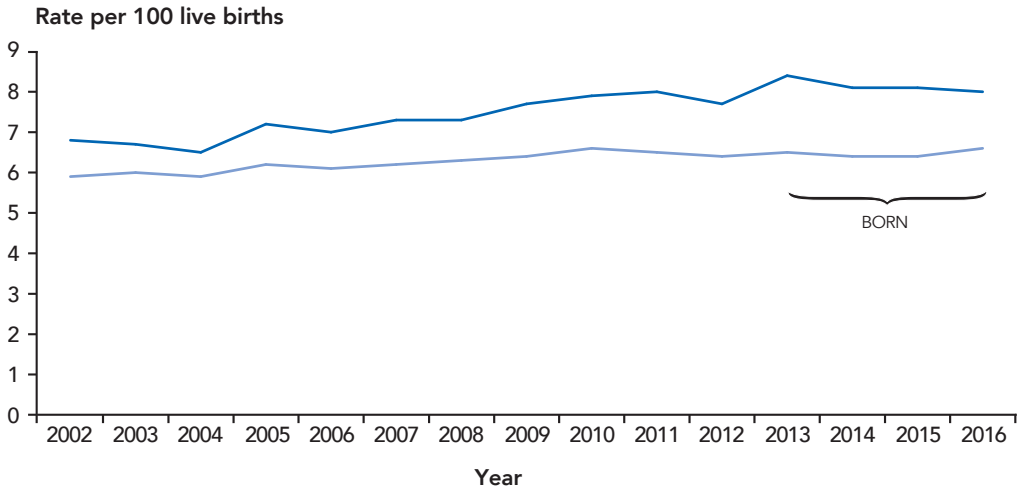
Two factors affecting low birth weight are preterm birth (before 37 weeks gestation) and intrauterine growth restriction (IUGR). IUGR happens when the fetus does not gain the appropriate amount of weight for its gestational age in utero. This distinction is important because the risk factors for preterm birth and IUGR are different.

Additionally, multiple birth infants are at a greater risk for having a low birth weight, as well as being more likely to be pre-term.

In Peel in 2016, the low-birth-weight rate decreased from 8.0 per 100 live births to 6.4 per 100 live births when multiple births were excluded (Table 4.13). The rate decreased to 2.7 per 100 live births when both multiple and preterm infants were excluded. This trend has also been observed in previous years.

Figure 4.18

Low Birth Weight Rate, Peel and Ontario, 2002–2016



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Peel	6.8	6.7	6.5	7.2	7.0	7.3	7.3	7.7	7.9	8.0	7.7	8.4	8.1	8.1	8.0
Ontario	5.9	6.0	5.9	6.2	6.1	6.2	6.3	6.4	6.6	6.5	6.4	6.5	6.4	6.4	6.6

Note: Across years, low birth weight was missing for 0.0–0.7% of records. Missing data were included in the calculation of the rates.
Sources: Ontario Live Birth Database, 2002–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Distribution of birth weight in grams, by public health unit and province (Standard Report), 2013–2016, Born Information System (BIS), BORN Ontario. Information accessed on November 8, 2017.

Table 4.13

Low-Birth-Weight Rate Among All Infants, Singletons and Full-term Singletons, Peel, 1986, 1996, 2006, 2016

Year	Low-Birth-Weight		
	Rate per 100 Live Births	Rate per 100 Singleton Live Births	Rate per 100 Full-Term Singleton Live Births
1986	5.4	4.4	2.0
1996	6.3	5.2	2.4
2006	7.0	5.2	2.3
2016	8.0	6.4	2.7

Note: Across years, low birth weight was missing for 0.0–0.6% of records. Missing data were included in the calculation of the rates.
Sources: Ontario Live Birth Database, 1986, 1996, 2006, Ontario Registrar General, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on April 27, 2018.

Low Birth Weight and Maternal Geographic Region of Birth

Mothers of certain ethnic origins have been found to be more likely to give birth to low-birth-weight infants.[108] It should be noted that babies born in the low-birth-weight category may not necessarily be at increased risk for illness or poor health outcomes. The definition of low-birth-weight as less than 2,500 grams may be too high for these babies.[109] For example, those of South Asian ethnicities may be naturally smaller, resulting in some infants being defined as low birth weight when in reality, they are at an acceptable weight without the associated risks.[110]

In 2012, two-thirds (64%) of Peel live births were to mothers born outside of Canada compared to 36% in Ontario (Table 4.14). In terms of live births by maternal geographic region of birth, South Asian-born mothers were the largest proportion in Peel (30%). This is higher compared to Ontario (8%). Between 2002 and 2012, the proportion of live births to South Asian-born mothers increased by 8%.

Table 4.14

Live Births by Maternal Geographic Region of Birth, Peel and Ontario, 2002, 2012

Maternal Geographic Region of Birth	Peel		Ontario	
	2002 Per cent	2012 Per cent	2002 Per cent	2012 Per cent
Canada	42.0	34.3	64.8	62.6
South Asia	21.8	29.9	7.5	8.4
East Asia	9.2	9.2	7.8	9.0
Africa	3.5	4.6	3.1	3.2
Caribbean	5.5	4.1	2.6	1.9
Other	18.0	15.9	14.1	13.1
Missing	0.0	2.1	0.0	1.8

Note: Missing data were included in the calculation of the percentages.
Source: Ontario Live Birth Database 2002, 2012, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Historically, in Peel, term female and male infants of South Asian-born mothers have been found to have lower median birth weights compared to term female and male infants of Canadian-born mothers (median difference of -189 grams and -220 grams, respectively). These infants had the largest difference of all infants of immigrant mothers.[108]

In both Peel and Ontario between 2008 and 2012 combined, infants with a Caribbean- or South Asian-born mother had higher low-birth-weight rates compared to infants with Canadian-born mothers (Table 4.15). Caribbean-and South Asian-born mothers comprised 30% of Peel's live births in 2012, which contributes to the increased low-birth-weight rates in Peel compared to Ontario.

Small-for-Gestational Age

Classifying infants as small-for-gestational age (SGA) is a way to measure intrauterine growth restriction. Based on Canadian population data, infant growth charts were created indicating the range of possible weights at each gestational age in weeks. This was done separately for male and female singleton infants between 22 and 43 weeks old.[111]

Definition

Infants are considered ***small-for-gestational age (SGA)*** if they have a birth weight below the sex-specific 10th percentile for gestational age.

Peel mothers had consistently higher rates of SGA than Ontario mothers between 2004 and 2016 (Figure 4.19). SGA rates in Peel have increased over time between 2000 and 2016.

Table 4.15

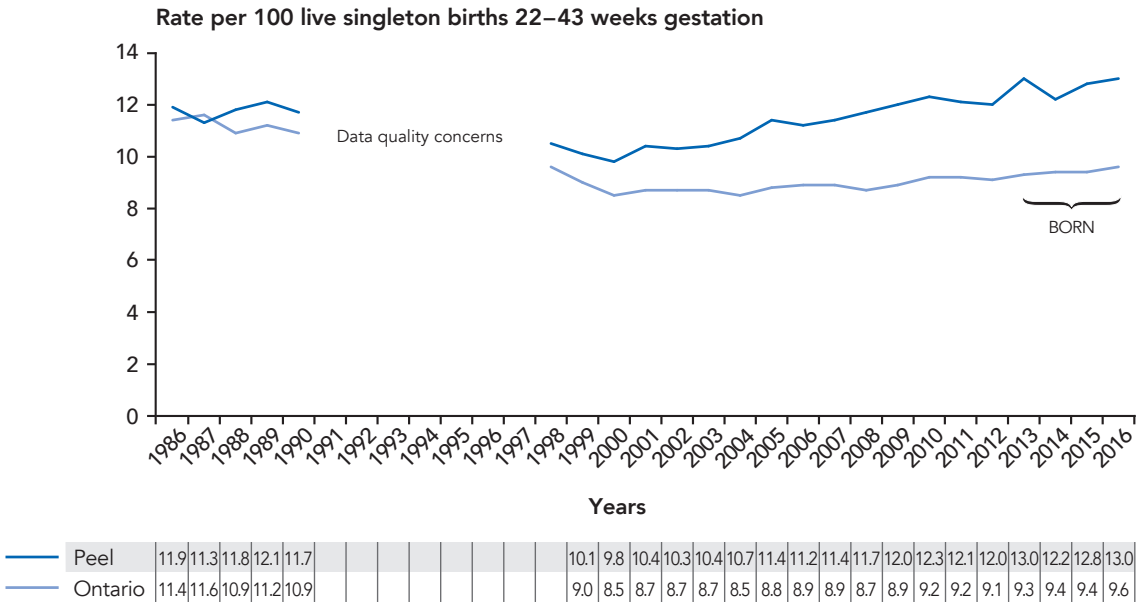
Low-Birth-Weight Rate by Maternal Geographic Region of Birth, Peel and Ontario, 2008–2012 Combined

Maternal Geographic Region of Birth	Peel		Ontario	
	Number	Rate per 100 Live Births	Number	Rate per 100 Live Births
Caribbean	358	9.8	1,480	9.8
South Asia	2,058	8.5	5,194	8.6
East Asia	536	7.6	3,830	6.6
Africa	275	7.5	1,640	7.0
Other	966	7.2	5,757	6.0
Canada	1,864	6.9	26,534	6.0

Note: Low birth weight was missing for 0.01%–0.02% of records. Missing data were included in the calculation of the rates.
Source: Ontario Live Birth Database, 2008–2012, Ontario Registrar General, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 4.19

Small-for-Gestational-Age Rate, Peel and Ontario, 1986–2016



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Peel	11.9	11.3	11.8	12.1	11.7									10.1	9.8	10.4	10.3	10.4	10.7	11.4	11.2	11.4	11.7	12.0	12.3	12.1	12.0	13.0	12.2	12.8	13.0
Ontario	11.4	11.6	10.9	11.2	10.9									9.0	8.5	8.7	8.7	8.7	8.5	8.8	8.9	8.9	8.7	8.9	9.2	9.2	9.1	9.3	9.4	9.4	9.6

Notes: Across years, data were missing for 0.0–0.3% of records. Missing data were included in the calculation of the rates.
Source: Ontario Live Birth Database, 1986-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Custom Data Request, 2013-2016, BORN Information System (BIS), BORN Ontario. Information accessed on March 6th, 2018.

The increase in Peel rates and the difference compared to Ontario may be explained by the difference in demographics between populations. Except for the category "other region of birth", infants born to immigrant mothers from all regions outside of Canada had higher SGA rates compared to infants born to Canadian-born mothers, in both Peel and Ontario between 2008 and 2012 combined (Table 4.16). Futhermore, infants with South Asian-born mothers had the highest SGA rates.

However, some SGA infants with South Asian- or East Asian-born mothers were not SGA when growth charts specific to their own ethnicity were used. These children may naturally weigh less than infants of other ethnicities, without cause for concern.[110]

Table 4.16

Small-for-Gestational-Age Rate by Maternal Geographic Region of Birth, Peel and Ontario, 2008-2012 Combined

Maternal Geographic Region of Birth	Peel		Ontario	
	Number	Rate per 100 Singleton Live Births	Number	Rate per 100 Singleton Live Births
South Asia	3,563	15.3	9,495	16.1
Caribbean	465	13.2	1,872	12.8
East Asia	860	12.5	6,373	11.3
Africa	415	11.7	2,365	10.5
Other	1,327	10.4	8,014	8.7
Canada	2,473	9.5	32,101	7.5

Note: Missing data were not included in the calculation of the rates.
Source: Ontario Live Birth Database, 2008–2012, Ontario Registrar General, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Large-for-Gestational Age

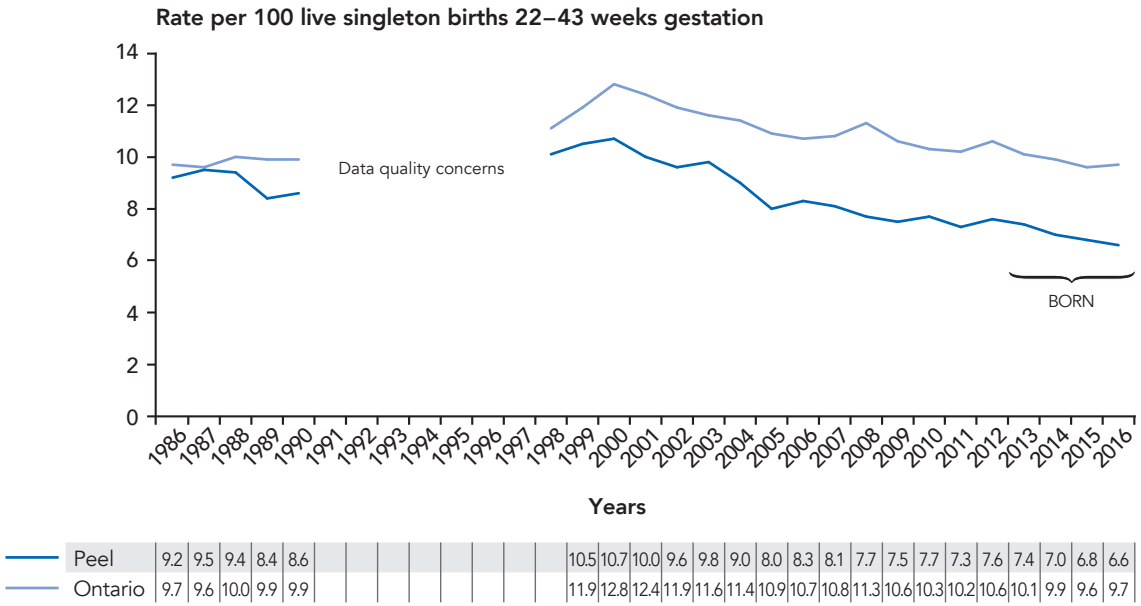
Definition

An infant is ***large-for-gestational age (LGA)*** if they have a birth weight above the sex-specific 90th percentile for their gestational age.

Large-for gestational-age (LGA) rates were consistently lower in Peel compared to Ontario between 2004 and 2016 (Figure 4.20). LGA rates in Peel and Ontario have decreased over time between 2000 and 2016. The reason for this decrease is unknown but may be related to the recent increase in immigrant population and lower birth weights of infants born to immigrant mothers.[112]

Figure 4.20

Large-for-Gestational-Age Rate, Peel and Ontario, 1986–2016



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Peel	9.2	9.5	9.4	8.4	8.6									10.5	10.7	10.0	9.6	9.8	9.0	8.0	8.3	8.1	7.7	7.5	7.7	7.3	7.6	7.4	7.0	6.8	6.6
Ontario	9.7	9.6	10.0	9.9	9.9									11.9	12.8	12.4	11.9	11.6	11.4	10.9	10.7	10.8	11.3	10.6	10.3	10.2	10.6	10.1	9.9	9.6	9.7

Notes: Across years, data were missing for 0.0–0.7% of records. Missing data were included in the calculation of the rates.
Source: Ontario Live Birth Database 1986–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Custom Data Request, BORN Information System (BIS), 2013–2016, BORN Ontario. Information accessed on March 6th, 2018.

Stillbirths

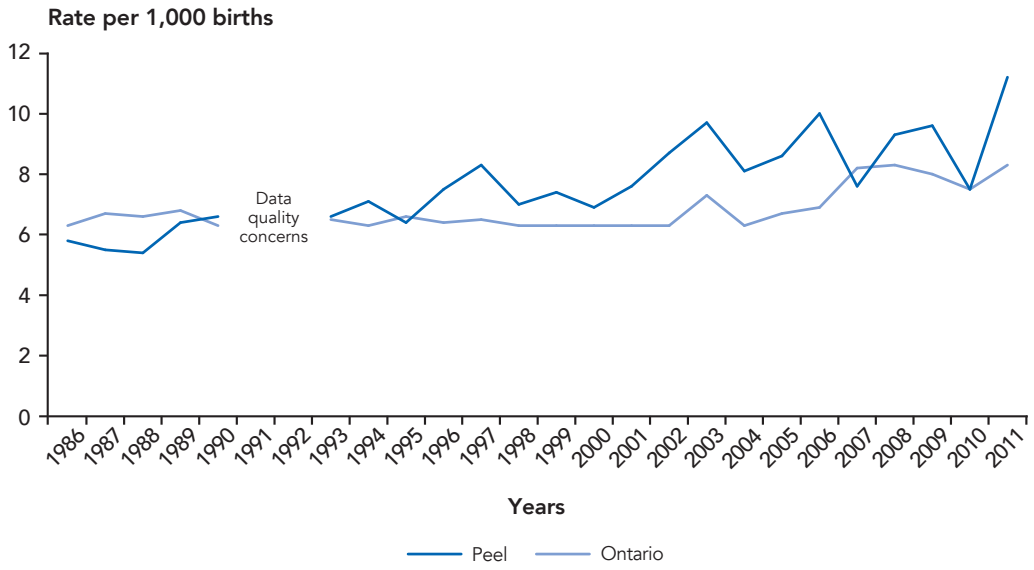
Definition

A ***stillbirth*** is a fetal loss of 20 weeks or more gestation or with a fetal weight of 500 grams or more, which did not breathe or show other signs of life at delivery. Death may occur before or during delivery.

Since 1986, Peel's stillbirth rate has increased, from 5.8 per 1,000 births to 11.2 per 1,000 births in 2011 (Figure 4.21). On January 1, 2010, Service Ontario, on behalf of the Ontario Registrar General, made changes to better facilitate the registration of stillbirths. It is expected that this change contributed to the increased stillbirth rate between 2010 and 2011.

Figure 4.21

Stillbirth Rate, Peel and Ontario, 1986–2011



Source: Ontario Live Birth and Stillbirth Databases, 1986-2011, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Congenital Anomalies

Between 2012 and 2015 combined, the rate of all congenital anomalies is similar in Peel compared to Ontario (498 cases per 10,000 births and 538 cases per 10,000 births, respectively).[T] The most common types of congenital anomalies in Peel are congenital heart defects, urinary system anomalies and musculoskeletal anomalies (Table 4.17).[T]

Table 4.17

Top 10 Congenital Anomalies by Type of Anomaly, Peel, 2012–2015 Combined

Type of Congenital Anomaly	Number	Rate per 10,000 Births
Congenital heart defects	643	105.2
Urinary system anomalies	486	79.5
Musculoskeletal anomalies	442	72.3
Genital organ anomalies	207	33.9
Circulatory system anomalies	161	26.3
Digestive system anomalies	140	22.9
Central nervous system anomalies	135	22.1
Down syndrome	93	15.2
Cleft lip and/or palate	71	11.6
Ear face and neck anomalies	47	7.7
Total anomalies	**3,041**	**497.7**

Note: Total anomalies does not sum to the rows presented in the table, as only the top 10 anomaly categories are presented.
Source: Canadian Congenital Anomalies Surveillance System (CCASS), 2012-2015, Public Health Agency of Canada.

Maternal Death

Definition

Maternal death is defined as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes."[113]

Between 1986 and 2012, there were a total of 25 maternal deaths in Peel, resulting in a maternal mortality rate of 6.7 maternal deaths per 100,000 live births. Peel's rate was the same as Ontario's (6.5 maternal deaths per 100,000 live births).[O,P,I2]

Infant Deaths

Definition

Neonatal death rate is the number of deaths among live-born infants 27 days of age or younger per 1,000 live births.

Postneonatal death rate is the number of deaths among live-born infants between 28 days of age and less than one year of age per 1,000 live births.

Infant death rate is the number of deaths of live-born infants up to 364 days of age per 1,000 live births.

Over the past 25 years, the infant death rate has declined in both Peel and Ontario.[O,P] In 2012, the neonatal and infant death rates were higher in Peel compared to Ontario, and the postneonatal death rate in Peel was similar to Ontario (Table 4.18).

In both Peel and Ontario for the years 2008 to 2012 combined, the top three underlying causes of infant death were: birth trauma and obstetric causes; disorders related to length of gestation and fetal growth: and congenital malformations of the circulatory system.[O,P]

Early Childhood Screening

Early detection of various diseases and chronic conditions through early screening can lead to earlier treatment, improved health and quality of life, and in some cases, can save lives.

Hearing Screening

Measurement

The newborn hearing screen test is performed in hospital using either the Auditory Brainstem Response (ABR) or Distortion Product Otoacoustic Emission (DPOAE) method.[114]

Undetected hearing loss can delay an infant's language development. This can lead to early behavioural and emotional problems that can cause difficulty for the child at school. The Ontario Infant Hearing Program (IHP), offered by the Ministry of Children and Youth Services, screens babies for hearing loss soon after birth.[115]

In 2016, 72% of Peel infants passed the newborn hearing screen test, while 7% of newborns were sent for referral (Table 4.19). The test was not completed for 16% of Peel infants.

Table 4.18

Neonatal, Postneonatal and Infant Death Rate, Peel and Ontario, 2012

Period of Death	Peel		Ontario	
	Number	Rate per 1,000 Live Births	Number	Rate per 1,000 Live Births
Neonatal (≤27 days old)	76	4.8	523	3.7
Postneonatal (28 days to <1 year old)	17	1.1	156	1.1
Infant (<1 year old)	93	5.9	679	4.8

Sources: Ontario Live Birth and Mortality Databases, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

18-month Enhanced Well-baby Visit

The 18-month Enhanced Well-baby Visit (EWBV) is a provincially funded, in-depth visit with a primary care provider to identify concerns or developmental issues at an important early milestone. The visit can lead to early identification of any concerns and if necessary a referral to specialized community services.[116]

In 2015, there were at least 8,851 EWBV provided in Peel. Twenty-seven per cent of eligible Peel infants received this service, which was similar to Ontario (29%).[L] These data are compiled from OHIP billing records and may underestimate the number of children undergoing the assessment because of inconsistencies in billing practices.

Table 4.19

Live Births by Newborn Hearing Screen Result, Peel, 2016

Newborn Hearing Screen Result	Number	Per cent
Pass	11,278	71.7
Not done	2,542	16.2
Referral	1,109	7.0
Inconclusive/no result	13	0.1
Missing data	793	5.0
Total	**15,735**	**100.0**

Note: Missing data were included in the calculation of the percentages.
Source: Public Health Unit Analytic Reporting Tool (Cube), 2016, BORN Information System (BIS), BORN Ontario. Information accessed on November 13, 2017.

Chapter 5

Health and Behaviours

Key Messages

- The proportion of the population who are overweight or obese has increased over the past 10 years and across all age groups. Older men (age 45 years and older) are more likely to be overweight than females of the same age.
- Over the past decade, there has been no improvement in levels of physical activity and the consumption of vegetables and fruits. Additionally, the amount of time spent using screens has increased.
- A higher proportion of females consume vegetables and fruit five or more times per day compared to males.
- There have been large reductions in smoking rates and exposure to second-hand smoke in the past decade.
- Overall, Peel has a low proportion of alcohol use; however, those in the highest income category drink more alcohol compared to other income categories.
- While drug use in Peel is low, opioids are becoming a growing concern with increased deaths due to opioid overdose.

The association between health behaviours and health outcomes is complex. Population health outcomes, such as rates of chronic disease, mental health and injury, the trajectory of early childhood development, and infectious diseases, are affected by health behaviours and the determinants of health.

Among adults, replacing sedentary behaviour with physical movement, including light intensity physical activity, results in improved cardiovascular disease risk, reduced mortality, and better general health.[117] Consuming a healthy diet and getting adequate quality sleep may help to improve cardiovascular health and reduce the risk of developing chronic diseases, such as diabetes, obesity and cancer.[118]

In Ontario, the combined rates of smoking, alcohol use, physical inactivity, diet and stress represent a loss of 7.5 years of life expectancy and 9.8 years of health-adjusted life expectancy.[119]

This chapter will present data on body weight, indicators of movement (e.g., physical activity, sedentary behaviour and sleep), nutrition, tobacco use, alcohol consumption, drug use and road safety.

BODY WEIGHT

The association between body weight, health and mortality is complex and not linear. It is typically described as U-shaped, whereby there are greater health risks and mortality at low and high Body Mass Indexes (BMIs).[120] For example, a classification of overweight and obesity is associated with developing chronic diseases including type 2 diabetes, cardiovascular disease and some cancers.[121,122] In addition, as weight increases into obesity class II and III, the risk of health problems and mortality increase significantly.

Measurement of Body Weight

There are several ways to measure body weight. Two of the most common measures are waist circumference and height and weight measurement to calculate BMI. Other measures for body weight include skin-fold thickness, bioelectrical impedance, densitometry (underwater weighing) and dual energy x-ray absorptiometry (DXA). For children and youth, growth charts such as BMI-for-age, height-for-age and weight-for-age are available for growth reference.

Measurement

Waist circumference, that is the measurement of fat around the waistline, is used as an indicator of overweight or obesity classifications. An increase in waist circumference is associated with increased health risks, such as heart disease.[123] The Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada provides a guideline for waist circumference targets based on sex and ethnicity.

Although not shown, waist circumference reference charts have been generated for male and female children aged two to 19 years based on North American data, with percentile-based cut-offs.[124]

Adult Abdominal Obesity as Defined by Waist Circumference Measurements by Sex

Country or Ethnic Group	Waist Circumference	
	Male	Female
Eastern Mediterranean and Middle Eastern (Arab), European, Sub-Saharan African	≥94 cm (37.6 inches)	≥80 cm (32 inches)
Chinese, Japanese, South Asian, South and Central American	≥90 cm (36 inches)	≥80 cm (32 inches)

Adapted from: Waist Circumference [Internet]. Diabetes Canada; 2018 [cited August 21, 2018]. Available from: *https://www.diabetes.ca/diabetes-and-you/healthy-living-resources/weight-management/waist-circumference*.

Body Mass Index (BMI) is calculated by taking weight in kilograms and dividing it by the square of height in meters (i.e., the formula is BMI=kg/m^2).[125] It is the usual method used to measure body weight in adults. Although BMI does not measure body fat directly, it can be an indicator of excessive body fat.

The classification of BMI is primarily derived from Caucasian populations. As a result, the health risk at a given BMI may be different for other ethnic groups due to differing body proportions (i.e., percentage of body fat, body fat distribution). For example, the increased level of health risk associated with type 2 diabetes and cardiovascular disease appears to be higher for those of South Asian descent in the overweight and obese classifications.[126] Special consideration for various ethnic groups is relevant to Peel given its ethno-cultural diversity.

Body weight data presented in this section will include data for waist circumference, as well as BMI. Associations between overweight and obesity classifications and various social (e.g., household income level, immigrant status) and behavioural (e.g., physical activity levels) determinants are also examined.

Waist Circumference

In Canada, the mean waist circumference for men and women aged 20 years and older approaches or exceeds the recommended targets (Table 5.1).[127] Data are not available for Peel or Ontario.

Table 5.1
Waist Circumference by Age Group and Sex, Canada, 2015

Measure	Age Group (years)	Male	Female
		Mean Centimetres (95% CI)	Mean Centimetres (95% CI)
Waist circumference (cm)	20–39	95.2 (92.8–97.7)	88.9 (84.4–93.3)
	40–59	100.6 (98.3–102.9)	94.1 (91.8–96.3)
	60–79	103.2 (101.3–105.1)	94.9 (92.7–97.1)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Table 13-10-0319-01 Anthropometry measures of the household population, Canada, Canadian Health Measures Survey [Internet]. Ottawa, Ontario: Statistics Canada [updated August 21, 2018; cited August 21, 2018]. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310031901.

Body Mass Index

Data about BMI are available as either measured BMI or self-reported BMI. Measured BMI data are available for Canada and Ontario whereas self-reported data are available for Peel.

Measurement

Using a statistical model, self-reported BMI can be adjusted for common biases in self-reporting. When self-reporting weight and height, people tend to underestimate their weight and overestimate their height, which results in a lower BMI value.[128] Using a model brings self-reported BMI estimates closer to those derived from measured data.

Measured BMI data are also available for Ontario children. In 2015, 30%* (*use estimate with caution) of Ontario children aged two to five years old were classified as "at risk of overweight, overweight, obese".[129] The per cent of male and female children aged five to 11 years with measured BMI classifications of overweight or obese is shown in Table 5.3.

Childhood Body Mass Index

Although BMI in children and adolescence is calculated the same way as in adults (kg/m^2), the standards used to define overweight and obese classifications are different because children are still growing and the amount of body fat changes as they grow.[130] For children and adolescents, BMI references are age- and sex-specific and expressed as a percentile. In children, both a high and low BMI can be a risk factor for health issues.[130,131]

The per cent of measured obesity is shown in Table 5.2 for Canadian children and youth aged five to 18 years. Overall, between 2011 and 2015, there has been no change in the percentage of obesity for male or female children or youth (Table 5.2).

Table 5.2

Child and Youth Obesity by Age Group and Sex, Canada, 2011, 2013, 2015

Age Group (years)	2011		2013		2015	
	Male Per cent (95% CI)	Female Per cent (95% CI)	Male Per cent (95% CI)	Female Per cent (95% CI)	Male Per cent (95% CI)	Female Per cent (95% CI)
5–11	19.6 (15.6–24.3)	6.3* (4.1–9.7)	8.4* (4.8–14.1)	9.4 (6.7–13.0)	14.3 (10.5–19.0)	10.8* (7.4–15.5)
12–18	11.5* (7.7–16.8)	10.5* (6.9–15.6)	21.3* (13.6–31.7)	10.4 (7.5–14.2)	13.2* (8.9–19.1)	13.5* (9.0–19.7)
Total	**15.2 (12.7–18.1)**	**8.6 (6.4–11.5)**	**15.2 (11.0–20.6)**	**9.9 (7.5–12.9)**	**13.7 (10.7–17.4)**	**12.2 (8.5–17.2)**

* Use estimate with caution.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Table 13-10-0322-01 Children's body mass index - World Health Organization classification system, Canada, Canadian Health Measures Survey [Internet]. Ottawa, Ontario: Statistics Canada [updated September 12, 2018; cited September 12, 2018;]. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310032201.

Table 5.3

Measured Child and Youth Body Mass Index for Children Aged 5–11 by Sex, Ontario, 2015

Body Mass Index	Male		Female	
	Per cent (95% CI)	Number	Per cent (95% CI)	Number
Neither overweight nor obese	66.3 (55.4–75.7)	292,300	81.2 (72.2–87.7)	427,300
Overweight	20.3* (12.7–30.9)	89,500*	12.8* (7.7–20.7)	67,500*
Obese	13.4* (7.9–21.9)	59,200*	NR	NR
Total	**–**	**441,000**	**–**	**526,500**

* Use estimate with caution.
NR – Not releasable due to small numbers.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Table 13-10-0795-01 Measured children and youth body mass index (BMI) (World Health Organization classification), by age group and sex, Canada and provinces, Canadian Community Health Survey – Nutrition [Internet]. Ottawa, Ontario: Statistics Canada [updated August 21, 2018; cited August 21, 2018]. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310079501.

Data for Peel youth in grades 7 to 12 are from self-reported height and weight. The proportion of students in the overweight or obese categories has not changed between 2013 and 2017 (Figure 5.1).

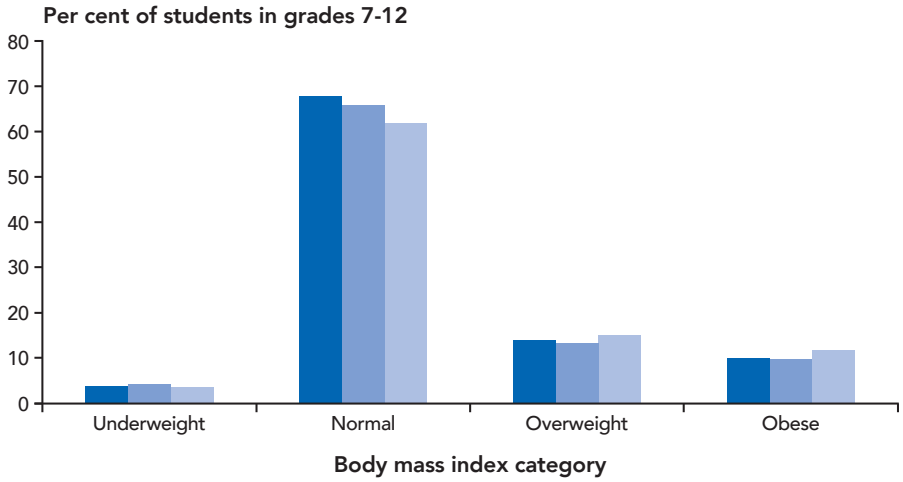
In Peel, among students in grades 7 to 12, 27% overweight or obese (Figure 5.2).

Measurement

The Ontario Student Drug Use and Health Survey (OSDUHS) self-reported height and weight data are applied to the World Health Organization Growth Reference 2007 Charts for Children and Youth (age 5 to 19 years) cut-points to generate BMI-for-age percentiles.

Figure 5.1

Per cent of Students by Body Mass Index Category†, Peel, 2013, 2015, 2017

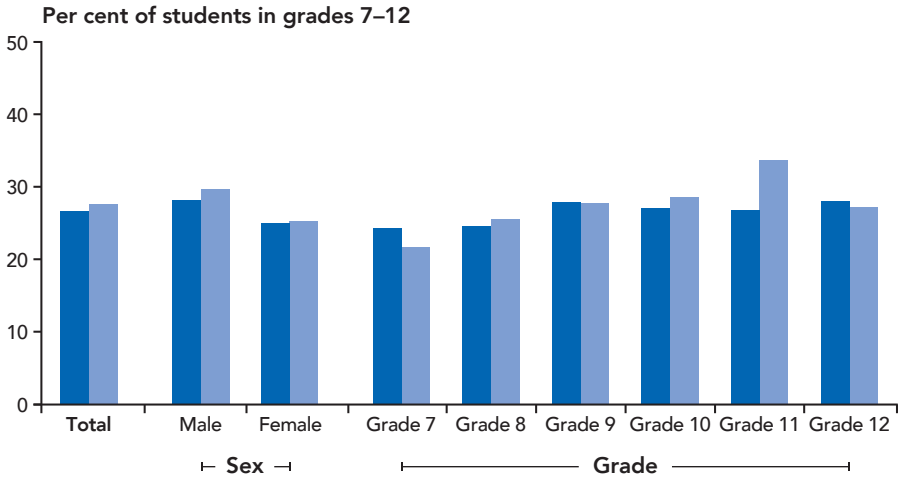


	Underweight	Normal	Overweight	Obese
2013 Per cent (95% CI)	3.8 (2.9 – 5.0)	67.7 (65.6 – 69.8)	13.8 (12.1 – 15.7)	10.0 (8.8 – 11.3)
2015 Per cent (95% CI)	4.2* (2.7 – 6.4)	65.9 (62.2 – 69.4)	13.3 (11.6 – 15.2)	9.7 (7.5 – 12.5)
2017 Per cent (95% CI)	3.4* (2.2 – 5.1)	61.8 (57.6 – 65.8)	14.9 (12.7 – 17.4)	11.7 (9.9 – 13.8)

† BMI determined using the World Health Organization Growth Reference Chart.
* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Survey participants who did not respond to the question (4.6% to 8.3%) were included in the calculation of percentages in this graph.
Source: Ontario Student Drug Use and Health Survey, 2013, 2015, 2017, Centre for Addiction and Mental Health. Region of Peel - Public Health.

Figure 5.2

Per cent of Students Who are Overweight or Obese† by Sex and Grade, Peel and Ontario, 2017



	Total	Male	Female	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Peel	26.6	28.1	25.0	24.3	24.5	27.9	27.1	26.8	28.0
Per cent (95% CI)	(23.8 – 29.5)	(23.9 – 32.7)	(22.2 – 28.0)	(17.8 – 32.3)	(19.3 – 30.7)	(22.2 – 34.5)	(21.6 – 33.5)	(19.2 – 36.0)	(22.8 – 33.8)
Ontario	27.6	29.7	25.3	21.6	25.5	27.7	28.6	33.6	27.2
Per cent (95% CI)	(25.6 – 29.7)	(27.1 – 32.4)	(22.0 – 29.0)	(16.3 – 28.0)	(22.9 – 28.3)	(23.8 – 32.0)	(24.8 – 32.7)	(28.8 – 38.7)	(23.4 – 31.3)

† BMI determined using the World Health Organization Growth Reference Chart.
* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Survey participants who did not respond to the question (8.3% and 7.6% for Peel and Ontario, respectively) were included in the calculation of percentages in this graph.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel - Public Health.

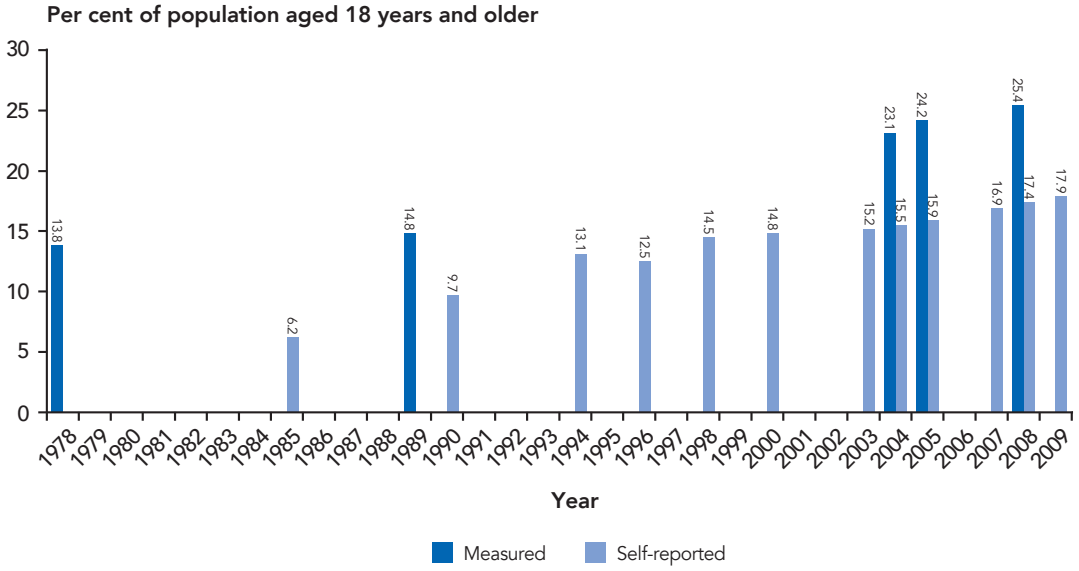
Adult Body Mass Index

The prevalence of both measured and self-reported obesity has increased among Canadian adults over time (Figure 5.3).[132]

Measured BMI shows a near doubling of the proportion of Canadian adults who are obese between 1978 and 2008, and self-reported BMI for obesity has nearly tripled between 1985 and 2009.[132] These increases in prevalence are of concern given the increased health risk associated with obesity during adulthood.[122]

Figure 5.3

Measured and Self-Reported Obesity, Canada Excluding Territories, 1978–2009



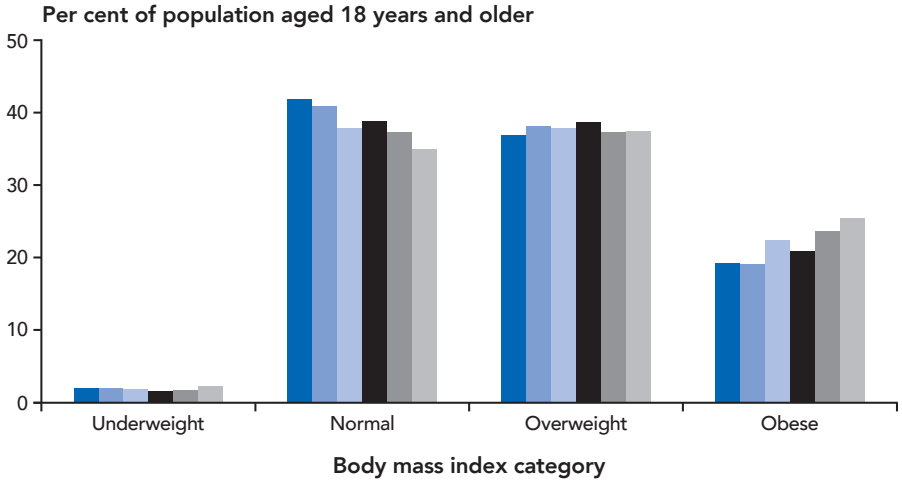
Adapted from: Canadian Institute for Health Information and the Public Health Agency of Canada. Obesity in Canada: A joint report from the Public Health Agency of Canada and the Canadian Institute for Health Information [Internet]. Ottawa, Ontario: [2011; cited September 14, 2018]. ISBN: 978-1-100-18133-2. Available from: https://www.canada.ca/content/dam/phac-aspc/migration/phac-aspc/hp-ps/hl-mvs/oic-oac/assets/pdf/oic-oac-eng.pdf.
Original sources: Canada Health Survey, 1978/1979. Canadian Heart Health Survey (ages 18-74), 1989.
Health Promotion Survey, 1985, 1990. National Population Health Survey, 1994/1995, 1996/1997, 1998/1999.
Canadian Community Health Survey, 2000/2001, 2003, 2004, 2005, 2007, 2008, 2009. Statistics Canada and CANSIM Table 105-0501.

In Peel, the proportion of normal weight adults decreased significantly between 2003 and 2013/2014, while the percentage of those who are obese has increased significantly over the same time period (Figure 5.4). The per cent of Peel adults who are overweight has remained stable between 2003 and 2013/2014. These trends are similar for Ontario (data not shown).[H2-H7]

Overall, male Peel residents (44%) are more likely to be overweight than female residents (31%). This is similar to Ontario (43% and 32%, respectively).[H2] The gap between overweight men and women widens from age 45 onwards, where men have significantly higher rates (Figure 5.5).

Figure 5.4

Per cent of Population by Adjusted† Body Mass Index Category, Peel, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014

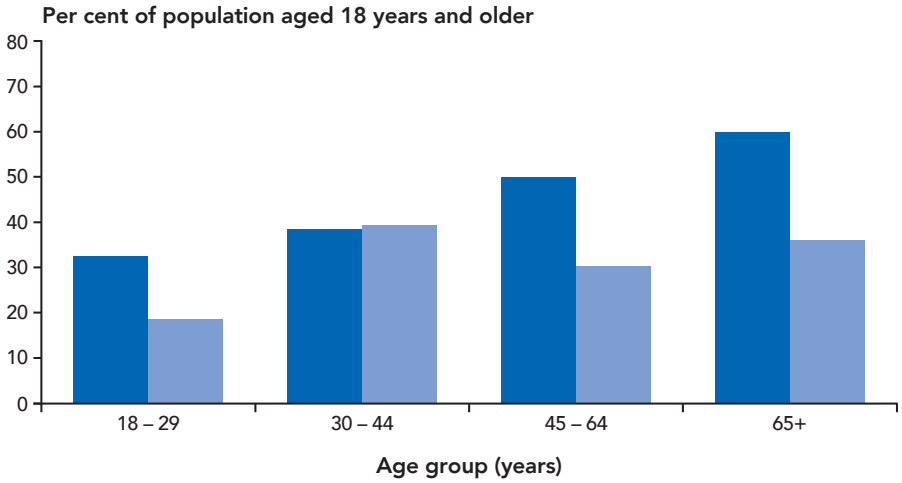


	Underweight	Normal	Overweight	Obese
2003 Per cent (95% CI)	2.0* (1.4 – 2.9)	41.9 (38.8 – 45.1)	36.9 (34.2 – 39.7)	19.2 (16.9 – 21.6)
2005 Per cent (95% CI)	1.9* (1.1 – 3.1)	40.9 (38.0 – 43.9)	38.1 (35.4 – 40.9)	19.1 (16.7 – 21.7)
2007/2008 Per cent (95% CI)	1.8* (1.1 – 3.0)	37.8 (35.0 – 40.7)	37.9 (35.4 – 40.5)	22.4 (19.9 – 25.2)
2009/2010 Per cent (95% CI)	1.6* (1.0 – 2.6)	38.8 (35.5 – 42.2)	38.7 (35.3 – 42.2)	20.9 (18.3 – 23.9)
2011/2012 Per cent (95% CI)	1.7* (1.0 – 3.0)	37.3 (34.0 – 40.7)	37.3 (33.7 – 41.0)	23.7 (21.1 – 26.6)
2013/2014 Per cent (95% CI)	2.2* (1.3 – 3.6)	35.0 (31.8 – 38.3)	37.5 (34.4 – 40.7)	25.4 (22.6 – 28.3)

† Adjusted estimates of body mass index in this graph were generated using a model that adjusts for bias in self-report data.
* Use estimate with caution.
Notes: Excludes individuals who are less than 0.914 m tall or greater than 2.108 m tall, as well as females who are pregnant or currently breastfeeding.
95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 5.5

Per cent of Population Who are Overweight† by Age Group and Sex, Peel, 2013/2014



	18 – 29	30 – 44	45 – 64	65+
Male Per cent (95% CI)	32.5 (23.2 – 43.4)	38.5 (29.1 – 48.8)	49.9 (40.1 – 59.7)	59.8 (46.6 – 71.8)
Female Per cent (95% CI)	18.5* (12.6 – 26.4)	39.2 (30.7 – 48.4)	30.2 (23.7 – 37.5)	35.9 (28.4 – 44.0)

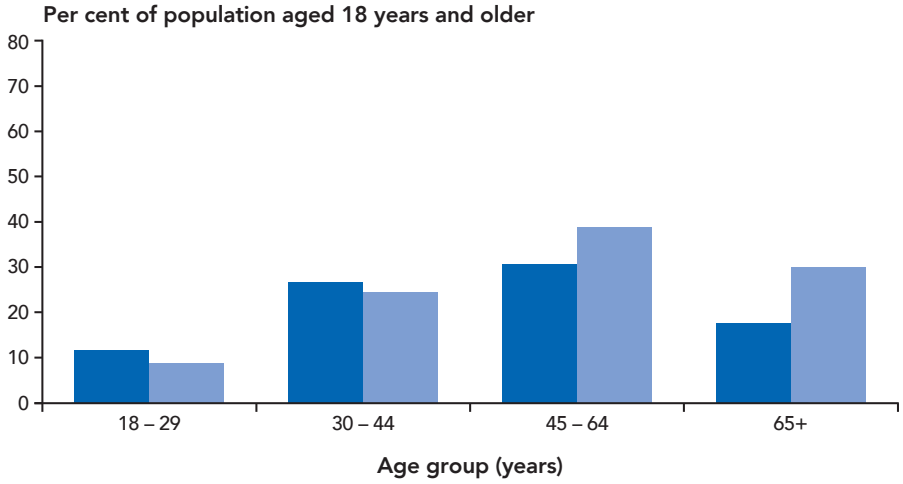
† Adjusted estimates of body mass index in this graph were generated using a model that adjusts for bias in self-report data.
* Use estimate with caution.
Notes: Excludes individuals who are less than 0.914 m tall or greater than 2.108 m tall, as well as females who are pregnant or currently breastfeeding.
95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Looking at the obese BMI classifications, a similar proportion of adult males in Peel are obese (24%) compared to females (27%). Ontario's obesity rates for males and females are 28% and 24%, respectively.[H2] Analyzing obesity rates by age, a significantly higher proportion of older men in Peel aged 45 to 64 years (31%) are obese than younger males aged 18 to 29 years (12%* - use estimate with caution). Females in Peel follow a similar trend (Figure 5.6).

There are many factors associated with overweight and obese BMI classifications, some of which are related to one another. To accurately assess these factors, each one has been examined independently through binomial logistic regression modelling, which incorporates multiple variables into the analysis. The results of such an analysis are presented in Table 5.4, which uses the odds ratios to measure the risk of each factor on the likelihood of being overweight or obese.

Figure 5.6

Per cent of Population Who are Obese† by Age Group and Sex, Peel, 2013/2014



	18 – 29	30 – 44	45 – 64	65+
Male Per cent (95% CI)	11.5* (6.6 – 19.5)	26.7 (19.0 – 36.2)	30.6 (22.0 – 40.9)	17.6* (11.7 – 25.6)
Female Per cent (95% CI)	8.8* (5.1 – 14.8)	24.3 (17.5 – 32.7)	38.8 (30.3 – 48.1)	30.1 (23.0 – 38.3)

† Adjusted estimates of body mass index in this graph were generated using a model that adjusts for bias in self-report data.
* Use estimate with caution.
Notes: Excludes individuals who are less than 0.914 m tall or greater than 2.108 m tall, as well as females who are pregnant or currently breastfeeding.
95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Measurement

An ***odds ratio (OR)*** estimates the likelihood of an event occurring in one population in relation to the likelihood of it occurring in another population.

- If the OR equals 1, the odds of an event occurring in one population is equal to the odds of an event occurring in another population.
- If the OR is greater than 1, the odds of an event occurring in one population is greater than the odds of an event occurring in another population. For example, if the OR equals two, the odds of the event occurring is twice as high in one population compared to the other population.
- If the OR is less than 1, the odds of an event occurring in one population is less than the odds of an event occurring in another population. For example, if the OR is 0.50, the odds of the event occurring in one population is 50% lower compared to the other population.

After controlling for all other factors in the model, being overweight or obese is independently associated with:

- Age: Females are more likely to be overweight or obese as age increases.
- Ethnicity: Females who are "Black" or "Other" ethnicity are more likely to be overweight or obese compared to those who are "White."
- Fair/poor self-perceived general health: Females who have fair or poor health are more likely to be overweight or obese than females who have excellent/very good/good general health.
- Physical activity level: Females who are moderately active or inactive are more likely to be overweight or obese compared to those who are active.

Table 5.4

Association Between Overweight or Obese Adjusted Body Mass Index and Social or Behavioural Determinants by Sex†, Peel, 2007/2008, 2009/2010, 2011/2012, 2013/2014 Combined

Variable	Male Adjusted Odds Ratio (95% CI) N=3,061	Female Adjusted Odds Ratio (95% CI) N=3,342
Age (years)	1.02 (1.00–1.03)*	**1.03 (1.02–1.04)***
Household income level		
Low-middle	1.39 (0.65–2.97)	0.85 (0.43–1.67)
Middle	0.83 (0.58–1.17)	0.92 (0.66–1.27)
Upper-middle	1.0	1.0
Highest	1.20 (0.90–1.60)	0.93 (0.71–1.23)
Education level		
Less than high school	1.15 (0.76–1.75)	1.21 (0.75–1.96)
High school	1.04 (0.76–1.43)	1.30 (0.95–1.78)
Some post-secondary	0.95 (0.60–1.50)	0.83 (0.50–1.38)
Post-secondary	1.0	1.0
Ethnicity		
White	1.0	1.0
Black	0.82 (0.53–1.28)	**1.63 (1.05–2.53)***
East/Southeast Asian	**0.41 (0.28–0.61)***	**0.35 (0.22–0.55)***
South Asian	**0.65 (0.44–0.96)***	0.80 (0.54–1.18)
Other	0.95 (0.55–1.64)	**1.63 (1.05–2.52)***
Immigrant status		
Recent immigrant	0.98 (0.66–1.47)	0.78 (0.53–1.14)
Long-term immigrant	0.91 (0.63–1.31)	0.92 (0.69–1.23)
Non-immigrant	1.0	1.0
Marital status		
Now married/common-law	1.0	1.0
Divorced/separated/widowed	0.74 (0.41–1.34)	0.77 (0.55–1.06)
Single, never married	**0.48 (0.33–0.70)***	**0.53 (0.39–0.71)***
Employment status in past week		
Employed	1.0	1.0
Unemployed/permanently unable to work	0.94 (0.70–1.26)	**0.76 (0.60–0.97)***
Sense of community belonging		
Very strong/somewhat strong	1.0	1.0
Somewhat weak/very weak	0.87 (0.67–1.12)	1.05 (0.84–1.32)
Self-perceived life stress		
Quite a bit/extremely	1.11 (0.82–1.51)	0.89 (0.70–1.13)
Not at all/not very/a bit	1.0	1.0

Table 5.4 continues...

Table 5.4 continued

Variable	Male Adjusted Odds Ratio (95% CI) N=3,061	Female Adjusted Odds Ratio (95% CI) N=3,342
Self-perceived mental health		
Excellent/very good/good	1.0	1.0
Fair/poor	**0.52 (0.29–0.94)***	1.04 (0.61–1.79)
Self-perceived general health		
Excellent/very good/good	1.0	1.0
Fair/poor	1.52 (0.92–2.51)	**1.58 (1.05–2.37)***
Physical activity level		
Active	1.0	1.0
Moderately active	1.07 (0.71–1.63)	**1.64 (1.19–2.26)***
Inactive	0.91 (0.64–1.28)	**1.80 (1.37–2.38)***
Weekly alcohol consumption		
Yes	1.09 (0.85–1.40)	0.76 (0.58–1.01)
No	1.0	1.0
Vegetable and fruit consumption		
Five or more times a day	1.0	1.0
Less than five times a day	1.00 (0.77–1.28)	0.96 (0.77–1.21)
Rural versus urban residence		
Rural	1.41 (0.66–3.05)	0.66 (0.37–1.15)
Urban	1.0	1.0

† Reflects respondents aged 18–75 years and excludes individuals who are less than 0.914 m tall or greater than 2.108 m tall, as well as females who are pregnant or currently breastfeeding.
* Indicates statistically significant findings ($p<0.05$).
Note: 95% CI reflects the 95% confidence interval of the estimated odds ratio.
Source: Canadian Community Health Survey Share File, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

MOVEMENT

Movement is a broad concept that includes physical activity, sedentary behaviour and sleep. These three components of movement are independent modifiable risk factors for chronic diseases and some injuries, and are important to overall physical and mental health. Movement also has a significant influence on early childhood development.

For healthy growth and development, infants, toddlers, and preschoolers should achieve the recommended balance of high levels of physical activity, low levels of high-quality sedentary behaviour (e.g., reading), and sufficient sleep each day.[133]

The Canadian Society for Exercise Physiology (CESP) has a set of four guidelines that provide movement recommendations to Canadians at various ages and stages of life.[134-136]

Data presented in this section will describe physical activity, sedentary behaviour and sleep. Environmental factors that influence movement, in particular, health-promoting elements of the built environment and rates of active transportation are included in ***Chapter 1 – Peel's People and their Physical Environmental***.

Physical Activity

Physical activity plays an important role in the prevention of chronic diseases such as cardiovascular disease, type 2 diabetes, osteoporosis and injuries such as falls.[137] It is also associated with positive mental health and well-being across the lifespan.[137]

Definition

Physical activity is defined as "any bodily movement produced by skeletal muscles that result in energy expenditure, and increases heart rate and breathing."[138]

Measurement

Physical fitness is assessed by measuring musculoskeletal fitness and energy expenditure. Musculoskeletal fitness is a combination of muscle strength, muscle endurance and muscle power. It is measured by assessing:

- aerobic fitness (i.e., the amount of oxygen in the blood pumped by the heart and transported to the working muscles);
- grip strength (i.e., the force applied by the hand to pull on or suspend from objects); and
- sit and reach abilities (i.e., the flexibility of the back of the legs, hips, and lower back).[139]

Physical activity data are collected through:

- self-reported questionnaires
- self-reported activity diaries/logs
- direct observation
- devices (e.g., accelerometers, pedometers, heart-rate monitors, armbands)[139]

Direct measures of physical fitness are available for the Canadian population from the Canadian Health Measures Survey, which assesses the musculoskeletal fitness of participants using devices and direct observation.[140] In 2011, Canadians were categorized in Table 5.5 as having "good", "very good" or "excellent":

- aerobic fitness (53%);
- sit and reach (42%);
- grip strength (47%); and
- general musculoskeletal fitness (54%).

Data about musculoskeletal fitness classifications are not available for Peel.

Table 5.5

Proportion of Population by Musculoskeletal Fitness Classification†, Canada, 2011

Measure	Classification‡	Per cent (95% CI)
Aerobic fitness	Needs improvement	19.5 (14.9–25.0)
	Fair	27.8 (25.8–29.9)
	Good	31.6 (27.0–36.6)
	Very good	15.6 (13.3–18.3)
	Excellent	5.5* (3.8–7.9)
Sit and reach	Needs improvement	36.5 (32.9–40.2)
	Fair	21.1 (18.9–23.5)
	Good	15.0 (12.2–18.4)
	Very good	14.9 (12.6–17.6)
	Excellent	12.5 (10.6–14.5)
Grip strength	Needs improvement	30.0 (25.3–35.3)
	Fair	23.2 (20.6–25.9)
	Good	18.8 (16.7–21.1)
	Very good	16.7 (13.5–20.5)
	Excellent	11.3 (8.1–15.4)
Musculoskeletal fitness	Needs improvement	15.5 (12.5–19.0)
	Fair	29.5 (26.6–32.6)
	Good	33.2 (30.0–36.5)
	Very good	17.1 (14.4–20.1)
	Excellent	3.5 (2.5–5.0)

† Reflects total household population aged 15–69 years of age.
‡ Categories based on Canadian Society for Exercise Physiology, 2004, The Canadian Physical Activity, Fitness and Lifestyle Approach (CPAFLA), 3rd edition, Ottawa.
* Use estimate with caution.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Table 13-10-0325-01 Distribution of the household population by musculoskeletal fitness classification, Canada, Canadian Health Measures Survey [Internet]. Ottawa, Ontario: Statistics Canada [updated July 24, 2018; cited July 24, 2018]. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310032501.

Physical Activity Level

Appropriate levels of physical activity are required to maintain overall physical and mental health at any age. The recommended levels for all age groups are described in Table 5.6.

Children who report more time outdoors are more physically active and less sedentary, and display enhanced psychosocial health, compared with children who spend less time outdoors.[141]

In 2015, only 7% of Canadian children and youth (six to 17 years) and only 18% of Canadian adults (18 to 79 years) were meeting the recommended physical activity guidelines.[142] The average time Canadians spend engaging in physical activity, as measured by accelerometers, is shown in Table 5.7.

Table 5.6

Physical Activity Recommendations by Age Group

Age Group (years)	Physical Activity Recommendation
<1	• A minimum of 30 minutes of tummy time each day (spread throughout the day). • A range of physical activities (e.g., interactive floor-based play), through the day, for more active and mobile children.
1 – 2	• A minimum of 180 minutes, throughout each day, participating in a variety of physical activities of any intensity, including energetic play.
3 – 4	• A minimum of 180 minutes, participating in a variety of physical activities, with at least 60 minutes of energetic play.
5 – 17	• A minimum of 60 minutes per day of moderate-to-vigorous physical activity and several hours of light physical activities (e.g., planned or free-time/self-selected free play).
18 – 64	• A minimum of 150 minutes per week of moderate-to-vigorous physical activity (10 minutes or more at a time).
65+	• A minimum of 150 minutes per week of moderate-to-vigorous physical activity (10 minutes or more at a time).

Sources: Canadian 24-Hour Movement Guidelines for the Early Years (0–4 years): An Integration of Physical Activity, Sedentary Behaviour and Sleep [Internet]. CSEP [cited August 22, 2018]. Available from: http://csepguidelines.ca/early-years-0-4/.
Canadian 24-hour Movement Guidelines for Children and Youth (ages 5–17 years): An Integration of Physical Activity, Sedentary Behaviour and Sleep [Internet]. CSEP [cited August 22, 2018]. Available from: http://csepguidelines.ca/children-and-youth-5-17/.
Canadian Physical Activity Guidelines for Adults (18–64 years) [Internet]. CSEP [cited August 22, 2018]. Available from: http://csepguidelines.ca/adults-18-64/.
Canadian Physical Activity Guidelines for Older Adults (65 years and older) [Internet]. CSEP [cited August 22, 2018]. Available from: http://csepguidelines.ca/adults-65/.

Table 5.7

Time Spent Engaging in Physical Activity by Age Group, Canada, 2015

Age Group (years)	Mean Time Spent in Light Physical Activity (per day)	Mean Time Spent in Moderate-to-vigorous Physical Activity (per day)
3–5	3.4 hours (202 minutes)	1.2 hours (73 minutes)
6–17	4.0 hours (239 minutes)	55 minutes
18–79	3.6 hours (217 minutes)	24 minutes

Source: Table 13-10-0339-01 Average time spent being physically active, Canada, Canadian Health Measures Survey [Internet]. Ottawa, Ontario: Statistics Canada [updated June 13, 2018; cited June 13, 2018]. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310033901.

Daily Physical Activity Among Children and Youth

It is recommended that children and youth aged five to 17 years spend at least 60 minutes of each day participating in moderate-to-vigorous physical activity (MVPA).[134]

In 2017, only 19% of Peel students in grades 7 to 12 met the daily activity recommendations.[U1] Male students (25%) are more likely than female students (14%) to be active every day. These rates decline with increasing grade (Figure 5.7).[U1]

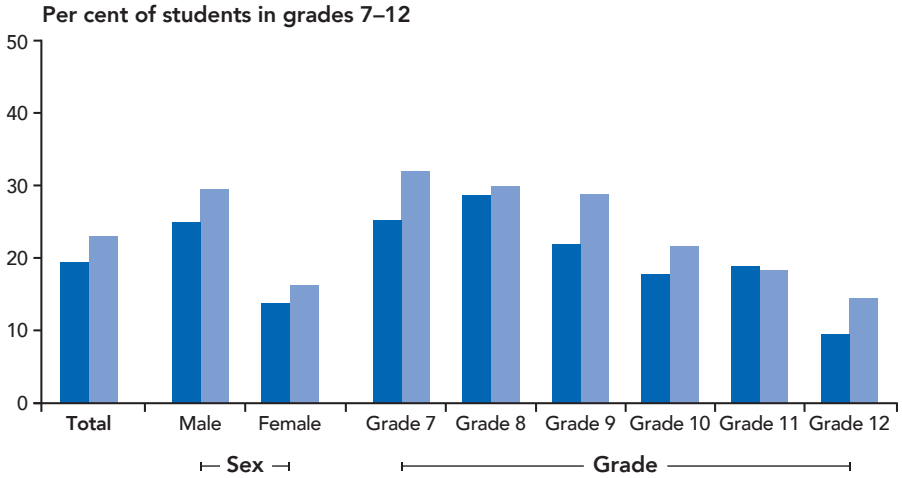
The proportion of Peel students achieving at least 60 minutes of physical activity per day has remained steady at 20% since 2013, which is similar to Ontario (22%).[U1]

Measurement

The Ontario Student Drug Use and Health Survey (OSDUHS) asks students in grades 7 to 12 to report on **how many of the last seven days they were physically active for a total of at least 60 minutes each day**. Students are asked to sum all the time they spent in any kind of physical activity – either in school or elsewhere – that increased their heart rate and made them breathe hard some or all the time.

Figure 5.7

Per cent of Students Who Achieved at Least 60 Minutes of Physical Activity on Each Day of the Past Week by Sex and Grade, Peel and Ontario, 2017



	Total	Male	Female	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Peel Per cent (95% CI)	19.4 (16.7 – 22.5)	24.9 (20.2 – 30.2)	13.7 (11.4 – 16.3)	25.2 (18.4 – 33.5)	28.7* (19.8 – 39.7)	21.9 (17.1 – 27.6)	17.8 (13.7 – 22.8)	18.8 (14.1 – 24.6)	9.4* (6.1 – 14.1)
Ontario Per cent (95% CI)	23.0 (21.7 – 24.4)	29.5 (27.5 – 31.5)	16.2 (14.9 – 17.5)	31.9 (29.1 – 34.8)	29.9 (26.1 – 34.0)	28.8 (25.3 – 32.7)	21.6 (18.7 – 24.7)	18.3 (15.5 – 21.4)	14.4 (11.5 – 17.9)

* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health.
Region of Peel - Public Health.

Physical Activity During Leisure Time

Measurement

The Canadian Community Health Survey measures leisure-time physical activity by asking respondents a series of questions about the duration, frequency and type of physical activities they engaged in during their leisure time, over the past three months. Based on their answers, respondents are categorized into three physical activity levels according to their leisure time energy expenditure (EE):

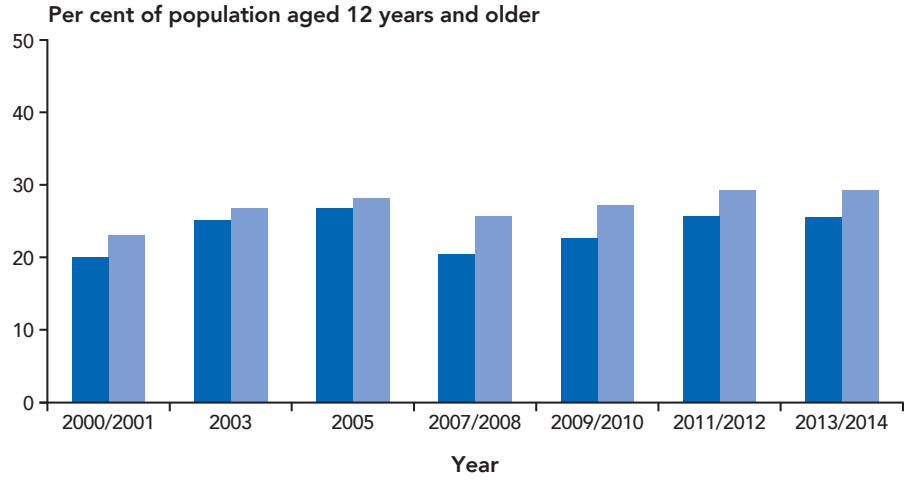
- **active** (EE of 3.0 kcal/kg/day or more)
- **moderately active** (EE between 1.5 and 2.9 kcal/kg/day) and
- **inactive** (EE less than 1.5 kcal/kg/day).

In Peel, leisure-time physical activity has been inconsistent over time (Figure 5.8). In 2013/2014, 26% of Peel's population were physically active during leisure time, which is similar to Ontario (29%).[H2]

There is no difference in leisure time physical activity by age group between males and females in Peel (Figure 5.9). For males only, there is a significant decrease with age. Non-immigrants (32%) living in Peel are significantly more likely to report being physically active during leisure time than recent immigrants (20%* - use estimate with caution) or long-term immigrants (21%).[H2]

Figure 5.8

Per cent of Population Who are Physically Active During Leisure Time, Peel and Ontario, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014

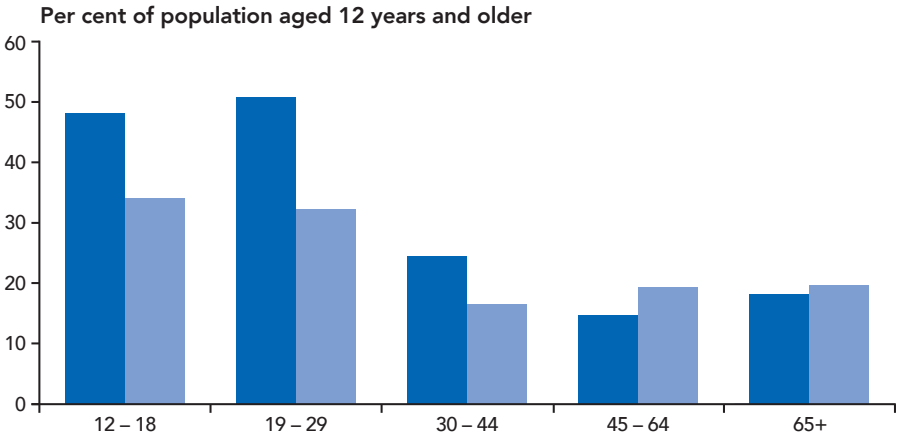


	2000/2001	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	20.0 (17.9–22.2)	25.1 (22.8–27.5)	26.8 (24.5–29.3)	20.4 (18.2–22.8)	22.6 (20.3–25.2)	25.6 (22.9–28.5)	25.5 (22.7–28.5)
Ontario Per cent (95% CI)	23.0 (22.4–23.7)	26.8 (26.1–27.5)	28.2 (27.5–28.9)	25.7 (25.0–26.4)	27.2 (26.4–28.0)	29.3 (28.5–30.2)	29.3 (28.5–30.2)

Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 5.9

Per cent of Population Who are Physically Active During Leisure Time by Age Group and Sex, Peel, 2013/2014



	12 – 18	19 – 29	30 – 44	45 – 64	65+
Male Per cent (95% CI)	48.1 (37.8 – 58.5)	50.8* (39.6 – 62.0)	24.5* (17.1 – 33.9)	14.6* (8.8 – 23.3)	18.1* (11.9 – 26.5)
Female Per cent (95% CI)	34.1* (23.9 – 45.9)	32.3* (24.0 – 42.0)	16.5* (11.0 – 24.1)	19.3* (13.2 – 27.4)	19.6* (14.0 – 26.9)

* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Sedentary Behaviour

Currently, the differentiation between sedentary behaviours and physical inactivity as they relate to health outcomes is a topic of debate.[143] Sedentary behaviour is recognized by some as a modifiable risk factor independent from physical inactivity. For example, an employee who sits at a desk for prolonged periods may still be at an increased risk for developing chronic disease such as type 2 diabetes and cardiovascular disease, even if they are physically active.[144] Further research is required to fully elucidate the underlying mechanisms between physical activity, physical inactivity, sedentary behaviours and health.

Definition

Sedentary behaviour is defined as any waking behaviour where energy expenditure is 1.5 metabolic equivalents (METs) or less while sitting, reclining or lying down. Sedentary activities include using a computer or smart phone, playing video games, and watching television.[138]

Measurement

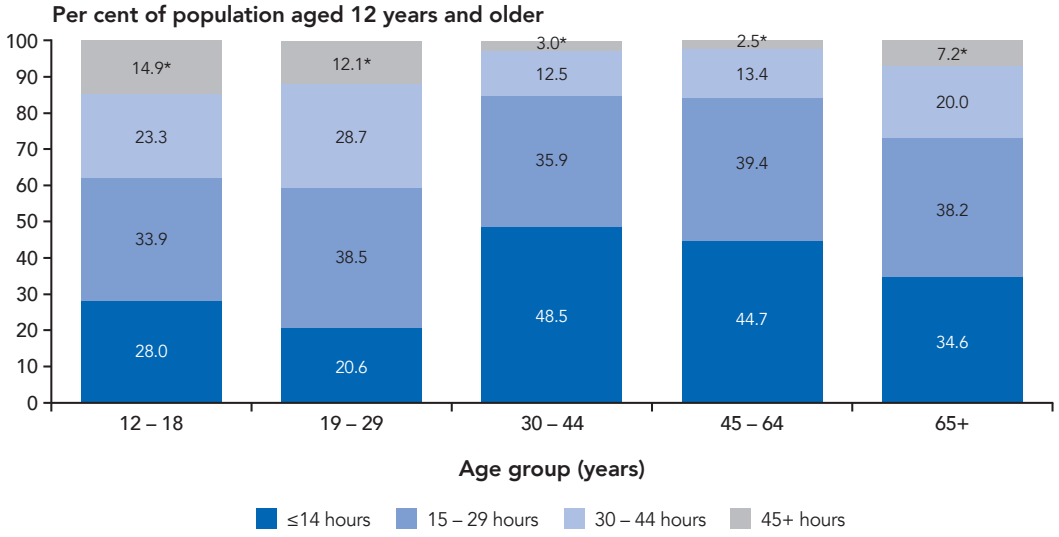
Sedentary behaviour is measured in the Canadian Community Health Survey. Respondents are asked to report the total number of hours they spent in sedentary activities in a typical week over the past three months. Activities reported in the survey include time spent using the computer, using the internet, playing video games, watching television/ videos, and reading. Summary measures are calculated including and excluding reading and all time spent at school or work.

In Peel, 76% of residents spent on average 15 hours or more engaging in sedentary activities per week over the last three months.[H3] Some of this activity is reading. When reading was excluded, the proportion drops to 62%.[H3]

Adults aged 30 years and older spend fewer hours engaging in leisure time activity (Figure 10).

Figure 5.10

Per cent of Population by Hours of Sedentary Activities Per Week† by Age Group, Peel, 2011/2012



† Excludes reading.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File, 2011/2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Recreational Screen Time and Social Media

Recreational Screen Time

Over one-third of Ontario's boys and girls between six and 11 years of age spend more than two hours of screen time per day. This is above the two-hour daily recommendation for recreational screen time.[134]

Definition

Recreational screen time is defined as the time spent using a computer, smart phone, gaming console, television, or other screens that are not related to school or work.[138]

In 2017, two-thirds (67%) of grade 7 to 12 students in Peel dedicated an average of more than two hours to recreational screen time per day, which is higher than Ontario students (60%). This trend remained stable between 2013 and 2017.[U1-U3] Additionally, recreational screen time increased by grade (Figure 5.11).

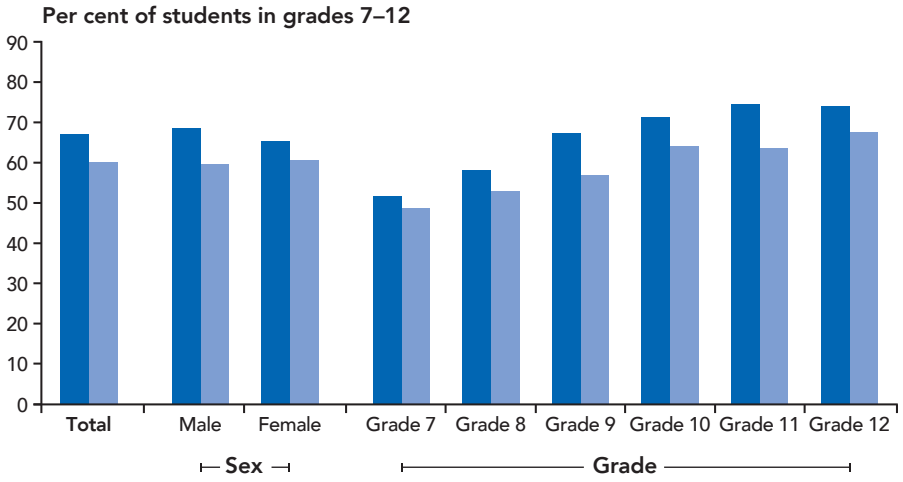
Social Media

Definition

Social media are websites and applications where users create and share information, ideas, personal messages and other content to participate in online communities.

Figure 5.11

Per cent of Students Whose Screen Time is an Average of More Than Two Hours per Day by Sex and Grade, Peel and Ontario, 2017



	Total	Male	Female	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Peel Per cent (95% CI)	66.9 (63.6 – 70.1)	68.5 (63.9 – 72.7)	65.3 (61.6 – 68.9)	51.5 (42.9 – 60.1)	58.0 (49.9 – 65.7)	67.2 (61.1 – 72.9)	71.3 (64.1 – 77.6)	74.5 (67.6 – 80.4)	73.9 (66.4 – 80.2)
Ontario Per cent (95% CI)	60.0 (57.7 – 62.3)	59.5 (56.4 – 62.6)	60.5 (57.6 – 63.4)	48.5 (44.6 – 52.3)	52.8 (48.4 – 57.2)	56.8 (52.2 – 61.4)	64.1 (59.2 – 68.7)	63.4 (57.1 – 69.3)	67.5 (63.2 – 71.4)

Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health.
Region of Peel - Public Health.

In 2017, 46% of Peel students in grades 7 to 12 spent more than two hours per day on social media websites, which is similar to Ontario (45%).[U1] This is a significant increase from the 30% in 2013.[U1-U3] Male students in Peel (36%) were significantly less likely to spend more than two hours a day on social media than their female counterparts (59%).[U1]

Sleep

Sleep is both a protective factor and a risk factor for chronic disease and injury. Healthy sleep is important for good health. It can help protect your mental health, physical health, quality of life and safety (e.g., reduce drowsiness that can lead to accidents).[145] Optimal sleep supports growth and development in children and youth, helps maintain a healthy balance of hormones and enhances learning and problem-solving skills.[145]

Inadequate sleep, including both short duration and poor quality, is associated with a range of adverse health outcomes, including being overweight and obese, type 2 diabetes, cardiovascular disease, depression and anxiety, premature death, and overall reduced well-being.[146] Inadequate sleep is also associated with impaired immune function, increased risk of workplace injury and accidents, and cognitive and behavioural problems in children.[145]

The 24-hour Movement Guidelines offer recommendations for the number of hours of sleep by age (Table 5.8).

In Canada, all age groups meet or nearly meet the sleep requirements set out in these guidelines (Table 5.9).

Table 5.8

Sleep Duration Recommendations by Age Group

Age Group (years)	Sleep Duration Recommendation
< 1 **• 0–3 months** **• 4–11 months**	• 14 – 17 hours of good-quality sleep (including naps) • 12 – 16 hours of good-quality sleep (including naps)
1–2	• 11 – 14 hours of good-quality sleep (including naps), with consistent bedtimes and wake-up times
3–4	• 10 – 13 hours of good-quality sleep (may include naps), with consistent bedtimes and wake-up times
5–13	• 9 – 11 hours of uninterrupted sleep per night, with consistent bed and wake-up times
14–17	• 8 – 10 hours of uninterrupted sleep per night, with consistent bed and wake-up times
18+	• There are no specific requirements for sleep duration for Canadian adults; however, for optimal health, it is recommended that those aged 18 – 64 get seven to nine hours of sleep, whereas seniors aged 65 years and older get seven to eight hours of sleep per night

Sources: Canadian 24-hour Movement Guidelines for the Early Years (0–4 years): An Integration of Physical Activity, Sedentary Behaviour and Sleep [Internet]. CSEP [cited August 22, 2018]. Available from: http://csepguidelines.ca/early-years-0-4/.
Canadian 24-hour Movement Guidelines for Children and Youth (ages 5–17 years): An Integration of Physical Activity, Sedentary Behaviour and Sleep [Internet]. CSEP [cited August 22, 2018]. Available from: http://csepguidelines.ca/children-and-youth-5-17/.
Chaput, J.P., Wong, S.L., Michaud, I.: Duration and quality of sleep among Canadians aged 18 to 79. Health Reports. 2017 Sept 20; 28(9):28-33.

Sleep duration data by age group are shown in Table 5.9 and Figure 5.12. Data about sleep among adults for Peel are not available.

Table 5.9

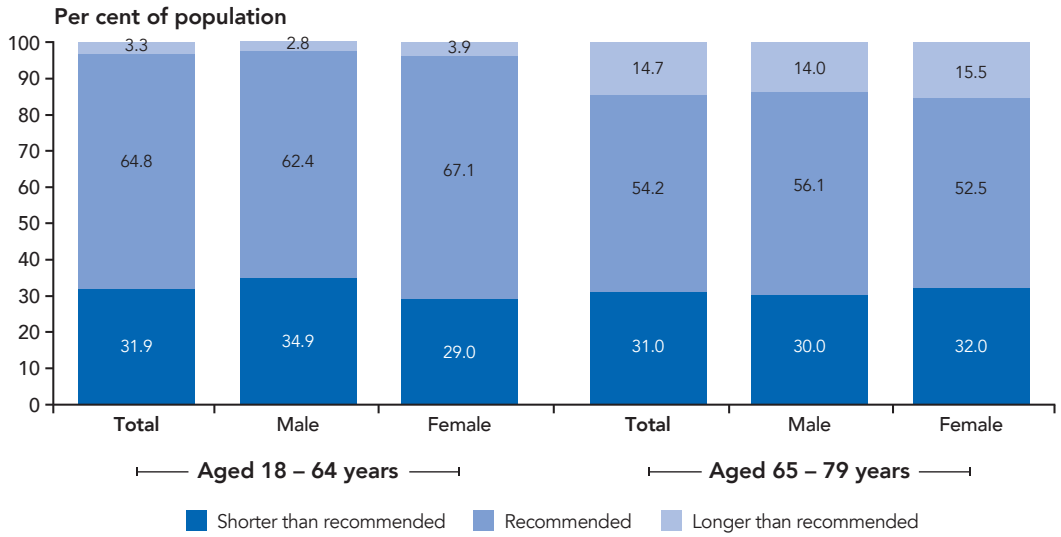
Self-reported Average Sleep Duration by Age Group, Canada, 2014–2015

Age Group (years)	Average Sleep Duration (hours per day)	Guideline Status
5–11†	9.6	Meets the sleep requirement in the Canadian 24-hour Movement Guidelines
12–17	8.3	Nears or meets the sleep requirement in the Canadian 24-hour Movement Guidelines
18–79‡	7.2	Meets the sleep requirement recommendation

† Parent-reported.
‡ Physical Activity, Sedentary Behaviour and Sleep (PASS) indicators: Quick Stats, Adults (Aged 18+), Canada, 2017 edition. Ottawa, Ontario: Public Health Agency of Canada [2017; cited November 10, 2017]. Available from: https://infobase.phac-aspc.gc.ca/src/doc/pass_adults_en.pdf.
Source: Roberts, K.C., Yao, X., Carson, V., Chaput, J.P., Janssen, I., Tremblay, M.S. Meeting the Canadian 24-Hour Movement Guidelines for Children and Youth Health Reports. 2017 Oct; 28(10):3-7.

Figure 5.12

Per cent of Adults by Sleep Duration Recommendations, Age Group† and Sex, Canada Excluding Territories, 2007-2013 Combined



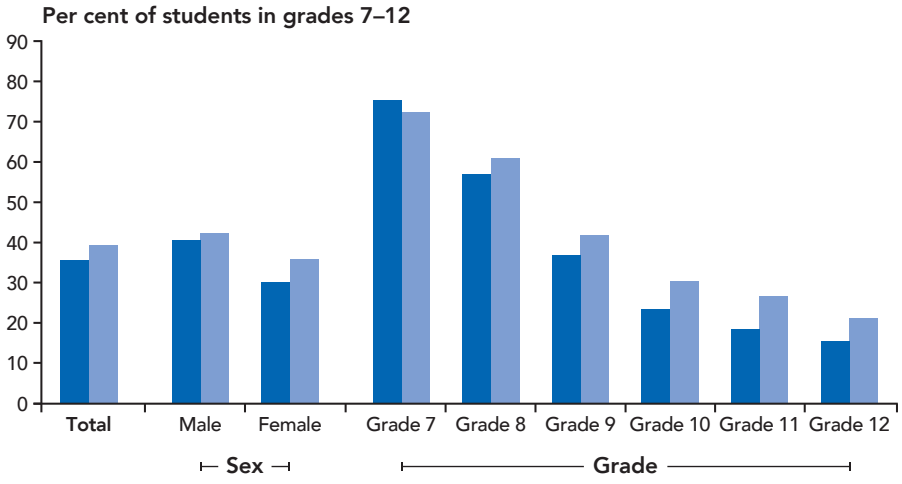
† Reflects individuals aged 18–64 years (n=8,914) and aged 65–79 years (n=2,035).
Notes: Responses were rounded to the closest half hour. Recommended sleep duration for individuals aged 18–64 years is seven to nine hours per night, while the recommended sleep duration for individuals aged 65–79 years is seven to eight hours per night.
Source: Chaput, J.P., Wong, S.L., Michaud, I. Duration and quality of sleep among Canadians aged 18 to 79. Health Reports. 2017 Sept; 28(9):28-33

In Peel, less than half of students in grades 7 to 12 (36%) reported eight or more hours of sleep on an average school night. This is similar to Ontario (39%).[U1] Overall, female students get significantly less sleep than male students in both Peel and Ontario (Figure 5.13). Further, as students age, the less they sleep.

In Peel, 75% of Grade 7 students reported eight or more hours of sleep on an average school night, whereas only 15%* (*use estimate with caution) of Grade 12 students slept the same amount. (Figure 5.13).

Figure 5.13

Per cent of Students Who Report Eight or More Hours of Sleep on an Average School Night by Sex and Grade, Peel and Ontario, 2017



	Total	Male	Female	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Peel Per cent (95% CI)	35.5 (31.1 – 40.1)	40.6 (35.7 – 45.6)	30.2 (25.5 – 35.4)	75.2 (65.6 – 82.8)	57.0 (51.7 – 62.2)	36.8 (31.2 – 42.6)	23.5 (17.9 – 30.2)	18.3* (12.0 – 26.8)	15.4* (9.6 – 23.7)
Ontario Per cent (95% CI)	39.2 (37.1 – 41.3)	42.2 (40.1 – 44.4)	35.9 (32.9 – 39.1)	72.3 (69.4 – 74.9)	60.8 (54.0 – 67.2)	41.8 (37.7 – 46.0)	30.4 (26.2 – 35.0)	26.5 (21.6 – 32.1)	21.1 (16.6 – 26.5)

* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health.
Region of Peel - Public Health.

NUTRITION

Nutrition is a modifiable risk factor for the prevention of chronic disease. It has a significant influence on early childhood development and is important to overall physical and mental health at any age.

To maintain positive health benefits, individuals must meet recommended nutrient requirements (i.e., vitamins, minerals, macronutrients). The Dietary Reference Intakes are a set of specific recommendations for nutrients that individuals require to not only prevent nutrient deficiencies, but also to lower the risk of chronic disease.[147]

In addition, the Acceptable Macronutrient Distribution Ranges provide intake guidelines for energy sources (i.e., protein, fat, carbohydrate). The ranges for adults are:

- carbohydrates: 45% to 65% of total energy (added sugars limited to no more than 25% of total energy);
- protein: 10% to 35% of total energy; and
- fat: 20% to 35% of total energy (saturated fat, trans fat and dietary cholesterol as low as possible while consuming a nutritionally adequate diet).[147]

Direct measures (i.e., biomarkers) are used to assess if nutrient recommendations are being met. Among Canadians six to 79 years of age, mean levels of ferritin, a metabolite of iron (66 µg/L, geometric mean), vitamin D (59 nmol/L), and red blood cell folate (1,485 nmol/L) are all above the suggested sufficiency thresholds for these micronutrients (≥ 15 µg/L, approximately ≥ 30 nmol/L, and ≥340 nmol/L, respectively).[148-151]

In 2015, Ontario residents self-reported mean percentages of total energy consumed that generally fell within the acceptable distribution ranges for all three macronutrients (for all age groups one to 71 years old) (data not shown).[149,152-155]

Micronutrient and macronutrient data are not available for Peel.

This section will describe the following nutrition concepts:

- vegetables and fruit consumption;
- sugar-sweetened beverages;
- infant feeding; and
- household food insecurity.

Measurement

Current methods of assessing dietary intake include biomarkers or self-reported assessments, such as real-time recording (e.g., food diaries) or food recall recordings (e.g., food frequency questionnaires, single/multiple daily recalls).[156]

Consumption of Vegetables and Fruit

Frequently eating vegetables and fruit is positively associated with overall dietary quality.[157] A diet high in vegetables and fruit, which are nutrient-dense and a good source of fibre, may lower the risk of developing some types of cancer and heart disease.[158]

The recommended number of daily servings of vegetables and fruit is different by age and sex and ranges from five to 10 servings per day.[158,159]

Measurement

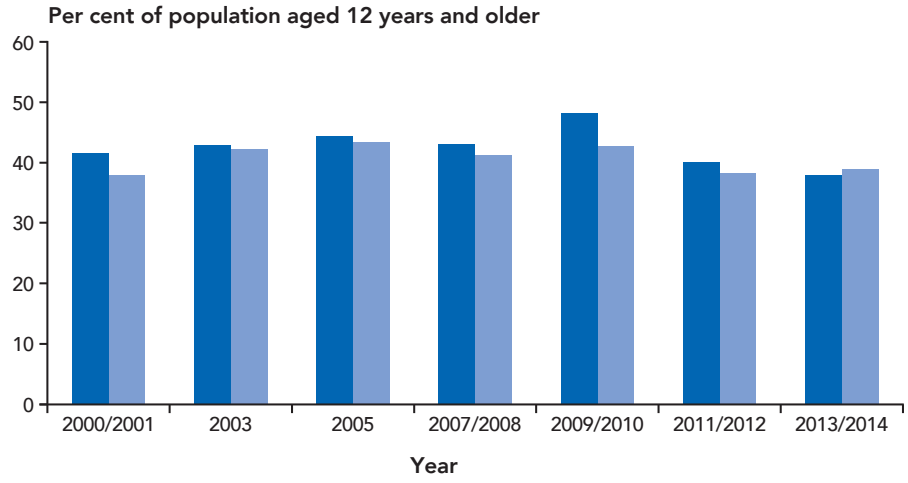
Vegetables and fruit intake is measured in the Canadian Community Health Survey. By asking the number of times per day an individual consumed fruit juice, fruits (excluding juice), green salad, potatoes (excluding French fries, fried potatoes, or potato chips), carrots and other vegetables (excluding carrots, potatoes, or salad).

The consumption of five or more vegetables and fruit per day has not changed between 2000/2001 and 2013/2014 (Figure 5.14). In 2013/2014, 38% of the Peel population report eating vegetables and fruit five or more times per day, which is similar to Ontario at 39% (Figure 5.14).

Peel women (43%) were significantly more likely to report eating vegetables and fruit five or more times per day than men (33%). By household income level, those in the middle (45%) and highest (41%) levels were significantly more likely to consume five or more vegetables and fruit per day than those in the lowest (16%* - use estimate with caution) (Figure 5.15).

Figure 5.14

Per cent of Population Who Consume Vegetables and Fruit Five or More Times per Day†, Peel and Ontario, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014

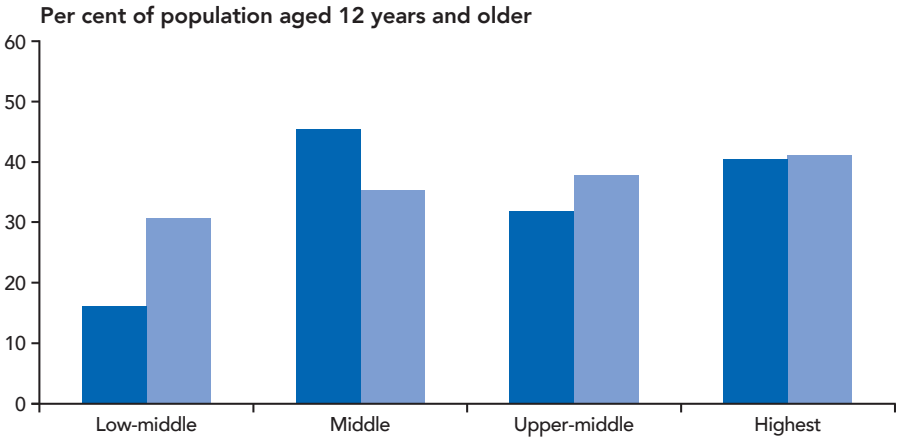


	2000/2001	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	41.5 (38.9–44.1)	42.8 (40.1–45.6)	44.3 (41.5–47.2)	43.0 (39.9–46.2)	48.2 (45.1–51.3)	40.1 (36.9–43.4)	37.8 (34.6–41.2)
Ontario Per cent (95% CI)	37.8 (37.1–38.6)	42.1 (41.3–42.8)	43.4 (42.6–44.2)	41.2 (40.4–42.1)	42.6 (41.7–43.5)	38.2 (37.3–39.2)	38.9 (37.9–39.8)

† This measure reflects the total number of times per day the respondent eats vegetables or fruit; it does not provide information on the actual amount consumed.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 5.15

Per cent of Population Who Consume Vegetables and Fruit Five or More Times per Day† by Income Level, Peel and Ontario, 2013/2014



	Low-middle	Middle	Upper-middle	Highest
Peel Per cent (95% CI)	16.1* (8.8 – 27.6)	45.4 (37.3 – 53.8)	31.9 (26.2 – 38.2)	40.5 (35.9 – 45.2)
Ontario Per cent (95% CI)	30.7 (26.4 – 35.4)	35.4 (32.8 – 38.0)	37.8 (36.1 – 39.6)	41.2 (39.9 – 42.6)

† This measure reflects the total number of times per day the respondent eats vegetables or fruit; it does not provide information on the actual amount consumed.
* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Peel Facts

In 2010, adult Peel residents reported consuming fast food an average of once in the past week (data not shown).[G8] Men (61%) were more likely to eat fast food once or more a week than women (49%).[G8] Weekly fast food consumption was also higher among young adults between 18 and 24 years (76%) compared to those aged 25 to 44 years (61%), 45 to 64 years (49%) and 65 years and older (39%).[G8]

Sugar-sweetened Beverages

Sugar-sweetened beverages (SSBs) include fruit drinks, regular soft drinks, sports drinks, specialty coffees or teas, flavoured milk, flavoured milk alternatives (e.g., flavoured soy 'milk'), vitamin waters and any other beverages with added sugar.[160] The servings of these drinks are often large in size and high in calories, and frequent consumption can increase the risk for obesity, type 2 diabetes and dental caries.[161] As a result, the World Health Organization recommends that free sugar, or food and drinks with added sugar be limited to less than 10% of total caloric intake.[161]

Many SSBs, such as colas, energy drinks, and specialty coffees, also contain caffeine. Consumption has a variety of general effects (e.g., headaches).[162]

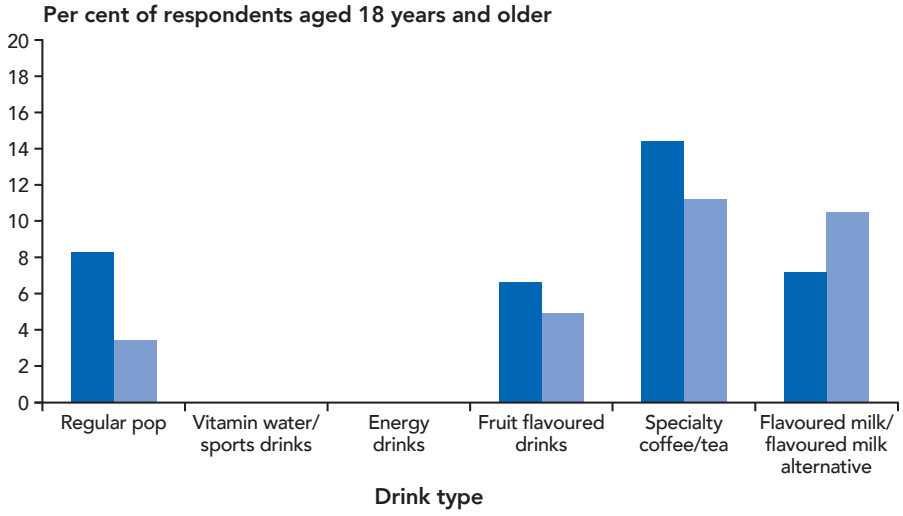
Over the past three decades, global intake and sales of some SSBs have either stabilized or started to decline.[163] However, there has been an increase in sales of other SSBs, such as sports drinks, flavoured water and energy drinks. In Canada, these drinks are particularly popular among adolescents.[163]

Artificial sweeteners such as aspartame, sucralose and saccharine are used as alternatives to lower calories in many types of beverages (e.g., soft drink, fruit juice, energy drink).[164] However, regular consumption of artificially sweetened soda is significantly associated with overall increased risk of overweight and obesity and a greater risk of metabolic syndrome and type 2 diabetes.[164]

In Peel, between 5% and 12% of adults (aged 18 years and older) report drinking an SSB on a daily basis.[G2] Significantly more males (8%*- use estimate with caution) consumed regular soft drinks once a day or more compared to females (3%* - use estimate with caution) (Figure 5.16).

Figure 5.16

Per cent of Adults Consuming Sugar Sweetened Beverages Once a Day or More in the Past Week by Sex, Peel, 2016



	Regular pop	Vitamin water/ sports drinks	Energy drinks	Fruit flavoured drinks	Specialty coffee/tea	Flavoured milk/ flavoured milk alternative
Male Per cent (95% CI)	8.3* (5.9–11.6)	NR	NR	6.6* (4.5–9.5)	14.4 (11.1–18.5)	7.2* (5.0–10.3)
Female Per cent (95% CI)	3.4* (2.3–5.1)	NR	NR	4.9* (3.5–6.9)	11.2 (8.9–13.9)	10.5 (8.3–13.2)

* Use estimate with caution.
NR - Not releasable due to small numbers.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Rapid Risk Factor Surveillance System, 2016, Region of Peel - Public Health.

Infant Feeding

Definition

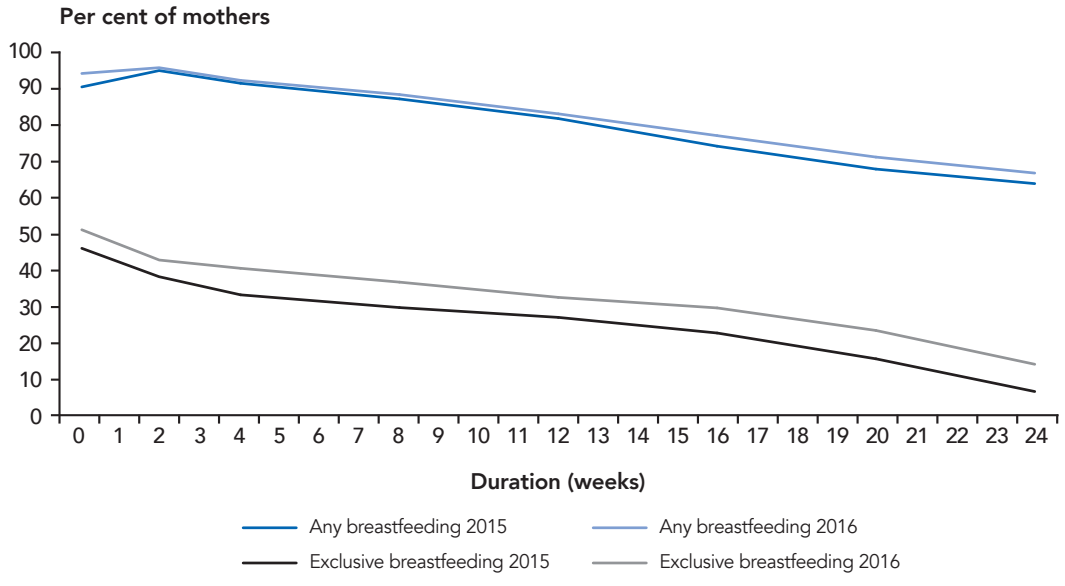
Any breastfeeding is defined as any self-reported attempt to feed the infant at the breast, or feed breast milk by cup, tube, or bottle.[165]

Breastfeeding initiation is defined as the introduction of breast milk to an infant. It is measured by the question "Have you ever tried to feed your baby breast milk?"[165]

Exclusive breastfeeding is defined as feeding an infant only breast milk, without addition of any foods or liquids (e.g., water, sugar water or formula) excluding vitamins, minerals or required medication.[165]

In 2016 in Peel, almost all mothers initiated breastfeeding (99%); however, breastfeeding rates gradually declined as infants grew. By six months, 67% of mothers continued to breastfeed (Figure 5.17).

Figure 5.17
Duration of Any Breastfeeding and Exclusive Breastfeeding to Six Months Postpartum, Peel, 2015–2016



* Use estimate with caution.
Source: Peel Infant Feeding Survey, 2015 - 2016, Region of Peel - Public Health.

Vitamin D

Did You Know

A daily vitamin D supplement of 10 ug (400 IU) is recommended for infants and young children less than two years of age who are breastfed or receive breast milk.[149]

Additionally, Region of Peel – Public Health recommends a daily vitamin D supplement of 10 ug (400 IU) per day for formula-fed infants who are consuming 500 mL or less of infant formula per day and 200 IU per day for formula-fed infants who are consuming between 500 mL and 1 L of formula per day.

In 2016 in Peel, 84% of breastfeeding mothers said they had given their infant a vitamin D supplement at least once. Among mothers who had given their infant a vitamin D supplement, 88% had done so either every day or almost every day.[165]

Introduction of Solids

Solid foods should be introduced at or around six months of age, when an infant shows readiness cues. In 2016 in Peel, almost a quarter (23%) of infants were introduced to solid food either too early (less than five months) or too late (more than seven months).[165]

Household Food Insecurity

Household food insecurity, "the inadequate or insecure access to food because of financial constraints" is a significant social and health issue in Canada.[166] Food insecurity can range from concerns about running out of food before one can afford more; to the inability to afford a balanced diet; to going hungry, missing meals, and in extreme cases, not eating for an entire day because of lack of food and/or money for food.[166]

Measurement

The degree of household food insecurity is measured by the Canadian Community Health Survey's Household Food Security Survey Module (CCHS HFSSM). Depending on the number of affirmative responses to the CCHS HFSSM, households are classified as food secure, marginally food insecure, moderately food insecure or severely food insecure.

Food secure: Household does not worry about running out of food and/or food selection is not limited due to a lack of money for food.

Marginally food insecure: Household worries about running out of food and/or food selection is limited due to a lack of money for food.

Moderately food insecure: Household experiences a compromise in quality and/or quantity of food due to a lack of money for food.

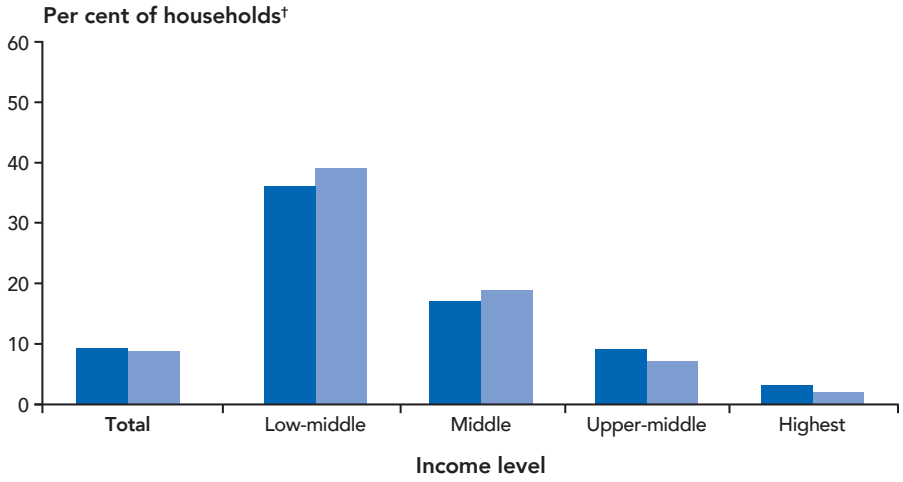
Severely food insecure: Household misses meals, reduces food intake, and in the most extreme cases, goes day(s) without food.

In Peel in 2013/2014, 9% of residents reported having moderate to severe food insecurity. This proportion has remained unchanged since 2007/2008.[H2-H5] Marginal food insecurity was noted by 5% of households in Peel in 2013/2014, which was similar to the Ontario estimate (3%).[H2]

Lower income households are significantly more likely to experience moderate to severe food insecurity compared to higher income households (Figure 5.18). The reason for high income households reporting food insecurity is not known.

Figure 5.18

Per cent of Households with Food Insecurity† (Moderate or Severe) in the Past 12 Months by Income Level, Peel and Ontario, 2013/2014



	Total	Low-middle	Middle	Upper-middle	Highest
Peel Per cent (95% CI)	9.2 (7.4 – 11.4)	36.0* (22.2 – 52.6)	17.0* (11.7 – 23.9)	9.1* (6.3 – 12.9)	3.1* (1.9 – 5.1)
Ontario Per cent (95% CI)	8.7 (8.2 – 9.2)	39.1 (35.8 – 42.5)	18.8 (17.1 – 20.6)	7.0 (6.2 – 7.9)	1.9 (1.5 – 2.2)

† This measure of food insecurity is a household measure. It does not determine the food security status of individuals residing in the household.
* Use estimate with caution.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Peel Facts

In Peel, approximately 11% of children aged 17 years or younger live in a household experiencing food insecurity.[H2]

USE OF TOBACCO AND TOBACCO PRODUCTS

Tobacco use and exposure to environmental tobacco smoke, are modifiable risk factors for the prevention of chronic and infectious diseases. It can have a significant influence on in utero and early childhood development and is associated with overall physical and mental health.

This section will describe tobacco use and tobacco products, and exposure to environmental tobacco smoke in homes, workplaces, private vehicles and multi-unit housing. Associations between tobacco use and various social and behavioural determinants are examined.

Cigarette Use

Definition

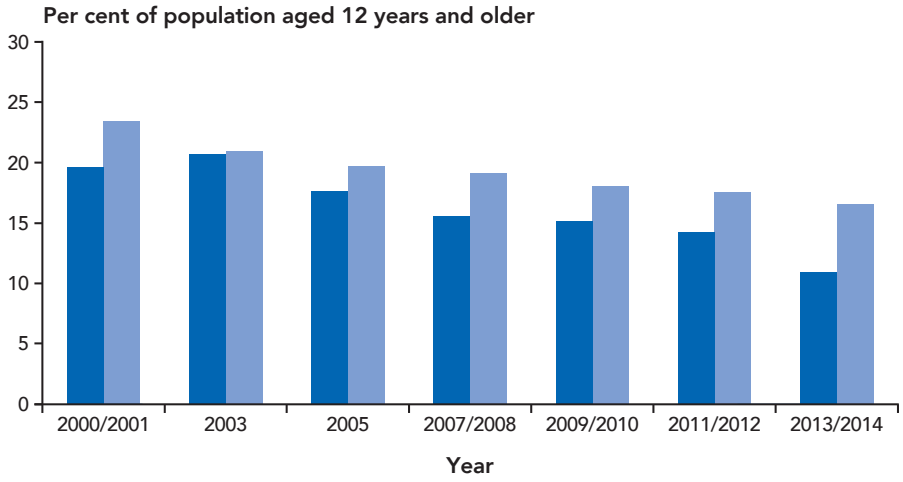
A ***current smoker*** is defined as a person who currently smokes daily or occasionally, has smoked at least 100 cigarettes in their lifetime and has smoked in the past 30 days.[167]

This indicator is derived from multiple questions in the Canadian Community Health Survey.

In 2013/2014, 11% of the Peel population were current smokers. This was significantly lower compared to Ontario (17%).[H2] The proportion of current smokers in Peel has declined significantly since 2000/2001 (20%) (Figure 5.19).

Figure 5.19

Per cent of Current Cigarette Smokers, Peel and Ontario, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014



	2000/2001	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	19.6 (17.6–21.8)	20.7 (18.4–23.2)	17.6 (15.6–19.8)	15.5 (13.4–18.0)	15.1 (13.0–17.4)	14.2 (12.2–16.5)	10.9 (9.0–13.0)
Ontario Per cent (95% CI)	23.4 (22.8–24.1)	20.9 (20.3–21.5)	19.7 (19.1–20.3)	19.1 (18.5–19.7)	18.0 (17.3–18.7)	17.5 (16.8–18.3)	16.5 (15.8–17.2)

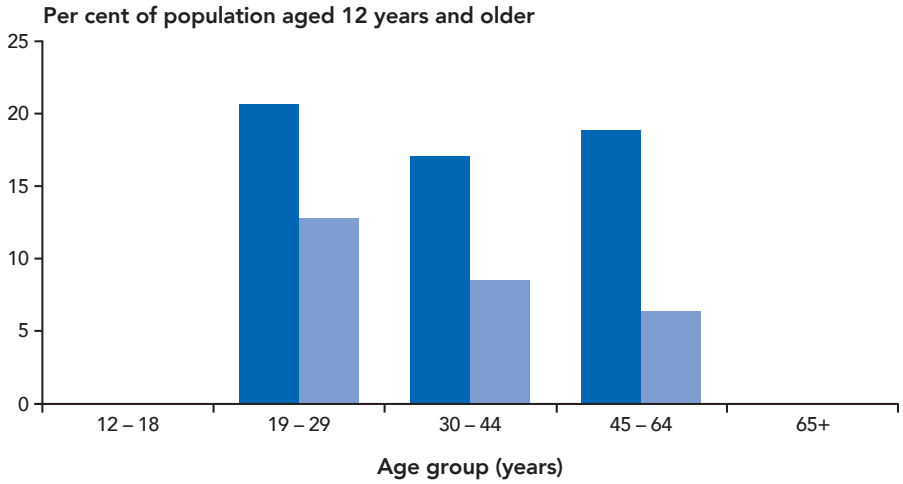
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Similar to previous years, the proportion of current smokers among Peel females (7%) in 2013/2014 was significantly lower than among males (15%).[H2] While rates of smoking are lower among females across all age groups, the sex difference in current smoking rates is only significant in the 45 to 64 year age groups (Figure 5.20).

To understand the association between current smoker status and social or behavioural determinants, a regression analysis was performed. The adjusted results are presented in Table 5.10. The table shows the strength of association between each factor explored and the likelihood of being a current smoker, using the adjusted odds ratio as the measure of association.

Figure 5.20

Per cent of Current Cigarette Smokers by Age Group and Sex, Peel, 2013/2014



	12 – 18	19 – 29	30 – 44	45 – 64	65+
Male Per cent (95% CI)	NR	20.7* (13.6 – 30.1)	17.1* (10.4 – 27.0)	18.9* (12.3 – 28.0)	NR
Female Per cent (95% CI)	NR	12.8* (8.3 – 19.3)	8.5* (5.8 – 12.3)	6.4* (4.1 – 9.6)	NR

* Use estimate with caution.
NR - Not releasable due to small numbers.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

After controlling for all other factors in the model, being a current smoker is independently associated with:

- Household income level: Males in the middle income level compared to those in the upper-middle income level are more likely to be a current smoker.
- Education level: Those with high school education are more likely to be a current smoker compared to those with post-secondary education.
- Marital status: Those who were divorced, separated or widowed are more likely to be a current smoker compared to those who were married or common law. Additionally, males who were single or never married were more likely to be smokers than those who were married or common law.
- Sense of community belonging: Males with a somewhat weak/very weak sense of community belonging are more likely to be current smokers compared to those with very strong or somewhat strong community belonging.
- Self-perceived life stress: Those having quite a bit of extreme life stress most days are more likely to be current smokers compared to those with no stress, not very much stress or a bit of stress.
- Self-perceived general health: Females with fair or poor self-perceived health are more likely to be current smokers compared to those with excellent, very good or good self-perceived health.
- Physical activity level: Males who are inactive are more likely to be current smokers compared to those who are active.
- Weekly alcohol consumption: Those who consume alcohol weekly are more likely to be a current smoker compared to those who do not.

Table 5.10

Association Between Current Smoking Status and Social or Behavioural Determinants by Sex†, Peel, 2007/2008, 2009/2010, 2011/2012, 2013/2014 Combined

Variable	Male Adjusted Odds Ratio (95% CI) N=3,143	Female Adjusted Odds Ratio (95% CI) N=3,661
Age (years)	0.99 (0.97–1.00)*	**0.97 (0.96–0.99)***
Household income level		
Low-middle	1.70 (0.88–3.30)	1.53 (0.81–2.90)
Middle	**2.01 (1.21–3.35)***	1.28 (0.72–2.29)
Upper-middle	1.0	1.0
Highest	1.19 (0.86–1.63)	0.71 (0.45–1.10)
Education level		
Less than high school	1.16 (0.70–1.94)	1.47 (0.82–2.63)
High school	**2.02 (1.41–2.89)***	**1.63 (1.08–2.47)***
Some post-secondary	0.91 (0.58–1.44)	0.85 (0.48–1.53)
Post-secondary	1.0	1.0
Ethnicity		
White	1.0	1.0
Black	**0.31 (0.14–0.66)***	**0.34 (0.13–0.87)***
East/Southeast Asian	0.70 (0.37–1.31)	0.51 (0.17–1.50)
South Asian	**0.48 (0.29–0.80)***	**0.15 (0.05–0.43)***
Other	**0.57 (0.34–0.94)***	0.52 (0.26–1.01)
Immigrant status		
Recent immigrant	1.18 (0.74–1.90)	**0.18 (0.07–0.46)***
Long-term immigrant	1.31 (0.89–1.93)	**0.54 (0.38–0.77)***
Non-immigrant	1.0	1.0
Marital status		
Married/common-law	1.0	1.0
Divorced/separated/widowed	**2.93 (1.83–4.67)***	**1.73 (1.09–2.75)***
Single, never married	**1.54 (1.03–2.30)***	**0.69 (0.48–0.99)***
Employment status in past week		
Employed	1.0	1.0
Unemployed/permanently unable to work	0.79 (0.53–1.17)	0.74 (0.49–1.12)
Sense of community belonging		
Very strong/somewhat strong	1.0	1.0
Somewhat weak/very weak	**1.42 (1.05–1.92)***	1.05 (0.69–1.60)
Self-perceived life stress		
Quite a bit/extremely	**1.58 (1.14–2.18)***	**1.48 (1.06–2.07)***
Not at all/not very/a bit	1.0	1.0

Table 5.10 continues...

Table 5.10 continued

Variable	Male Adjusted Odds Ratio (95% CI) N=3,143	Female Adjusted Odds Ratio (95% CI) N=3,661
Self-perceived mental health		
Excellent/very good/good	1.0	1.0
Fair/poor	1.06 (0.54–2.10)	0.70 (0.36–1.39)
Self-perceived general health		
Excellent/very good/good	1.0	1.0
Fair/poor	1.31 (0.85–2.03)	**2.50 (1.61–3.89)***
Physical activity level		
Active	1.0	1.0
Moderately active	1.34 (0.92–1.94)	0.99 (0.60–1.64)
Inactive	**1.45 (1.03–2.04)***	1.28 (0.84–1.94)
Weekly alcohol consumption		
Yes	**1.41 (1.02–1.96)***	**1.67 (1.20–2.34)***
No	1.0	1.0
Has a regular doctor		
Yes	1.0	1.0
No	1.28 (0.86–1.89)	1.19 (0.58–2.45)
Rural versus urban residence		
Rural	0.69 (0.34–1.41)	0.83 (0.43–1.63)
Urban	1.0	1.0

† Reflects respondents aged 18–75 years.
* Indicates statistically significant findings ($p<0.05$).
Note: 95% CI reflects the 95% confidence interval of the estimated odds ratio.
Source: Canadian Community Health Survey Share File, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Smoking Attributable Diseases, Hospitalizations, and Deaths

Smoking is a risk factor for many acute and chronic diseases. In this section, the relative risk for smoking-related diseases (Table 13.1) and the prevalence of smoking (Table 13.2) are used to determine the number and proportion of incident cases, hospitalizations and deaths that are attributable to smoking. This proportion of cases, hospitalizations or deaths is called the population-attributable fraction.

Definition

Relative risk (RR) is defined as the proportional difference in disease rates between exposed and non-exposed persons. The relative risk tells us how much more likely people with a specific exposure (e.g., smoking) are of developing a disease (e.g., lung cancer) compared to people without the exposure (e.g., non-smokers).

- If RR equals =1, the risk in exposed persons equals the risk in non-exposed persons.
- If RR is greater than 1, the risk in exposed persons is greater than the risk in non-exposed persons.
- If RR is less than 1, the risk in exposed persons is less than the risk in non-exposed persons.

The number of incident cases of disease, hospitalizations, and deaths attributable to the current smoking level in Peel are described in Table 5.11. In reviewing this table, the reader should be aware of the following caveats:

- It is possible that one person could have had several diseases at one time. The data in these tables have not been adjusted to reflect this.
- It is possible that one person could have had several hospital discharges for the same disease. The data have not been adjusted to account for this and must be interpreted as discharges rather than people.
- The calculations do not account for the synergistic effects of other exposures.

Definition

The ***population-attributable fraction (PAF)*** describes the proportion of all cases of disease, hospitalizations or death that are attributable to a particular exposure (e.g., smoking). It is a way of describing the proportion of the disease, hospitalizations, or deaths that could be prevented if the exposure was removed. For example, if the PAF for lung cancer and smoking was 80%, this means that 80% of cases of lung cancer are caused by smoking, and those cases would be eliminated if no one smoked. Use of the PAF is dependent on the existence of good evidence between the exposure and specific disease outcomes.

Details about the methods used to calculate the population-attributable fractions can be found in ***Chapter 13 – Data Methods***.

Definition

An ***incident case*** is a newly diagnosed case of a disease within a specified time period.

A ***hospitalization*** is counted once there is a discharge from hospital due to death, discharge home, or being transferred to another facility.

Table 5.11

Average Annual Number of Incident Cases, Hospitalizations and Deaths Attributable to Smoking, Peel

Type of Disease	Incident Cases (2008–2012 combined)			Hospitalizations (2008–2012 combined)			Deaths (2008–2012 combined)		
	PAF Per cent	Number	Number Attributable to Smoking	PAF Per cent	Number	Number Attributable to Smoking	PAF Per cent	Number	Number Attributable to Smoking
Cancer									
Lung cancer	70.6	509	360	70.6	337	238	68.5	363	249
Colorectal cancer	6.4	563	36	6.4	508	32	8.6	182	16
Stomach cancer	12.7	116	15	12.7	107	14	14.4	69	10
Pancreatic cancer	13.8	109	15	13.8	104	14	17.7	96	17
Bladder cancer	35.2	135	47	35.2	270	95	20.6	38	8
Kidney cancer	6.6	133	9	6.6	175	11	4.8	33	2
Esophageal cancer	29.6	42	12	29.6	38	11	62.8	36	23
Acute myeloid leukemia	14.5	35	5	14.4	75	11	13.8	23	3
Cervical cancer	7.4	48	4	7.4	43	3	7.3	12	1
Laryngeal cancer	61.4	26	16	61.4	19	12	78.1	9	7
Oral cavity and pharyngeal cancer	60.2	110	66	60.3	91	55	58.2	25	14

Table 5.11 continues...

Table 5.11 continued

Type of Disease	Incident Cases (2008–2012 combined)			Hospitalizations (2008–2012 combined)			Deaths (2008–2012 combined)		
	PAF Per cent	Number	Number Attributable to Smoking	PAF Per cent	Number	Number Attributable to Smoking	PAF Per cent	Number	Number Attributable to Smoking
Other conditions									
Ischaemic heart disease	21.6	3,698	797	20.9	4,189	874	14.4	690	99
Other heart disease	–	–	–	12.2	3,795	465	11.6	241	28
Cerebrovascular disease	11.7	2,170	255	11.8	1,496	176	7.8	298	23
Atherosclerosis	–	–	–	18.5	143	26	13.8	7	1
Aortic aneurysm	–	–	–	57.0	171	98	54.6	27	15
Other arterial diseases	–	–	–	15.0	216	32	14.2	24	3
Bronchitis/ emphysema	–	–	–	80.3	37	29	81.2	11	9
Chronic airway obstruction/other chronic obstructive pulmonary disease	–	–	–	73.1	1,148	839	72.9	133	97
Influenza, pneumonia	–	–	–	15.5	1,336	207	15.3	118	18
Total	**–**	**7,694**	**1,637**	**–**	**14,298**	**3,242**	**–**	**2,435**	**643**

PAF = Population-attributable fraction.
– Data not available
Notes: Deaths for esophageal cancer, acute myeloid leukemia, cervical cancer, laryngeal cancer, ischaemic heart disease and cerebrovascular disease are for adults aged 35 years and older. All numbers for cancer of the oral cavity and pharynx, other heart disease, atherosclerosis, aortic aneurysm, other arterial disease, bronchitis and emphysema, chronic airway obstruction and influenza and pneumonia are for adults aged 35 years and older. All others include those aged 20 years and older.
Sources: Ischaemic heart disease, Cerebrovascular disease, Chronic obstructive pulmonary disease, 2011–2015, Institute for Clinical Evaluative Sciences.
Ontario Cancer Incidence Database, 2008–2012, Cancer Care Ontario. SEER*Stat Package Release 10 – OCR (August 2015).
Hospital In-Patient Discharges, 2012–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2008–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Use of E-cigarettes and Waterpipes

E-cigarettes emerged in Canada in 2004, and have since been marketed as a healthier alternative to smoking regular cigarettes. E-cigarettes are battery-operated devices that look like cigarettes.

Waterpipes, which are often comprised of a head, body, water bowls, and hose, involve the movement of smoke through water prior to inhalation.[168]

In Peel, 2%* (*use estimate with caution) of the population report having ever used an e-cigarette in the past 30 days, while 2%* (*use estimate with caution) report having used a waterpipe in the same time period, which is similar to Ontario (3% and 1%, respectively).[H1]

Among Peel students (grades 7 to 12), 15% report using an e-cigarette and 11% report using a waterpipe in the past 12 months.[U1] These estimates are similar to Ontario at 18% and 9%, respectively.[U1]

Exposure to Environmental Tobacco Smoke

Measurement

To measure **exposure to second-hand smoke** in the home, the Canadian Community Health Survey asks participants if anyone, including household members and/or regular visitors, smokes inside their home every day or almost every day.

By analyzing individuals who identify as non-smokers, we can determine the percentage of the non-smoking population exposed to second-hand smoke in their home.

Exposure to Environmental Tobacco Smoke at Home

The proportion of non-smoking Peel residents who are exposed to second-hand smoke in the home has declined significantly between 2003 (9%) and 2013/2014 (3%) (Figure 5.21). In Peel, the proportion of non-smoking males (2%* - use estimate with caution) and females (4%* - use estimate with caution) exposed to second-hand smoke in the home are similar.[H2]

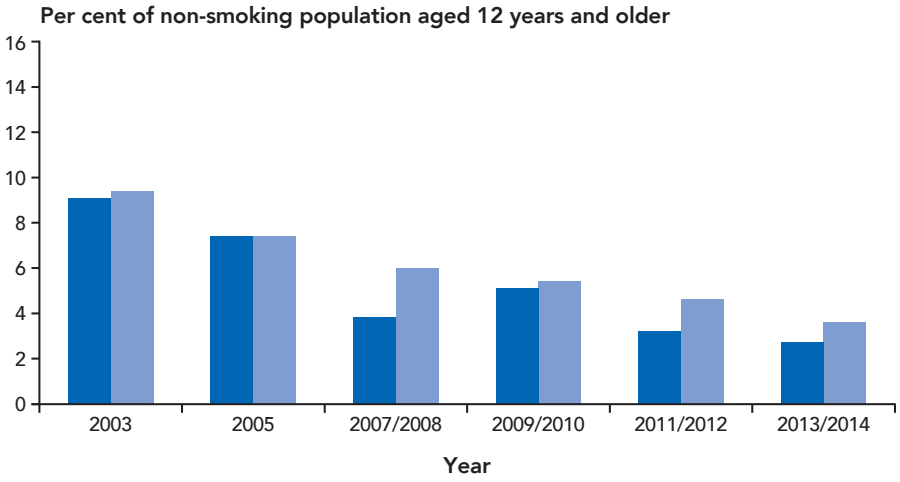
Peel Facts

In 2016, 77% of Peel residents (18 years and older) strongly or somewhat strongly supported banning smoking everywhere in multi-unit dwellings, including inside all units, on balconies and patios, as well as in all shared indoor spaces.[G2] Sixty per cent of those who supported the indoor ban also supported banning smoking on all outdoor property around the building.[G2]

Among Peel Living residents of multi-unit housing, 79% supported an indoor smoking ban and 72% supported a total outdoor ban.[169]

Figure 5.21

Per cent of Non-Smoking Population Exposed to Second-Hand Smoke Inside Their Home Daily or Almost Daily, Peel and Ontario, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014



	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	9.1 (7.6–10.9)	7.4 (6.0–9.2)	3.8* (2.7–5.5)	5.1 (3.8–6.8)	3.2 (2.4–4.4)	2.7 (1.9–3.7)
Ontario Per cent (95% CI)	9.4 (8.9–9.9)	7.4 (7.0–7.9)	6.0 (5.6–6.4)	5.4 (4.9–5.8)	4.6 (4.1–5.1)	3.6 (3.3–4.0)

* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Exposure to Environmental Tobacco Smoke at Work

Smoke-free workplaces protect non-smokers and create an environment that encourages people who smoke to cut back or quit.[170]

In 2017, 25% of Peel residents reported being exposed to second-hand smoke outdoors while at work at least one day in the previous week.[G1]

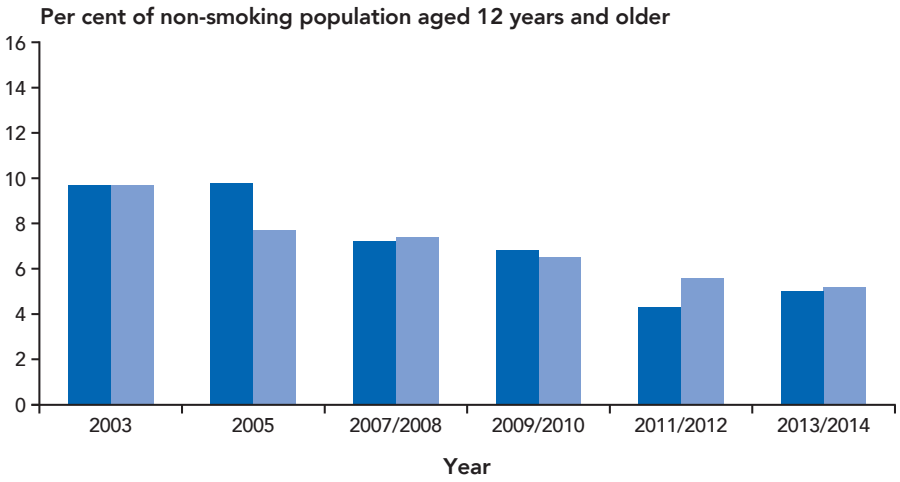
Exposure to Environmental Tobacco Smoke in Private Vehicles

Tobacco use in vehicles can potentially expose passengers to elevated concentrations of environmental tobacco smoke.

The proportion of Peel non-smokers exposed to second-hand smoke in a private vehicle daily or almost daily has declined significantly between 2003 (10%) and 2013/2014 (5%* - use estimate with caution) (Figure 5.22). This is similar to Ontario. Findings in Ontario also show a significantly greater proportion of individuals aged 12 to18 years (9%) and 19 to 29 years (10%) are exposed to second-hand smoke in private vehicles compared to those in the older age groups.[H2]

Figure 5.22

Per cent of Non-Smoking Population Exposed to Second-Hand Smoke in a Private Vehicle Daily or Almost Daily, Peel and Ontario, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014



	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	9.7 (8.1–11.7)	9.8 (8.1–11.8)	7.2 (5.6–9.2)	6.8 (5.4–8.6)	4.3 (3.3–5.6)	5.0* (3.6–6.9)
Ontario Per cent (95% CI)	9.7 (9.2–10.2)	7.7 (7.3–8.1)	7.4 (7.0–7.9)	6.5 (6.0–7.0)	5.6 (5.2–6.1)	5.2 (4.8–5.7)

* Use estimate with caution.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

ALCOHOL USE

Alcohol use is a modifiable risk factor for the prevention of chronic diseases and injuries. Depending on the extent of alcohol consumption, it can have a significant influence in utero and on early childhood development. Alcohol use is also associated with overall physical and mental health.

Data presented in this section will describe alcohol use among youth and adults, problematic, hazardous, and harmful drinking and co-use with energy drinks.

Definition

A ***current drinker*** is defined as a person who has consumed a drink of beer, wine, liquor or any other alcoholic beverage in the past 12 months. Current drinkers can be further described as regular drinkers and occasional drinkers:

- A ***regular drinker*** is defined as a person who has had at least one drink once per month or more in the past 12 months.
- An ***occasional drinker*** is defined as a person who has had a drink less than once per month in the past 12 months.

Type of Drinker

Peel has a significantly lower proportion of regular drinkers (47%) compared to Ontario (56%) and a significantly higher proportion of non-drinkers (36% versus 27%) (Table 5.12). Males (56%) are more likely to report drinking regularly compared to females (38%) in Peel (Figure 5.23). The proportion of regular, occasional and non-drinkers in Peel have fluctuated over time.[H2-H8]

Table 5.12

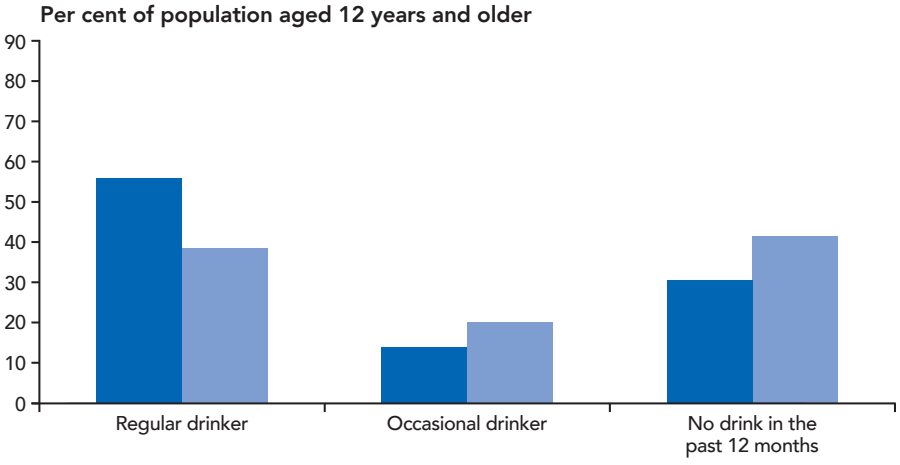
Type of Drinker†, Peel and Ontario, 2013/2014

Type of Drinker	Peel		Ontario	
	Per cent (95% CI)	Number	Per cent (95% CI)	Number
Regular drinker	47.0 (43.5–50.4)	553,700	56.0 (55.1–57.0)	6,422,600
Occasional drinker	17.0 (14.5–19.8)	200,200	17.2 (16.5–17.9)	1,971,700
No drink in the past 12 months	36.0 (32.8–39.4)	424,900	26.7 (25.9–27.6)	3,064,500

† Reflects respondents aged 12 years and older.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 5.23

Type of Drinker by Sex, Peel, 2013/2014



	Regular drinker	Occasional drinker	No drink in the past 12 months
Male Per cent (95% CI)	55.9 (50.6–61.1)	13.7 (10.2–18.3)	30.4 (25.9–35.2)
Female Per cent (95% CI)	38.4 (34.1–42.8)	20.1 (16.8–23.9)	41.5 (37.1–46.1)

Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

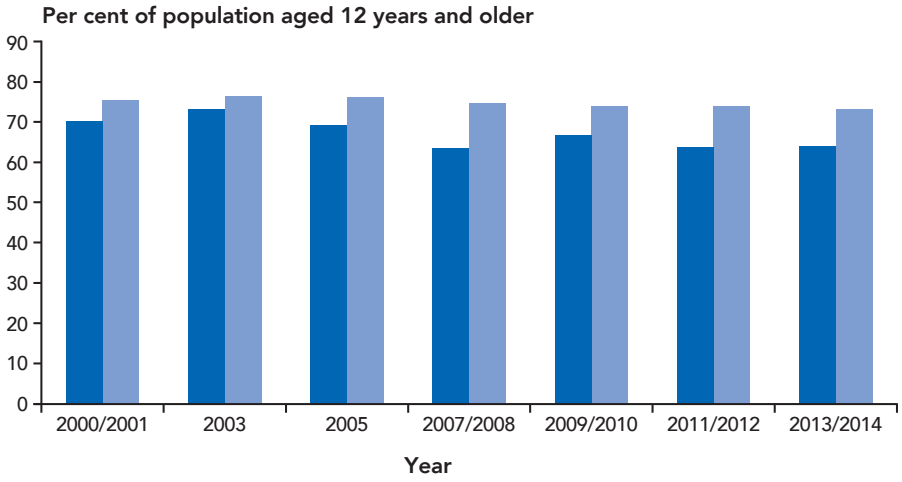
Current Drinkers

In Peel, the proportion of residents who are current drinkers (64%) is significantly lower than Ontario (73%).[H2] This rate has declined significantly between 2003 and 2013/2014 in both Peel and Ontario (Figure 5.24).

A significantly higher proportion of Peel males are current drinkers (70%) compared to females (59%).[H2] Additionally, a significantly higher proportion of Peel residents in the highest household income category (72%) are current drinkers compared to those at the low-middle income (47%* - use estimate with caution) and middle income (49%) categories.[H2]

Figure 5.24

Per cent of Current Drinkers, Peel and Ontario, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014



	2000/2001	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	70.2 (67.6–72.6)	73.1 (70.7–75.3)	69.3 (66.7–71.8)	63.4 (60.2–66.5)	66.6 (63.6–69.5)	63.8 (60.6–66.9)	64.0 (60.6–67.2)
Ontario Per cent (95% CI)	75.5 (74.8–76.2)	76.5 (75.9–77.2)	76.2 (75.5–76.8)	74.6 (73.8–75.3)	73.9 (73.1–74.6)	73.8 (72.9–74.7)	73.3 (72.4–74.2)

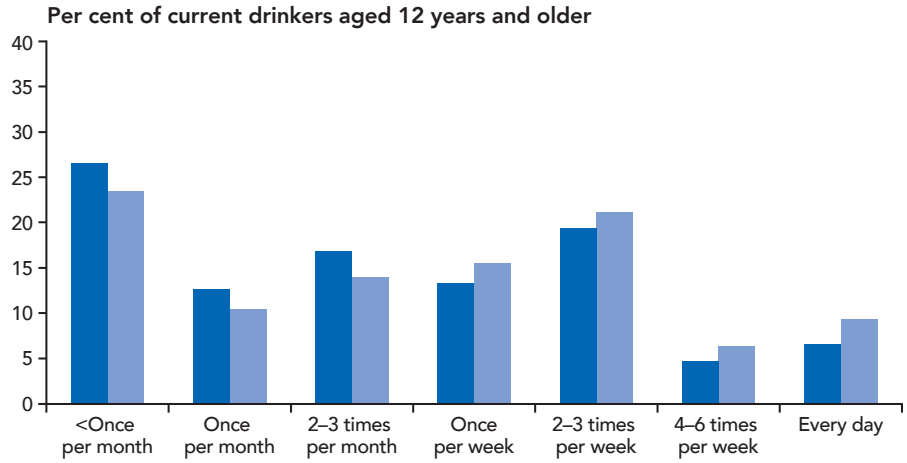
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Frequency of Alcohol Consumption

The majority of Peel residents who are current drinkers (56%) consume alcohol up to two to three times per month. This is similar to Ontario. (Figure 5.25)

Figure 5.25

Frequency of Alcohol Use, Peel and Ontario, 2013/2014



	<Once per month	Once per month	2–3 times per month	Once per week	2–3 times per week	4–6 times per week	Every day
Peel Per cent (95% CI)	26.6 (22.8–30.7)	12.7 (10.1–15.9)	16.8 (13.8–20.2)	13.3 (10.8–16.3)	19.4 (15.9–23.4)	4.7* (3.0–7.2)	6.6 (5.0–8.7)
Ontario Per cent (95% CI)	23.5 (22.6–24.4)	10.4 (9.8–11.0)	14.0 (13.2–14.8)	15.5 (14.7–16.2)	21.1 (20.2–22.1)	6.3 (5.8–6.8)	9.3 (8.7–9.8)

* Use estimate with caution.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Binge Drinking

Definition

Using 2013/2014 data, ***binge drinking*** is defined as having four (for females) and five (for males) or more drinks on one occasion, at least once per month in the past 12 months.[H2]

For data prior to 2013/2014, binge drinking is defined as having five or more drinks on one occasion, at least once per month during the past 12 months.[H3-H8]

In 2013/2014, 12% of Peel residents reported binge drinking at least once per month in the past 12 months. This is significantly lower than Ontario (17%).[H2] A significantly greater proportion of males (17%) binge drink compared to females (7%).[H2] In Peel, the prevalence of binge drinking has remained stable between 2000/2001 and 2013/2014 (data not shown).[H2-H8]

The adjusted results of the regression analysis for the association between binge drinking and social or behavioural determinants are presented in Table 5.13.

After controlling for all other factors in the model, binge drinking is independently associated with:

- Age: Those aged 19 to 34 years of age are more likely to binge drink compared with those aged 45 to 54 years of age.
- Marital status: Those who are single are more likely to binge drink compared with those who are married or common-law.
- Smoking status: Those who are current smokers are more likely to binge drink compared to non-smokers.

Table 5.13

Association Between Binge Drinking and Social or Behavioural Determinants†, Peel, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014 Combined

Variable	Male Adjusted Odds Ratio (95% CI) N=4,941	Female Adjusted Odds Ratio (95% CI) N=5,501
Age (years)		
15–18	**0.52 (0.31–0.87)***	1.33 (0.50–3.58)
19–24	**2.19 (1.35–3.54)***	**3.32 (1.80–6.11)***
25–34	**1.82 (1.21–2.73)***	**2.33 (1.40–3.88)***
35–44	1.23 (0.83–1.82)	1.35 (0.79–2.32)
45–54	1.0	1.0
55–64	0.61 (0.37–1.01)	0.68 (0.37–1.28)
65–75	0.61 (0.34–1.08)	0.73 (0.31–1.70)
Household income level		
Low-middle	0.64 (0.32–1.30)	0.55 (0.24–1.29)
Middle	**0.64 (0.44–0.93)***	0.75 (0.41–1.38)
Upper-middle	1.0	1.0
Highest	1.14 (0.88–1.48)	1.09 (0.77–1.56)
Education level		
Less than high school	1.05 (0.73–1.49)	0.81 (0.38–1.74)
High school	1.16 (0.82–1.65)	0.84 (0.56–1.26)
Some post-secondary	1.20 (0.80–1.79)	1.42 (0.86–2.37)
Post-secondary	1.0	1.0
Ethnicity		
White	1.0	1.0
Black	**0.43 (0.24–0.78)***	0.69 (0.31-1.53)
East/Southeast Asian	**0.42 (0.26–0.66)***	**0.34 (0.17–0.65)***
South Asian	**0.44 (0.31–0.63)***	**0.18 (0.07–0.48)***
Other	0.66 (0.41–1.08)	0.72 (0.40–1.29)
Immigrant status		
Recent immigrant	**0.37 (0.26–0.52)***	0.45 (0.19–1.09)
Long-term immigrant	0.77 (0.56–1.06)	**0.57 (0.37–0.88)***
Non-immigrant	1.0	1.0
Marital status		
Married/common-law	1.0	1.0
Divorced/separated/widowed	1.47 (0.92–2.34)	0.83 (0.47–1.47)
Single, never married	**1.49 (1.17–1.90)***	**1.69 (1.12–2.54)***
Employment status in past week		
Employed	1.0	1.0
Unemployed/permanently unable to work	**0.66 (0.48–0.92)***	**0.71 (0.51–0.98)***

Table 5.13 continues...

Table 5.13 continued

Variable	Male Adjusted Odds Ratio (95% CI) N=4,941	Female Adjusted Odds Ratio (95% CI) N=5,501
Sense of community belonging		
Very strong/somewhat strong	1.0	1.0
Somewhat weak/very weak	0.98 (0.79–1.21)	1.18 (0.90–1.55)
Self-perceived life stress		
Quite a bit/extremely	1.28 (0.96–1.70)	1.06 (0.78–1.45)
Not at all/not very/a bit	1.0	1.0
Self-perceived mental health		
Excellent/very good/good	1.0	1.0
Fair/poor	0.97 (0.54–1.76)	1.60 (0.90–2.86)
Self-perceived general health		
Excellent/very good/good	1.0	1.0
Fair/poor	1.31 (0.84–2.04)	0.71 (0.43–1.16)
Smoking status		
Current smoker	**2.25 (1.79–2.82)***	**3.65 (2.43–5.48)***
Non-smoker	1.0	1.0
Physical activity level		
Active	1.0	1.0
Moderately active	0.91 (0.69–1.20)	**0.66 (0.44–0.98)***
Inactive	**0.62 (0.48–0.79)***	**0.48 (0.35–0.67)***

† Reflects respondents aged 15–75 years.
* Indicates statistically significant findings (p<0.05).
Note: 95% CI reflects the 95% confidence interval of the estimated odds ratio.
Source: Canadian Community Health Survey Share File, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Harmful or Hazardous Drinking

Harmful drinking is defined as a pattern of drinking that is already causing damage to an individual's health (e.g., liver damage from chronic drinking, depressive episodes resulting from drinking).[171,172]

Among Ontario adults 18 years of age and older, 15% had symptoms of hazardous or harmful drinking and 7% report symptoms of alcohol dependence (findings based on AUDIT).[173] Data are not available for Peel adults.

In 2017, 7%* (*use estimate with caution) of Peel students in grades 9 to 12 had symptoms of hazardous or harmful drinking (as per AUDIT 8+). This is significantly lower than Ontario (14%).[U1]

Measurement

The World Health Organization's Alcohol Use Disorders Identification Test (AUDIT) is a screening tool which identifies **hazardous or harmful drinking**. Hazardous drinking is a pattern of drinking that increases the likelihood of future physical and mental health problems and is indicated by a score of eight or more out of 40 on the screening survey questions.[171]

The AUDIT is comprised of 10 questions pertaining to drinking frequency and quantity. The frequency of heavy drinking, impaired control, being unable to stop drinking, failing to meet obligations, morning drinking, guilt or remorse following drinking, the inability to remember events due to drinking, injury to oneself or others due to alcohol, and expression of concern regarding one's alcohol consumption from relatives, friends or others.[171]

Alcohol Attributable Diseases, Emergency Department Visits, Hospitalizations and Deaths

This section describes the numbers of cases of disease, emergency department visits, hospitalizations and deaths that are attributable to alcohol use.

Emergency Department Visits, Hospitalizations and Deaths that are 100% Attributable to Alcohol Use

Table 5.14 describes the number of emergency department visits, hospitalizations, and deaths that are 100% attributable to alcohol. Alcohol induced mental disorders are the most common condition for emergency department visits and hospitalizations. Alcoholic liver disease is the most common cause of death.

Definition

Emergency department visits, hospitalizations and deaths that are ***100% attributable*** to alcohol are fully the result of alcohol consumption and not any other cause. This definition is based on the International Classification of Disease Version 10 codes. It is recognized that there may be other underlying factors that are not captured.

Table 5.14

Average Annual Number of Emergency Department Visits, Hospitalizations, and Deaths that are 100 Per Cent Attributable to Alcohol, Peel

Health Condition	Emergency Department Visits (2012–2016 combined)	Hospitalizations (2012–2016 combined)	Deaths (2008–2012 combined)
Chronic conditions			
Alcohol induced mental disorders	3,174	377	3
Alcohol dependence syndrome	232	14	3
Alcoholic gastritis	68	16	0
Alcoholic liver disease	94	174	43
Degeneration of nervous system due to alcohol	2	12	0
Alcoholic polyneuropathy	0	0	0
Alcoholic cardiomyopathy	0	2	1
Alcoholic myopathy	0	0	0
Alcoholic-induced chronic pancreatitis	5	17	0
Fetal alcohol syndrome	3	0	0
Fetus and newborn affected by maternal use of alcohol	0	0	0
Acute conditions			
Alcohol-induced acute pancreatitis	72	150	2
Elevated blood alcohol level	0	0	0
Unintentional poisoning by alcoholic beverages	10	6	5
Alcohol poisoning undetermined intent	13	3	1
Suicide attempts by alcohol	28	12	0
Evidence of alcohol involvement determined by blood alcohol level	4	2	0
Total	**3,705**	**785**	**58**

Notes: Codes reflect alcohol-related conditions that are 100% attributable to alcohol.
Totals may include multiple conditions reported for the same person.
Sources: National Ambulatory Care Reporting System, 2012–2016, and Hospital In-Patient Discharges, 2012–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2008-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Alcohol and Public Health: Alcohol-Related Disease Impact (ARDI) [Internet]. Atlanta Georgia: National Centre for Chronic Disease Prevention and Health Promotion, Division of Population Health [cited May 3, 2018]. Available from: https://nccd.cdc.gov/DPH_ARDI/Info/ICDCodes.aspx.

Disease, Hospitalizations and Deaths that are Partially Attributable to Alcohol Use

To determine the disease, hospitalizations and deaths that are partially attributable to alcohol use, the following were used:

- Relative risks for alcohol-related diseases (Table 13.4) and population-attributable fractions for injuries that are partially attributable to alcohol consumption (Table 13.6).
- The proportion of Peel residents by level of daily alcohol consumption, by males and females (Table 13.5).

Table 5.15 presents the annual number of incident cases, hospitalizations and deaths partially attributable to the current level of alcohol consumption in Peel. There are an average of 81 incident cases, 178 hospitalizations and 36 deaths attributed to alcohol each year.

Table 5.15

Average Annual Number of Incident Cases, Hospitalizations and Deaths Attributable to Alcohol Use, Peel

Type of Disease	Incident Cases (2012–2016 or 2008–2012 combined)			Hospitalizations (2012–2016 combined)			Deaths (2008–2012 combined)		
	PAF Per cent	Number	Number Attributable to Alcohol	PAF Per cent	Number	Number Attributable to Alcohol	PAF Per cent	Number	Number Attributable to Alcohol
Respiratory diseases									
Tuberculosis	4.4	126	6	4.3	48	2	4.4	7	0
Lower respiratory infections; pneumonia	NA	NA	NA	2.1	1,730	37	2.1	122	3
Respiratory total	–	**126**	**6**	–	**1,778**	**39**	–	**129**	**3**
Cardiovascular diseases									
Ischaemic heart disease	0.1	3,698	2	0.1	4,189	3	0.1	691	0
Conduction disorders and other dysrhythmias	NA	NA	NA	2.7	931	26	2.4	38	1
Hemorrhagic stroke	NA	NA	NA	2.8	370	10	4.2	92	4
Ischaemic stroke	0.3	2,170	7	0.3	1,129	4	0.3	174	1
Hypertension	NA	NA	NA	3.9	233	9	4.3	53	2
Cardiovascular total	–	**5,868**	**9**	–	**6,852**	**52**	–	**1,048**	**8**

Table 5.15 continues...

Table 5.15 continued

Type of Disease	Incident Cases (2012–2016 or 2008–2012 combined)			Hospitalizations (2012–2016 combined)			Deaths (2008–2012 combined)		
	PAF Per cent	Number	Number Attributable to Alcohol	PAF Per cent	Number	Number Attributable to Alcohol	PAF Per cent	Number	Number Attributable to Alcohol
Gastrointestinal diseases									
Pancreatitis	NA	NA	NA	3.3	549	18	3.0	7	0
Cirrhosis of the liver	NA	NA	NA	13.5	68	10	26.9	32	9
Gastrointestinal total	–	**NA**	**NA**	–	**617**	**28**	–	**39**	**9**
Digestive diseases									
Oral cavity and pharyngeal cancer	14.8	11.3	17	14.6	97	14	14.1	25	4
Oesophageal cancer	8.1	42	4	7.6	38	3	8.2	37	3
Colon cancer	0.9	374	3	0.9	333	3	0.9	136	1
Rectal cancer	1.7	189	3	1.7	178	3	1.8	41	1
Liver cancer	4.1	71	3	3.8	111	4	3.6	73	3
Laryngeal cancer	9.6	26	3	10.1	19	2	9.5	9	1
Digestive total	–	**815**	**32**	–	**776**	**29**	–	**321**	**13**
Other diseases									
Female breast cancer	2.0	704	14	2.0	192	4	2.0	121	2
Epilepsy	NA	NA	NA	6.4	252	16	6.7	5	0
Diabetes	0.2	10,505	20	0.2	988	2	0.2	38	0
Low birth weight	NA	NA	NA	4.4	183	8	4.9	18	1
Other total	–	**11,209**	**34**	–	**1,615**	**30**	–	**182**	**3**
Total	–	**18,018**	**81**	–	**11,021**	**178**	–	**1,719**	**36**

PAF = Population-attributable fraction
NA - Data not available
Notes: Incidence of ischaemic heart disease, ischaemic stroke and diabetes include those aged 20 years and older. All others include those aged 15 years and older. Not all drinking categories for these diseases increase risk. The number attributable to alcohol refers to only those categories with increased risk (refer to Table 14.4 in Chapter 13 – Data Methods).
Sources: Integrated Public Health Information System (iPHIS), 2012-2016, Region of Peel – Public Health.
Ischaemic heart disease, Cerebrovascular disease, Diabetes, 2011-2015, Institute for Clinical Evaluative Sciences.
Ontario Cancer Incidence Database, 2008-2012, Cancer Care Ontario. SEER*Stat Package Release 10 – OCR (August 2015).
Hospital In-Patient Discharges, 2012-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2008-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The annual average number of injury-related hospitalizations and deaths partially attributable to the current level of alcohol consumption in Peel can be found in Table 5.16. There were an annual average of 450 hospitalizations and 48 deaths related to injuries that were attributable to alcohol.

Table 5.16

Average Annual Number of Injury-Related Hospitalizations and Deaths Attributable to Alcohol Use, Peel

Type of Injury	Hospitalizations (2012–2016)			Deaths (2008–2012)		
	PAF Per cent	Number	Number Attributable to Alcohol	PAF Per cent	Number	Number Attributable to Alcohol
Motor vehicle collisions	19.7	304	60	27.3	18	5
Cycling collisions	20.0	76	15	20.0	2	0
Water transport accidents	20.0	6	1	20.0	1	0
Accidental falls <65 years	18.5	802	148	20.4	13	3
Accidental falls 65+ years	6.5	1,374	90	7.6	90	7
Accidental excessive cold	25.0	3	1	25.0	0	0
Accidental drowning	34.0	6	2	34.0	7	2
Accidental aspiration	25.0	33	8	25.0	9	2
Striking against, struck by, caught in/between objects	7.0	108	8	5.8	1	0
Occupational and machine	7.0	40	3	7.0	1	0
Accidental firearm	25.0	5	1	25.0	0	0
Suicide, self-inflicted (excluding suicide by alcohol)	30.1	215	65	31.1	72	22
Assault†	47.0	102	48	47.0	14	7
Total	**–**	**3,074**	**450**	**–**	**228**	**48**

PAF=Population-attributable fraction.
† Defined as a victim of a fight, brawl, rape; assault with firearms or a cutting instrument; or victim of assault other.
Note: For hospitalizations, individuals could be included in more than one injury type.
Sources: National Ambulatory Care Reporting System, 2012–2016, and Hospital In-Patient Discharges, 2012–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2008–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

DRUG USE

Drug misuse is associated with increased harms and injuries, has an impact on in utero and childhood development, and impacts overall physical and mental health at any age.

Illicit Drug Use

Measurement

Any Drug Use (excluding cannabis) among respondents aged 12 years and older is based on a composite measure that includes past year use of any of the following: cocaine/crack; hallucinogens (phencyclidine or PCP, lysergic acid diethylamide or LSD); ecstasy (MDMA); amphetamines (speed); heroin; and glue/gasoline/other solvents.[H3]

In 2011/2012, 1%* (*use estimate with caution) of Peel residents reported using at least one drug (excluding cannabis) in the past 12 months, which was similar to Ontario (2%).[H3] The proportion of Peel's population reporting any drug use (excluding cannabis) in the past 12 months has remained stable between 2003 and 2011/2012 (data not shown).[H3-H7]

Use of Marijuana, Cannabis or Hashish

Cannabis refers to various psychoactive preparations of the plant *Cannabis sativa*, including:

- Marijuana (the dried and crushed leaves and flower buds);
- Hashish (the resin of flower buds); and
- Extracts (e.g., oils or wax).[174]

Did You Know

Canadian legislation to legalize and regulate non-medical cannabis came into effect on October 17, 2018.

There are immediate and long-term health risks associated with cannabis use. Risks may include:

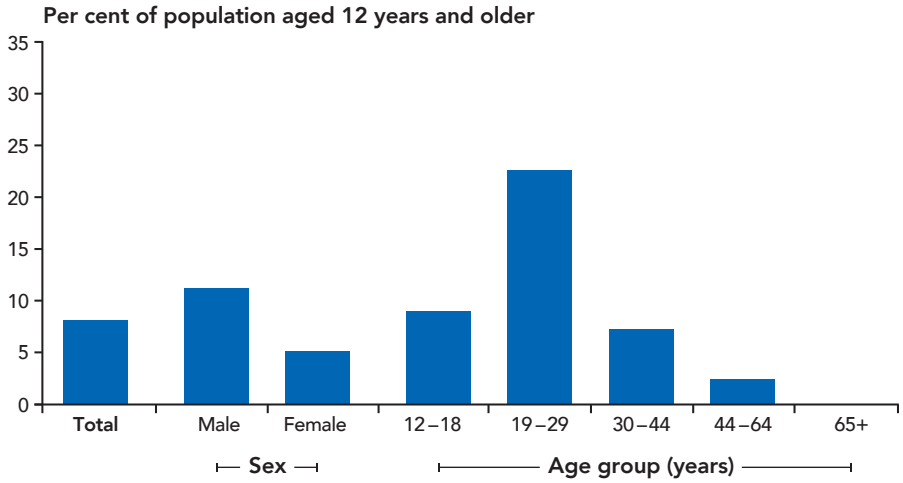
- problems with thinking, memory, or physical coordination;
- impaired perception or hallucinations;
- impaired driving and injuries (both fatal and non-fatal);
- mental health problems including dependence, addiction and psychosis;
- chronic respiratory or lung problems; and
- reproductive problems.[175]

The existing body of evidence on recreational cannabis is limited due to its past illegal status. Therefore, further research is required to better understand the full health implications of recreational cannabis use.

In Peel, 8% of residents report using cannabis at least once in the past 12 months, which is significantly lower than Ontario (12%).[H3] Peel males (11%) are significantly more likely than females (5%) to report using cannabis in the past 12 months.[H3] In addition, individuals aged 19 to 29 years (23%) are significantly more likely to report cannabis use compared to other age groups (Figure 5.26). The proportion of the Peel population reporting cannabis use in the past 12 months has remained stable between 2003 (10%) and 2011/2012 (8%).[H3-H7]

Figure 5.26

Per cent of Population Who Used Marijuana, Cannabis or Hashish in the Past 12 Months by Sex and Age Group, Peel, 2011/2012



	Total	Male	Female	12–18	19–29	30–44	44–64	65+
Peel Per cent (95% CI)	8.1 (6.7 – 9.9)	11.2 (8.7 – 14.3)	5.1 (3.7 – 6.9)	9.0* (5.9 – 13.4)	22.6 (17.8 – 28.2)	7.2* (4.2 – 12.1)	2.4* (1.3 – 4.6)	NR

* Use estimate with caution.
NR - Not releasable due to small numbers.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2011/2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Non-medical Use of Over-the-Counter and Prescription Drugs

Over-the-counter (OTC) medications are drugs that do not require a prescription and are sold in stores and pharmacies to help individuals self-manage symptoms.[176] OTC medications that are misused include codeine-based medicines, cough products (e.g., dextromethorphan), sedative antihistamines, decongestants and laxatives.[176] Misuse of OTC medications has negative health effects similar to those of illicit drugs, including psychosis, tachycardia, seizures, and agitation.[176]

Over the past year, 9% of Peel students in grades 7 to 12 used OTC cough/cold medicine to get "high", and 1%* (*use estimate with caution) used attention deficit hyperactivity disorder (ADHD) drugs for non-medical use.[U1] Among Peel students in grades 9 to 12, 2%* (*use estimate with caution) used tranquilizers/sedatives for non-medical use in the past year.[U1]

Data on non-medical use of OTC and prescription drugs for adult Peel residents are not available.

Opioids

Opioids are a family of related drugs. Some, such as morphine and codeine, occur naturally and are extracted from the opium poppy plant. Other opioids include synthetic varieties like fentanyl that are artificially created or are derived from morphine, such as oxycodone,

hydromorphone and heroin. Opioids vary in strength. Fentanyl, for example, has a toxicity level approximately 100 times greater than morphine.[177]

In a 2015 survey, 23% of adults in Ontario reported using prescription pain relievers in the past 12 months and 4% reported using opioid pain relievers for non-medicinal purposes in the same time period.[173] Data are not available for Peel adults.

In Peel, 12% of students in grades 7 to 12 have used opioid pain relief pills for non-medical use without a prescription in the last 12 months. This is similar to Ontario (11%).[U1] Additionally, 65% of Peel students in grades 7 to 12 who used opioid pills for non-medical use without a prescription obtained them from a parent or sibling. This is similar to Ontario (64%).[U1]

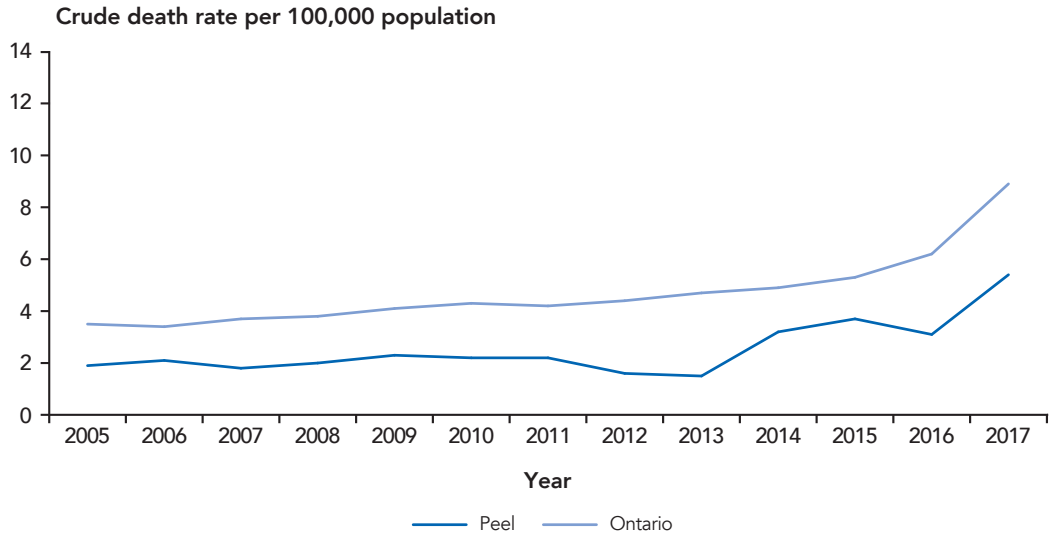
Opioid-related Deaths

Measurement

Data on deaths from opioid poisonings are obtained from the Public Health Ontario Interactive Opioid Tool, which includes deaths where opioid poisoning was considered to have contributed to the cause of death. Data are originally obtained from the Ontario Opioid-related Death database, Office of the Chief Coroner for Ontario.

The number of opioid-related deaths in Peel has tripled over the past five years from 21 deaths in 2013 to 81 deaths in 2017 (Figure 5.27).

Figure 5.27
Opioid-Related Deaths, Peel and Ontario, 2005–2017

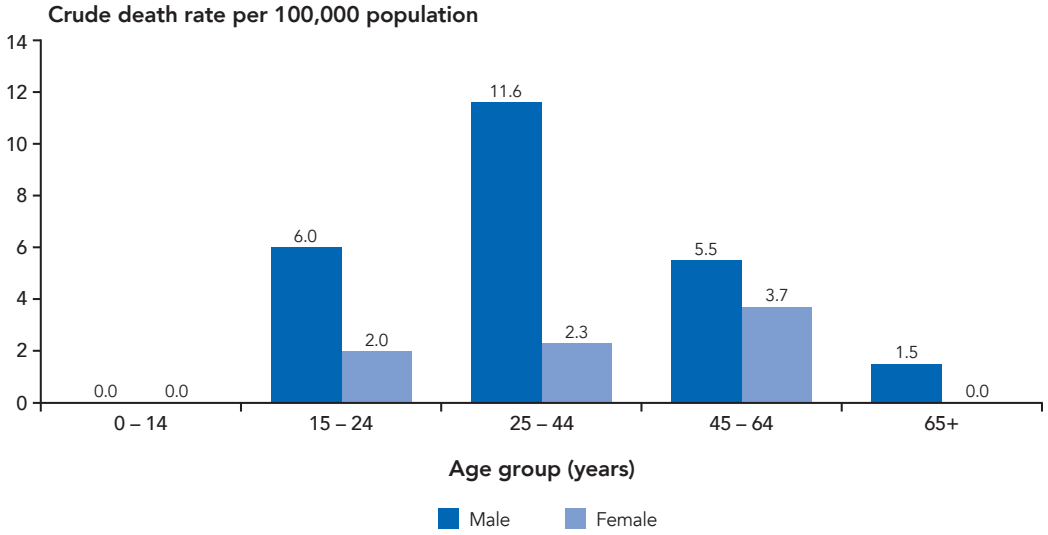


Note: Data for 2017 are preliminary and subject to change.
Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Interactive Opioid Tool [Internet]. Toronto, Ontario: Queen's Printer for Ontario; 2018.
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/Opioid.aspx.

Between 2014 and 2017 in Peel, the highest opioid-related mortality rate was among males aged 25 to 44 years (Figure 5.28).

Figure 5.28

Opioid-Related Deaths by Age Group and Sex, Peel, 2014–2017 Combined



Note: Data for 2017 are preliminary and subject to change.
Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Interactive Opioid Tool [Internet]. Toronto, Ontario: Queen's Printer for Ontario; 2018.
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/Opioid.aspx.

Drug Use Problems

In 2017, 2%* (*use estimate with caution) of all Ontario students in grades 9 to 12

Measurement

The **Severity of Dependence Scale (SDS)** is a validated five-item screening instrument used in the Ontario Student Drug Use and Health Survey[178] to determine the severity of one's dependence on a substance.[179]

The **Alcohol, Smoking and Substance Involvement Screening Test (ASSIST)** "screens for all levels of problem or risky substance use", where a "risk score is provided for each substance."[180,181]

The **CRAFFT test** is a six-item behavioural screening tool designed to assess problem substance use (alcohol or drugs) in the adolescent population.[182]

reported signs that indicate potential cannabis dependence, as per the marijuana SDS.[U1] In Ontario, 7%* (*use estimate with caution) of secondary school students who used marijuana in the past reported signs that indicate potential cannabis dependence.[U1]

In 2017, 12% (10,700) of Peel secondary school students were classified as having a potential drug use problem that may require intervention.[U1] This proportion is similar to Ontario (14%).[U1]

In 2015, 8% of Ontario adults aged 18 years and older reported signs that indicate moderate- or high-risk cannabis problems, as per the ASSIST-Cannabis Involvement Score (score 4 and higher).[173] In addition, 45% of Ontario cannabis users (18 years and older) reported signs that indicate moderate- or high-risk of cannabis problems.[173] Data are not available for Peel adults on cannabis-related problems, or substance problems, in general.

ROAD SAFETY

Road safety data presented in this section will describe driver behaviours including distracted driving, impaired driving, aggressive driving, speeding, driving while tired and seatbelt use.

Distracted Driving

Distracted driving contributes to motor vehicle crashes.[183] Using technology (e.g., smartphone) while driving is one of the most widely identified forms of distraction.[184] However, other visual, auditory, cognitive and physical distractions from inside or outside of the vehicle can also distract drivers.[184,185] Such diversions reduce a driver's awareness, decision-making or performance, and can lead to increased risk of driver error, near-crashes or crashes.[185]

In 2013/2014, 4%* (*use estimate with caution) of Peel drivers aged 16 years and older who had driven in the past year self-reported they often used a cell phone while driving (excluding hands-free phones), which is similar to trends in Ontario (3%) (Table 5.17). Significantly more males in Peel (6%* - use estimate with caution) report using a cell phone while driving than females (1%* - use estimate with caution) (Table 5.17).[H2]

Additionally, in 2017, 24% of Peel students and 33% of Ontario students in grades 10 to 12 who had a valid driver's licence reported texting or emailing from their cell phone while driving.[U1]

Impaired Driving

Drinking and driving among current drinkers in Peel and Ontario decreased between 2003 and 2013/2014 (Figure 5.29). In 2013/2014, 5%* (*use estimate with caution) of Peel drivers aged 16 years and older who are current drinkers reported driving after having two or more alcoholic drinks in the hour before they drove, which is similar to Ontario (4%) (Figure 5.29).

The proportion of Ontario drivers who reported drinking and driving was significantly higher among males (7%) compared to females (1%).[H2] Data are not releasable for Peel due to small numbers.

In 2017, 16% of Peel students in grades 7 to 12 reported riding in a vehicle with

Table 5.17

Proportion of Population Who Often Use a Cell Phone While Driving (Excluding Hands-Free) by Sex†, Peel and Ontario, 2013/2014

Sex	Peel		Ontario	
	Per cent (95% CI)	Number	Per cent (95% CI)	Number
Male	6.4* (3.6–11.0)	29,500*	4.1 (3.4–4.8)	183,800
Female	1.4* (0.7–2.5)	5,700*	1.6 (1.3–2.0)	67,900
Total	**4.0* (2.5–6.4)**	**35,200***	**2.9 (2.5–3.3)**	**251,700**

† Reflects respondents aged 16 years and older who have driven a motor vehicle in the past 12 months.
* Use estimate with caution.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

a driver who had consumed alcohol or other drugs (11%). Additionally, 8%* (*use estimate with caution) of students in grades 10 to 12 report using cannabis while driving. These proportions are similar to Ontario (Table 5.18)

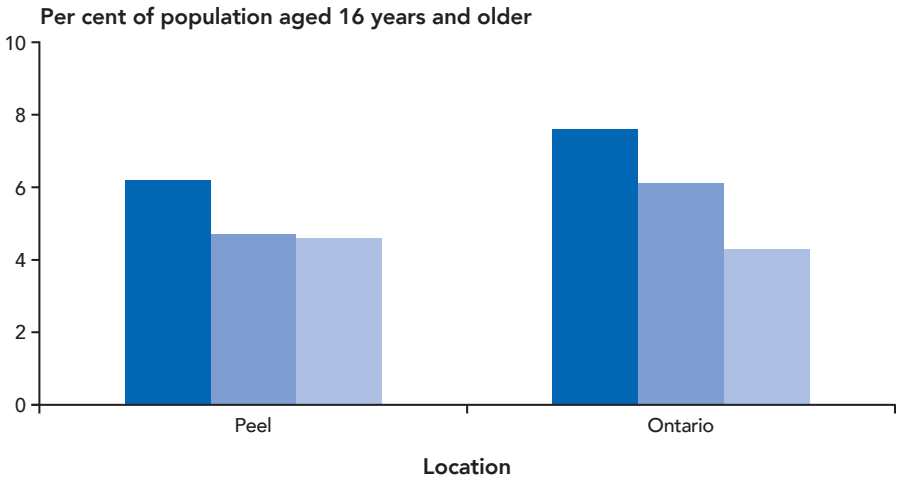
Aggressive Driving, Speeding, and Driving while Feeling Tired

"Aggressive driving includes speeding, running red lights, tailgating, weaving in and out of traffic, and failing to yield the right of way, among other dangerous driving behaviours. In Canada, 27% of fatalities and 19% of serious injuries involve speeding."[185] In addition, approximately 20% of fatal collisions involve driver fatigue.[185]

Table 5.19 summarizes road safety indicators for aggressive driving, speeding and driving while tired.

Figure 5.29

Per cent of Current Drinkers Who Drove After Having Two or More Drinks in the Hour Before They Drove†, Peel and Ontario, 2003, 2009/2010, 2013/2014



	Peel	Ontario
2003 Per cent (95% CI)	6.2 (4.8–8.0)	7.6 (7.1–8.1)
2009/2010 Per cent (95% CI)	4.7* (3.4–6.6)	6.1 (5.6–6.6)
2013/2014 Per cent (95% CI)	4.6* (3.0–7.1)	4.3 (3.9–4.9)

† Reflects respondents aged 16 years and older who are current drinkers (have drank in past 12 months) and who have driven a motor vehicle in the past 12 months.
* Use estimate with caution.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2003, 2009/2010, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Table 5.18

Student Impaired Driving (Alcohol and Drugs) in the Past 12 Months, Peel and Ontario, 2017

Impaired Driving Classification	Peel		Ontario	
	Per cent (95% CI)	Number	Per cent (95% CI)	Number
Drinking and driving (driver)†	NR	NR	4.2 (3.0–5.9)	11,600
Drinking and driving (passenger)‡	15.5 (13.5–17.8)	18,000	15.9 (14.3–17.7)	144,600
Using cannabis and driving (driver)†	7.9* (4.3–14.2)	2,500*	8.8 (6.9–11.1)	24,100
Using drugs and driving (passenger)‡	10.5 (8.6–12.7)	12,100	9.9 (8.8–11.2)	90,400

† Reflects students in grades 10–12 who have a valid driver's licence (G1, G2, or full G).
‡ Reflects students in grades 7–12.
* Use estimate with caution.
NR - Not releasable due to small numbers.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel - Public Health.

Table 5.19

Proportion of Population Who Engage in Unsafe Driving Practices,† Peel and Ontario, 2013/2014

Unsafe Driving Practice	Peel		Ontario	
	Per cent (95% CI)	Number	Per cent (95% CI)	Number
Drive much more or a little more aggressively than other drivers	9.8 (7.7–12.4)	85,700	12.7 (12.0–13.4)	1,102,000
Drive much faster or a little faster than other drivers	23.4 (20.0–27.1)	205,700	24.3 (23.4–25.3)	2,118,300
Often drive while feeling tired	8.9 (6.9–11.4)	78,600	8.6 (7.9–9.2)	747,200

† Reflects respondents aged 16 years and older who have driven a motor vehicle in the past 12 months.
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Seatbelt Use

The correct use of seat belts can reduce the probability of serious injury by 52% and the probability of death in a collision by 47%.[185]

In Peel, 97% of residents always wear a seat belt when driving and 96% do so when they are a passenger in the front seat. These trends are similar to Ontario.[H2] The proportion of Peel drivers who report always wearing a seat belt when driving is significantly higher among females (99%) compared to males (94%).[H2] A significantly lower proportion of Peel residents (80%) report wearing a seat belt while being a passenger in the backseat, compared to Ontario (85%).[H2]

Only 68% of Peel residents wear a seat belt while riding in a taxi, which is similar to Ontario (65%).[H2]

Chapter 6

Mental Health

Key Messages

- Peel residents have high levels of mental well-being demonstrated by measures such as self-rated mental health, happiness and life satisfaction. Additionally, most individuals have strong social networks.
- Mental well-being is influenced by determinants at four levels: individual, family, community and society.
  - At the individual level, many Peel adults experience childhood maltreatment and engage in lifestyle behaviours that lead to negative mental well-being.
  - At the family and community levels, Peel residents have strong social networks and social support that positively influence mental health.
  - There are limited data on mental well-being at the societal level in Peel.
- In Peel, depression is the most prevalent mental health disorder for which data are available.
- Since 2013, there have been increases in emergency department visits for substance-related mental health disorders, anxiety and mood disorders. Emergency department visits for mental health disorders have more than doubled among individuals younger than 24 years.
- Mental health varies by sex. Emergency department visits for anxiety, mood, personality and eating disorders and self-harm are more common among females. Males are more likely to be affected by substance-related mental health disorders and schizophrenia/ psychotic disorders and to die from suicide.
- Death due to mental health disorders and suicide is uncommon in Peel.
- In Peel, the incidence of dementia has stabilized while absolute numbers have increased. Prevalence of dementia continues to increase.

Mental health refers to "a state of well-being in which every individual realizes his or her own potential, and can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community."[186]

Mental health is more than the absence of mental illness; it is an overarching term capturing two dimensions that operate on separate continua: mental well-being and mental health disorders.

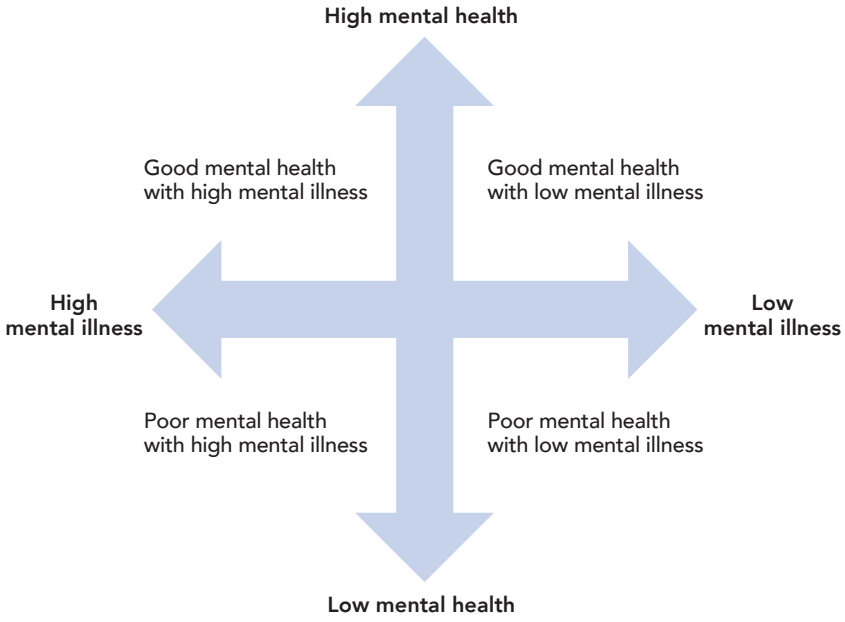
- Mental well-being refers to one's life satisfaction, happiness, and pro-social behaviour.
- Mental health disorders include a wide range of illnesses that affect mood, thinking and behaviour, or symptoms that interfere with emotional, cognitive and social function.

It is possible to achieve a state of mental well-being while having a mental health disorder. Likewise, the absence of a mental health disorder does not mean a person has a positive state of mental well-being (Figure 6.1).

This chapter describes the mental health status of Peel residents including the risk and protective factors that impact their mental health, the burden of mental health disorders, and access to health-care services.

Figure 6.1

Two Continua Model of Mental Health and Mental Illness



Adapted with permission from Keyes, 2010
Source: Keyes, CL. The next steps in the promotion and protection of positive mental health. Can J Nurs Res. 2010 Sep;42(3):17-28.

MENTAL WELL-BEING

Mental well-being is the capacity for each person to feel, think and act in ways that enhance the ability to enjoy life in a meaningful way and to deal with adversity.[187]

Table 6.1 presents indicators of mental well-being for Peel residents.

Self-rated Mental Health

Peel residents experience a high level of self-rated mental health. Approximately 72% of individuals 12 years and older self-rate their mental health as excellent or very good.[H2] This is similar to Ontario (71%) and has remained stable over time.[H2-H7]

Table 6.1

Mental Well-being Outcomes and Associated Measures, Peel

Mental Well-being Outcomes	Measures	Peel		
		Children Per cent	Adults Per cent	Total Per cent[¶]
Self-rated mental health	Self-rated mental health as "very good" or "excellent"[a]	77.4[†]	71.1[‡]	71.7
Happiness	Usually "happy and interested in life"[a]	82.0[†]	77.0[‡]	77.4
Life satisfaction	Very satisfied with life in general[a]	47.7[†]	34.0[‡]	35.3
Social well-being	"Very strongly" or "somewhat strongly" belong to their local community[a]	76.4[†]	67.1[‡]	68.0
Psychological well-being	High psychological well-being[b]	70.1[†]	75.1[‡]	74.6
Psychological distress	Students with moderate-to-high levels of psychological distress[c]	38.7[§]	--	NA
Academic achievement	Students with self-perceived mental health as affecting their grades a great deal or quite a lot[c]	31.5[†]	NA	NA

† Reflects respondents aged 12–17 years
‡ Reflects respondents aged 18 years and older
§ Reflects students in grades 7–12
¶ Reflects respondents aged 12 years and older
-- Data not available.
* Use estimate with caution.
NA – Not applicable.
Sources:
[a] Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[b] Canadian Community Health Survey Share File, 2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[c] Ontario Student Drug Use and Health Study, 2017, Centre for Addiction and Mental Health. Region of Peel - Public Health.

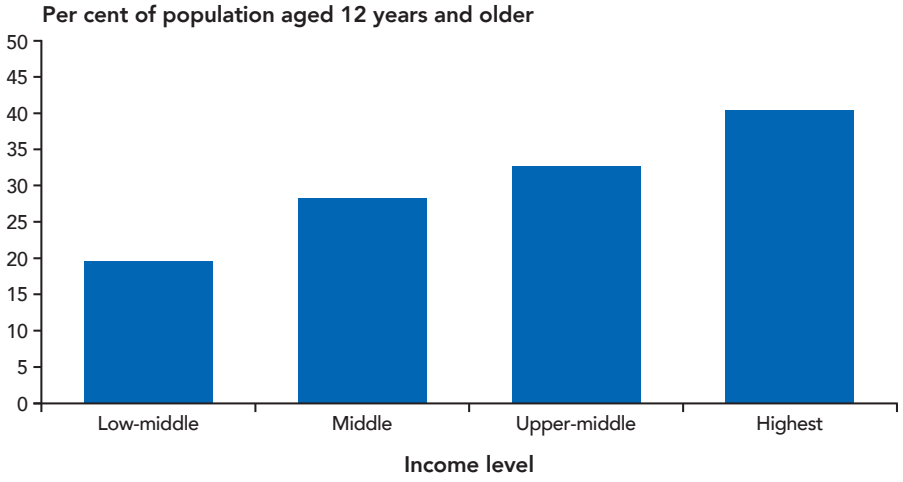
Happiness and Life Satisfaction

Happiness, a measure of subjective well-being, includes positive emotions, life satisfaction and life objectives, and is associated with lower health-care utilization.[188,189] Most residents in Peel (77%) describe themselves as usually being happy and generally interested in life.[H2] The prevalence of happiness in Peel is similar to Ontario (77%).[H2]

Life satisfaction is strongly associated with emotional well-being.[190] In Peel, 35% of residents aged 12 years and older are very satisfied with life in general. This proportion has remained stable over time between 2009/2010 and 2013/2014 and is similar to Ontario (37%).[H2-H4] Satisfaction with life is significantly higher among those in the highest income category, as compared to individuals with the lowest income (Figure 6.2).

Figure 6.2

Per cent of Population Very Satisfied with Life in General by Income Level, Peel, 2013/2014



	Low-middle	Middle	Upper-middle	Highest
Per cent (95% CI)	19.5* (10.8–32.6)	28.3 (22.0–35.7)	32.6 (26.5–39.4)	40.4 (35.7–45.2)

*Use estimate with caution
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

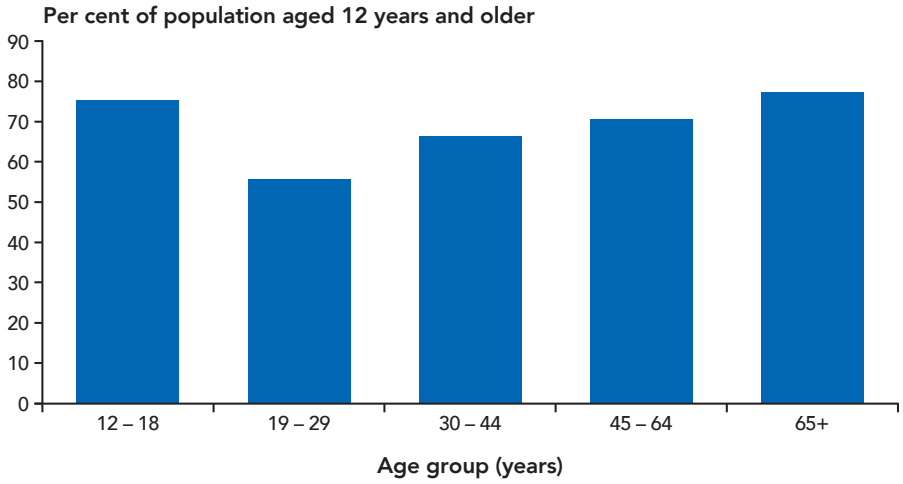
Social Well-being

Social well-being reflects an individual's sense of his/her experience in society including one's social contribution, acceptance, coherence, actualization and integration.[190] One's sense of belonging in the community is a recommended measure for social well-being.[190]

In Peel, 68% of the population have a very or somewhat strong sense of community belonging. Individuals 19 to 29 years old (56%) are the least likely to have a strong sense of community belonging compared to other age groups (Figure 6.3). Additionally, long-term immigrants (72%) are more likely to have a very strong sense of community belonging than non-immigrants (61%).[H2]

Figure 6.3

Very or Somewhat Strong Sense of Community Belonging by Age Group, Peel, 2013/2014



	12 – 18	19 – 29	30 – 44	45 – 64	65+
Per cent (95% CI)	75.2 (67.5 – 81.6)	55.7 (48.0 – 63.0)	66.4 (59.5 – 72.7)	70.6 (64.2 – 76.4)	77.2 (69.6 – 83.4)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Psychological Well-being

Psychological well-being refers to a person's sense of autonomy, mastery, personal growth, positive relations with others, purpose in life and self-acceptance.[190] In both Peel and Ontario 75% of residents have a high level of psychological well-being.[H10] Individuals aged 45 to 64 years old (82%) are more likely to report a high level of psychological well-being compared to those aged 19 to 29 years (59%).[H10]

Measurement

Psychological well-being is measured by the Mental Health Continuum – Short Form (MHC-SF) in the Canadian Community Health Survey. Within the MHC-SF, there is a six-item subscale on psychological well-being.

Psychological Distress

Psychological distress refers to unpleasant feelings or emotions that negatively impact a person's level of functioning and daily living. Among students in grades 7 to 12, 39% have moderate-to-high psychological distress.[U1] This is similar to Ontario (39%).[U1] Female students are 1.6 times more likely to experience moderate-to-high psychological distress compared to males (Figure 6.4). Moderate-to-high psychological distress is higher among students in older grades compared to younger students (Figure 6.4).

In Ontario, 26% of adults experience moderate-to-high levels of psychological distress and this is associated with: being female, between 18 to 29 years of age, not having completed high school, having low household income, and never having been married.[173] Data are not available for Peel adults.

Measurement

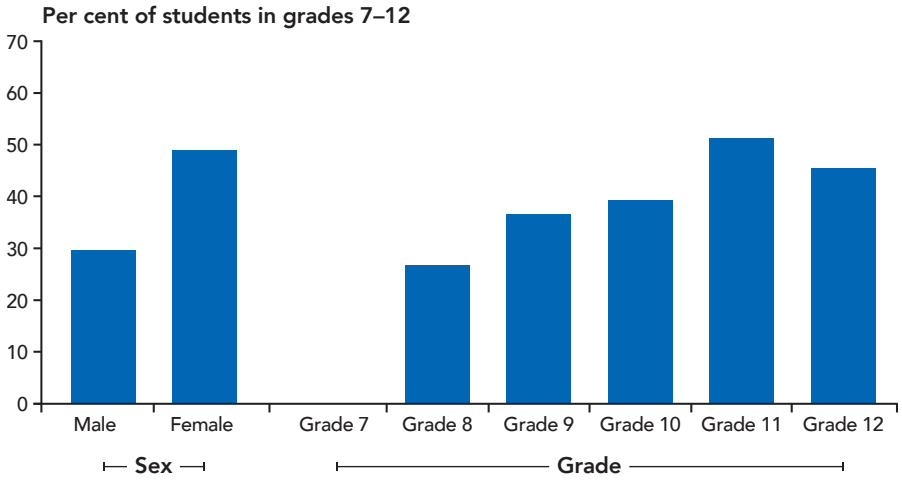
Psychological distress was assessed using the Kessler Six-item Psychological Distress Scale (K6). This validated screening tool assesses feelings and behaviours of individuals over the previous four weeks in order to detect non-specific psychological distress.

Student Academic Achievement

Student academic achievement is adversely affected by mental health problems.[191] In Peel, 32% of students in grades 7 to 12 perceive their mental health to be affecting their grades a great deal or quite a lot.[U1] This is comparable to Ontario (29%). Students in Grade 12 are three times more likely than students in Grade 7 to perceive their mental health to be affecting their grades (Figure 6.5).

Figure 6.4

Moderate-to-High Levels of Psychological Distress among Grade 7–12 Students by Sex and Grade, Peel, 2017

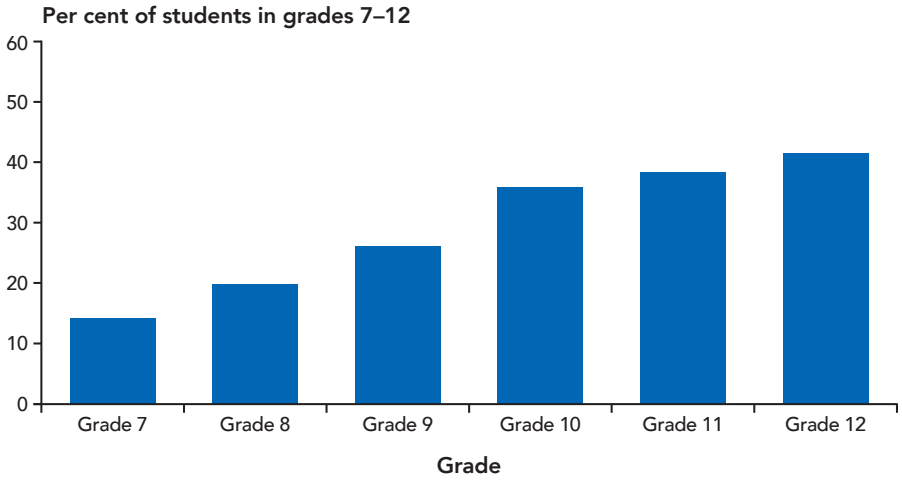


	Male	Female	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Per cent (95% CI)	29.6 (24.0 – 35.9)	49.0 (42.6 – 55.4)	NR	26.7 (19.0 – 36.1)	36.5 (29.5 – 44.2)	39.3 (31.8 – 47.4)	51.2 (42.0 – 60.4)	45.4 (37.8 – 53.2)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
NR – Not releasable due to small numbers.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.

Figure 6.5

Per cent of Grade 7–12 Students Self-Perceived their Mental Health as Affecting their Grades a Great Deal or Quite a lot by Grade, Peel, 2017



	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Per cent (95% CI)	14.2 (9.4 – 20.9)	19.8 (13.7 – 27.7)	26.1 (18.3 – 35.8)	35.9 (29.7 – 42.7)	38.3 (26.6 – 51.5)	41.5 (34.3 – 49.0)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.

DETERMINANTS OF MENTAL WELL-BEING

Mental well-being is shaped by multiple, interacting biological, social and psychological factors in the environments in which people live, work and play.[191-193] According to the Positive Mental Health Surveillance Indicator Framework, determinants of mental well-being can be organized into a socio-ecological model with four levels of influence: individual, family, community, and society (Figure 6.6).[192]

The following section describes the determinants of mental well-being within each of these four levels.

Individual Determinants of Well-being

An individual's mental health is influenced by resilience, coping, childhood environment, control and self-efficacy, exposure to violence, physical health status, physical activity, substance use, and spirituality.[192] Data gaps exist for several measures of individual determinants (Table 6.2).

Figure 6.6

Determinants of Mental Wellbeing across Ecological Levels

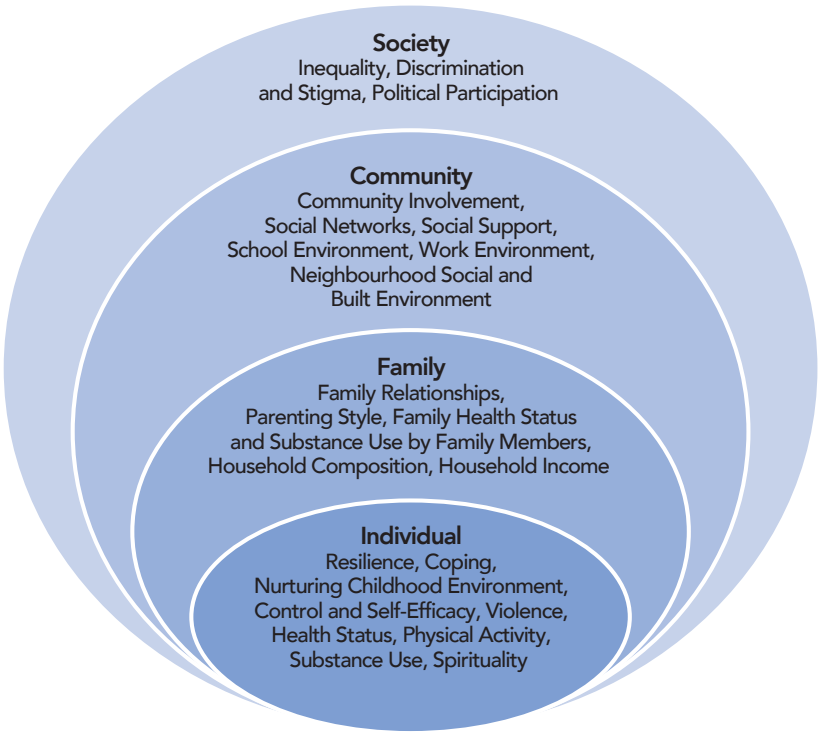


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Table 6.2

Individual Determinants of Mental Well-being and Associated Measurements' Peel

Individual Determinants	Measures	Peel		
		Children Per cent	Adults Per cent	Total Per cent††
Health status	Physical health self-rated as "very good" or "excellent"[a]	69.4†	56.4‡	57.6
	No or mild disability[a]	70.4†	67.9‡	68.1
Resilience	(Measurement in development by the Public Health Agency of Canada)	--	--	--
Coping	High level of coping[b]	34.7†*	39.8‡	39.3
Control, self-efficacy and self-esteem	Low self-esteem[c]	7.9§	--	--
	High level of perceived control over life chances	--	--	--
Nurturing childhood environment	Students who report having dinner together with their family greater than 5 times/week	--	NA	NA
	Students who report their family is willing to help them make decisions	--	NA	NA
Violence	Students who had a fight on school property[c]	9.4§	NA	NA
	Students who bullied others at school in the past school year[c]	11.2§	NA	NA
	Students who is a victim of bullying at school in the past school year[c]	17.2§	NA	NA
	Adults who experienced child maltreatment before age of 16[d]	NA	36.5ß	--
	Experienced a serious traumatic event that affected them emotionally[c]	37.6§	--	--
	Report being a victim of physical/sexual assault in the past year	--	--	--
	Adults who report being victim of spousal violence in the past five years	NA	--	NA
Physical activity	Are "active" or "moderately" active during their leisure time[a]	66.2†	44.4‡	46.4
	Students with at least 60-minutes of daily physical activity[c]	19.4§	NA	NA
	Engage in at least 150 minutes/week of moderate or vigorous physical activity in 10-minute bouts	NA	--	NA
Substance use	Students in grades 9–12 with harmful or hazardous drinking[c]	6.6*	--	NA
	Past-year users with symptoms of cannabis dependence (grades 9–12)[c]	7.2*	--	NA
	Drug use problem[c]	11.9§	--	--
	Current drinkers whose alcohol consumption falls within the low-risk alcohol drinking guidelines[a]	NA	85.9ß	NA
Spirituality	Report that religious or spiritual beliefs are "very important" or "somewhat important" in their daily life[d]	--	74.6¥	--

† Reflects respondents aged 12–17 years
‡ Reflects respondents aged 18 years and older
§ Reflects students in grades 7–12
¶ Reflects respondents aged 20 years and older
ß Reflects respondents aged 19 years and older
¥ Reflects respondents aged 15 years and older
†† Reflects respondents aged 12 years and older
-- Data not available.
* Use estimate with caution.
NA – Not applicable.

Sources:
[a] Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[b] Canadian Community Health Survey Share File, 2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[c] Ontario Student Drug Use and Health Study, 2017, Centre for Addiction and Mental Health. Region of Peel - Public Health
[d] Canadian Community Health Survey Share File – Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Health Status

Poor self-rated health or presence of a disability are two examples of measures that are associated with mental health. For additional details about the physical health status of Peel residents, please refer to ***Chapter 3 – General Health Status***.

Resilience and Coping

Currently, a specific measurement for resilience is still in development by the Public Health Agency of Canada and there are no resilience data available for Peel and Ontario.

Coping skills are strategies that help an individual deal with mental health challenges in order to achieve positive mental health. Positive coping skills can protect an individual's mental well-being.

Peel residents (39%) have a similar proportion of high coping levels as Ontario (38%).[H9] In Peel, low-level coping is most prevalent among youth and young adults (Figure 6.7). Coping ability differs by household income: 52% of all individuals in the highest income quintile have a high-level of coping as compared to only 24% of those in the lowest quintile.[H9]

Control, Self-efficacy and Self-esteem

Having a positive sense of self, as observed by measuring one's coping skills, control, and positive self-esteem, influences a person's mental health through a sense of autonomy, mastery and self-efficacy. A person is more likely to take control of his or her health if he or she feels in control of life. In Peel, 8% of students in grades 7 to 12 have low self-esteem which is similar to Ontario (7%).[U1] Data for Peel adults are not available.

Measurement

Coping level is measured by two questions in the Canadian Community Health Survey.

- In general, how would you rate your ability to handle the day-to-day demands in your life. For example, handling work, family and volunteer responsibilities?
- In general, how would you rate your ability to handle unexpected and difficult problems. For example, a family or personal crisis?

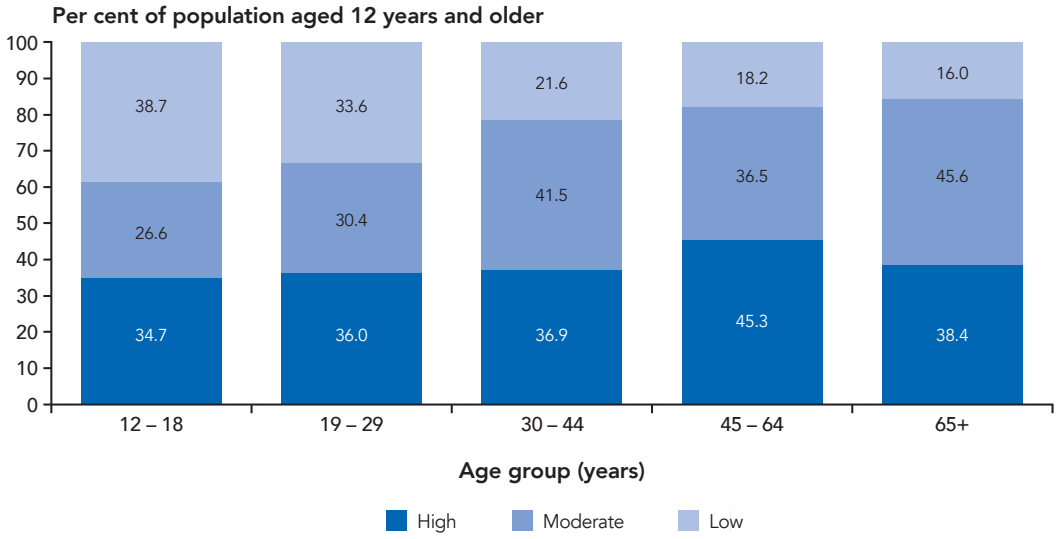
Levels of coping are defined as:

- High coping: 'Excellent' to both or any combination of 'Excellent' and 'Good' to the two questions;
- Moderate coping: 'Good' to both questions; and
- Low coping: 'Fair' or 'Poor' on either of the two questions.

Measurement

Low self-esteem is measured in the Ontario Student Drug Use and Health Survey through respondents' agreement rating with the statement "I am satisfied with myself". Those who strongly disagree are classified as having low self-esteem.

Figure 6.7
Coping Level by Age Group, Peel, 2016



Source: Canadian Community Health Survey Share File, 2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Nurturing Childhood Environment

A nurturing childhood environment with strong family involvement and support in decision making can help a child build resilience and promote mental well-being. Peel and Ontario data for this concept are not available.

Traumatic Life Events

Violence, experienced or witnessed, can be physical, sexual, psychological or emotional. Mental health disorders such as depression, anxiety, and suicidal behaviour can occur as a result of exposure to violence.[191] For additional details about assault in Peel, refer to ***Chapter 8 – Injuries and Violence***.

Definition

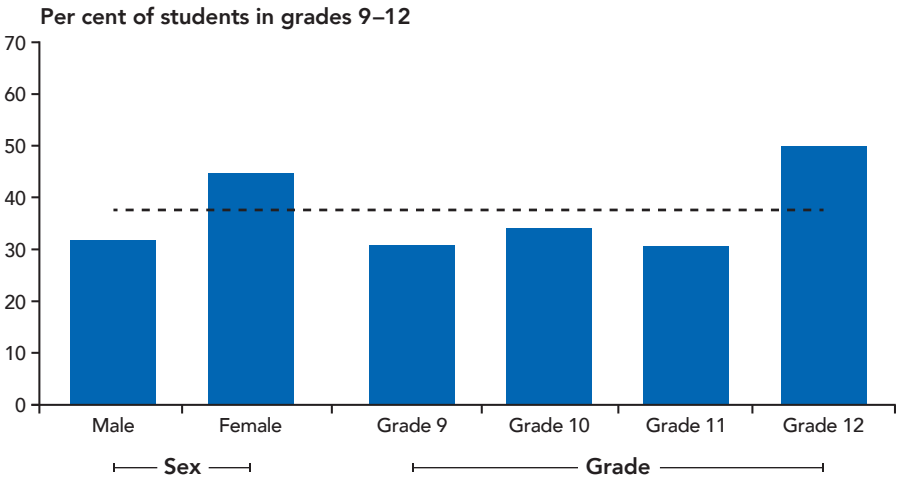
A ***serious traumatic event*** is self-identified by the student as a negative event that affected them emotionally or physically.

Individuals who have experienced a traumatic event are more likely to have poor mental well-being.[191] Among secondary school students in Peel, approximately 38% experienced a serious traumatic event that affected them emotionally in their lifetime (Figure 6.9). This is similar to Ontario (35%).[U1]
In Peel, female students are more likely than males to have experienced a traumatic event (Figure 6.8) and the prevalence of experiencing a traumatic event is highest among students in Grade 12 (Figure 6.8).

In Peel, 37% of individuals aged 20 years and older have experienced child abuse before the age of 16 (i.e., physical abuse, sexual abuse and/or exposure to intimate partner violence).[H11] This is similar to Ontario (32%).[H11]

Figure 6.8

Per cent of Grade 9–12 Students who Experienced a Serious Traumatic Event† by Sex and Grade, Peel, 2017



	Male	Female	Grade 9	Grade 10	Grade 11	Grade 12
Per cent (95% CI)	31.8 (27.4 – 36.5)	44.8 (38.5 – 51.3)	30.8 (24.9 – 37.5)	34.1 (26.4 – 42.8)	30.7 (23.6 – 38.8)	49.9 (40.6 – 59.2)

† A serious traumatic event is self-identified by the student as a negative event that affected them emotionally or physically.
Notes: 95% CI reflects the 95% confidence interval of the estimated per cent. Dotted line represents the estimate for all Grade 9–12 students.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.

Measurement

Child abuse is measured by the Canadian Community Health Survey using items from the Childhood Experiences of Violence Questionnaire. Respondents were asked to report the frequency of occurrence for different types of abuse before the age of 16 years (never, one to two times, three to five times, six to 10 times or more than 10 times). Respondents were classified as having experienced child abuse if they had one or more of the three types of abuse:

- Physical abuse: Being slapped on the face, head or ears, hit or spanked with something hard; pushed, grabbed or shoved; having something thrown at the respondent to hurt them three or more times; or being kicked, bit, punched, choked, burned or physically attacked one or more times.
- Sexual abuse: Experiencing attempts or being forced into unwanted sexual activity by being threatened, held down or hurt in some way; and/or being sexually touched which includes unwanted touching, grabbing, kissing or fondling against the respondent's will one or more times.
- Exposure to intimate partner violence: Having seen or heard parents, step-parents or guardians hitting each other or another adult in the home three or more times.[194]

Physical Activity

Regular physical activity can promote feelings of self-efficacy, self-determination, control and self-esteem and protect against depression across the lifespan.[191,195,196] Only 46% of individuals aged 12 years and older in Peel are active or moderately active during leisure time. For additional details regarding physical activity behaviour in Peel, refer to ***Chapter 5 – Health and Behaviours***.

Substance Use

Substance use is linked to lower life satisfaction and can exacerbate, mimic or mask the symptoms of mental health disorders.[191] Substance abuse among Peel adults and students is low compared to Ontario. For additional detail on alcohol and drug use among Peel residents, refer to ***Chapter 5 – Health and Behaviours***.

Spirituality

Spirituality, within or separate to a religious affiliation, can positively influence mental well-being.[191] In Peel, 75% of individuals aged 15 years or older rate religious/spiritual beliefs as being very or somewhat important in their daily lives. This is higher than the Ontario population (65%).[H11]

Spirituality differs by age, immigrant status and ethnicity. Across age groups, Peel individuals aged 15 to 24 years old (55%) have the lowest proportion of people ranking religious/spiritual beliefs as high in their daily lives.[H11] Recent and long-term immigrants (86%) are 1.5 times more likely than non-immigrants (58%) to have strong spirituality. More non-white individuals (87%) have strong spirituality as compared to white individuals (62%) (Figure 6.9).

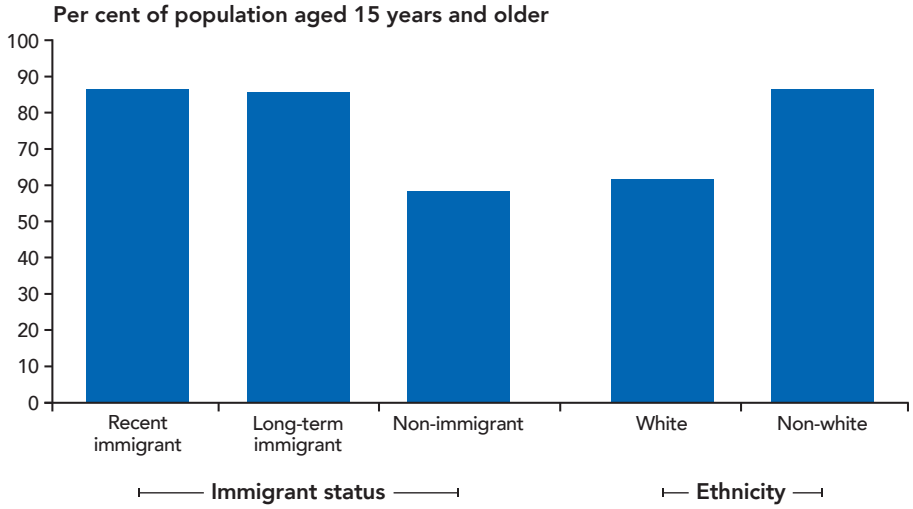
Family Determinants of Mental Well-being

At the family level, an individual's mental health is influenced by family relationships, parenting style, family health status and substance use by family members, and household composition and household income (Table 6.3).

Relationships are essential to mental well-being. Available data on family determinants indicate that a segment of Peel residents are negatively affected by isolation or by a family member who has a mental health or substance misuse problem. Data gaps exist for other family determinants of mental well-being, particularly parenting style.

Figure 6.9

Per cent of Population Having Very or Somewhat Important Religious/Spiritual Beliefs in Their Daily Lives by Immigrant Status and Ethnicity, Peel, 2012



	Recent immigrant	Long-term immigrant	Non-immigrant	White	Non-white
Per cent (95% CI)	86.5 (73.9 – 93.6)	85.6 (76.3 – 91.6)	58.3 (48.6 – 67.4)	61.6 (52.4 – 70.1)	86.6 (80.4 – 91.1)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Table 6.3

Family Determinants of Mental Well-being and Associated Measurements

Family Determinants	Measures	Peel	
		Children† Per cent	Adults‡ Per cent
Family relationships	Students (grades 7–12) who get along very well with their mother[a]	74.3	NA
	Students (grades 7–12) who get along very well with their father[a]	63.8	NA
	Students (grades 7–12) who always or usually talk about their problems to at least one parent[b]	35.1	NA
	Students who report it is "very easy" or "easy" to talk to their parents about things that really bother them	--	NA
	Students who have high communication (i.e., talking about important things, listening to each other, asking questions when there is a misunderstanding, and taking until misunderstandings are clear) in their family	--	NA
Parenting style	Students who report that their parents trust them	--	NA
	Students who report that their parents expect too much from them	--	NA
Family health status and substance use by family members	Mothers who drank alcohol during pregnancy[c]	NA	1.0§
	Mothers who took drugs during pregnancy[c]	NA	1.0§
	Family member who has problems with their emotions, mental health or use of alcohol or drugs[d]	--	25.7§
	Is affected "a lot" or "some" by a family member who has problems with their emotions mental health or use of alcohol or drugs[d]	--	47.3§
Household composition	Live in a lone-parent census family household[e]	16.4¶	5.9§
	Live with a spouse or partner in a census family household[e]	NA	57.3§
	Persons not in economic families who live alone[e]	NA	6.1§
Household income	Private households living below the low-income cut-off after tax[e]	NA	10.1

† Reflects respondents aged 12–17 years, unless otherwise stated.
‡ Reflects respondents aged 18 years and older, unless otherwise stated.
§ Reflects individuals aged 15 years and older
¶ Reflects individuals aged 0–14 years.
-- Data not available.
NA – Not applicable.
Sources:
[a] Ontario Student Drug Use and Health Study, 2013, Centre for Addiction and Mental Health. Region of Peel – Public Health.
[b] Ontario Student Drug Use and Health Study, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.
[c] Public Health Unit Analytic Reporting Tool (Cube), BORN Information System (BIS), BORN Ontario. Information accessed on October 18–19, 2017.
[d] Canadian Community Health Survey Share File – Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[e] Census, 2016. Statistics Canada.

Family Relationships and Parenting Style

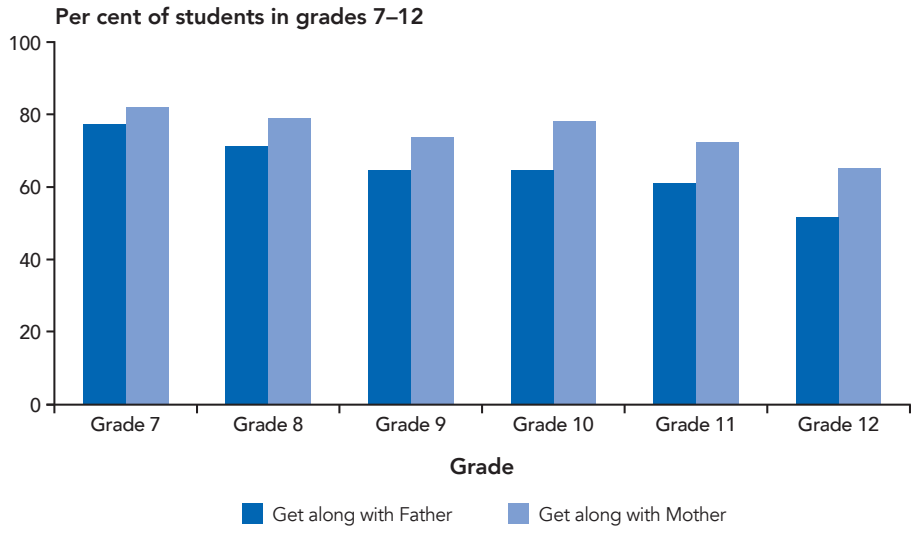
Positive and secure attachment between parents and children promotes a child's mental well-being. In Peel, 74% of students in grades 7 to 12 reported getting along very well with their mother and 64% reported getting along very well with their father (Figure 6.10). This is similar to Ontario students (data not shown).[U3]

Among Peel students in grades 7 to 12, 35% always or usually talk about their problems or feelings with at least one parent. This is similar to Ontario (34%). Males are less likely than females to talk to their parents about their problems. Across grades, students in Grade 7 are most likely to always or usually talk to their parents about their problems (Figure 6.11).

There are no Ontario or Peel level data for measures of parenting style.

Figure 6.10

Per cent of Students who Get Along Very Well with Their Mother or Father by Grade, Peel, 2013

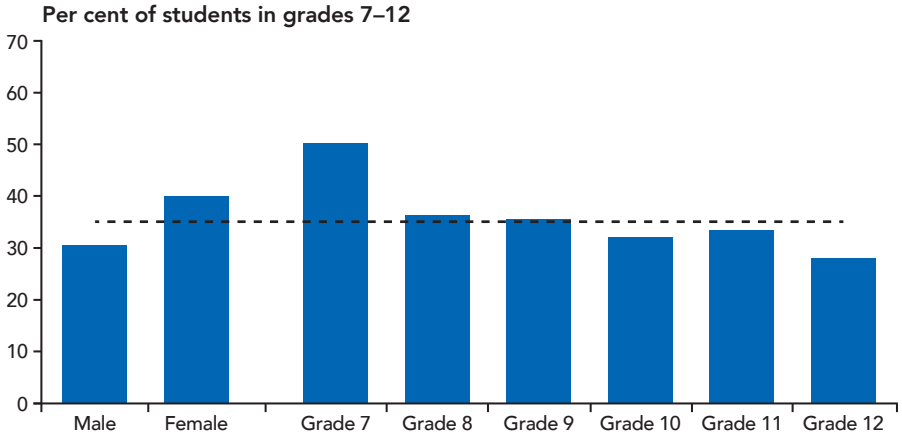


	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Get along with Father Per cent (95% CI)	77.3 (70.7–82.8)	71.2 (66.3–75.6)	64.5 (57.6–70.8)	64.5 (58.2–70.4)	60.9 (53.4–67.9)	51.7 (45.3–58.0)
Get along with Mother Per cent (95% CI)	82.1 (77.7–85.9)	79.1 (70.4–85.7)	73.7 (69.0–78.0)	78.1 (71.8–83.4)	72.3 (64.0–79.3)	65.3 (58.9–71.3)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey 2013, Centre for Addiction and Mental Health. Region of Peel – Public Health.

Figure 6.11

Per cent of Students who Always or Usually Talk to One of Their Parents About Their Problems or Feelings by Sex and Grade, Peel, 2017



	Male	Female	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Per cent (95% CI)	30.5 (25.5 – 35.9)	40.0 (36.5 – 44.1)	50.1 (37.9 – 62.3)	36.2 (29.8 – 43.2)	35.5 (29.4 – 42.0)	32.0 (26.5 – 38.2)	33.3 (26.1 – 41.4)	28.0 (21.6 – 35.4)

Notes: 95% CI reflects the 95% confidence interval of the estimated per cent. Dotted line represents the estimate for all Grade 7-12 students.
Source: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health, Region of Peel – Public Health.

Family Health Status and Substance Use by Family Members

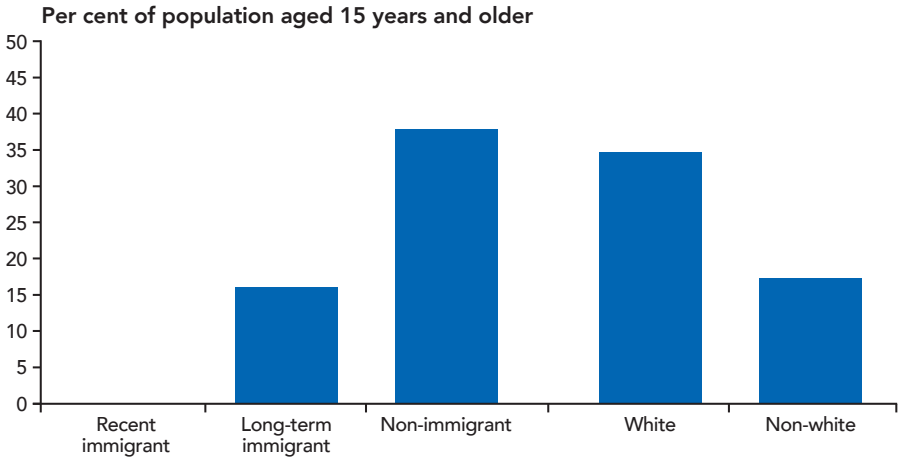
Poor parental health, including substance or alcohol abuse during pregnancy, can negatively impact a child's mental health. For more details on maternal smoking, second-hand smoke exposure and drug and alcohol abuse during pregnancy in Peel, see ***Chapter 4 – Health in Early Life***.

In Peel, 26% of individuals aged 15 and older have a family member who has problems with their emotions, mental health or use of alcohol or drugs. This is lower than Ontario (36%). Of these individuals, 47% report that their family member's problem affected their life "a lot" or "somewhat."[H11]

Non-immigrants (38%) are twice as likely as long-term immigrants (16%* - use estimate with caution) to have a family member with mental health or substance use problems as are white individuals (35%) compared with non-white (17%) individuals (Figure 6.12).

Figure 6.12

Per cent of Population with a Family Member who has Problems with their Emotions, Mental Health or Use of Alcohol or Drugs by Immigrant Status and Ethnicity, Peel, 2012



	Recent immigrant	Long-term immigrant	Non-immigrant	White	Non-white
Per cent (95% CI)	NR	16.1* (9.4 – 26.1)	37.8 (29.1 – 47.3)	34.7 (26.3 – 44.2)	17.3 (11.2 – 25.8)

*Use estimate with caution
NR – Not releasable due to small numbers
Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File – Mental Health Module, 2012, Statistics Canada.
Ontario Ministry of Health and Long-Term Care.

Household Income and Household Composition

Poverty is an important risk factor of poor mental health. For example, individuals living in lone and teenage parent families often have lower household incomes, and, as a result, are at a higher risk for poor mental health. In Peel, one in 10 private households live below the low-income cut-off after tax.[A1] For more information on about household composition and income in Peel, refer to ***Chapter 2 – Determinants of Health***.

Community Determinants of Mental Well-being

At the community level, mental health is influenced by community involvement, social networks, the school or workplace, and the neighbourhood social and built environment (Table 6.4). There are data gaps in the measures of mental well-being at the community level. Available data on community determinants indicate that most people in Peel have strong social networks or support that promote mental well-being.

Table 6.4

Community Determinants of Mental Well-being and Associated Measurements

Community Determinants	Measures	Peel	
		Children† Per cent	Adults Per cent
Community involvement	Are members of, or participate in, at least one recreational or professional organization, group, association or club	--	--
Social networks	Students (grades 7–12) who feel close to people at school[a]	85.4	NA
	Students who can count on their friends when things go wrong	--	NA
	Students who have friends to share their joys and sorrows with	--	NA
	Have no close friends or family members	NA	--
	Students who did not know hwere to turn to for mental health or emotional issues.	33.1	--
Social support	Report a high level of perceived social support[b]	--	78.7‡
School environment	Students (grades 7–12) who felt they were a part of their school[a]	84.9	NA
Work environment	Experience high job strain[c]	NA	10.3§
Neighbourhood social environment	Report that their neighbourhood is a place where neighbours help each other	--	--
	Report that social disorder in their neighbourhood is "a very big problem" or "a fairly big problem"	--	--
	Students who can trust people in the area where they live	--	NA
Neighbourhood built environment	Students who report there are places such as recreation centres, parks and shopping centres to spend free time in the area where they live	--	NA

† Reflects respondents aged 12–17 years
‡ Reflects respondents aged 18 years and older
§ Reflects respondents aged 18–75 years
-- Data not available.
NA – Not applicable.
Sources:
[a] Ontario Student Drug Use and Health Study, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.
[b] Canadian Community Health Survey Share File, 2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[c] Canadian Community Health Survey Share File – Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Community Involvement

Being a part of a community group or organization enhances social connections and increases self-efficacy, positively influencing mental health. There are no Peel level data available for this concept.

Social Networks and Social Support

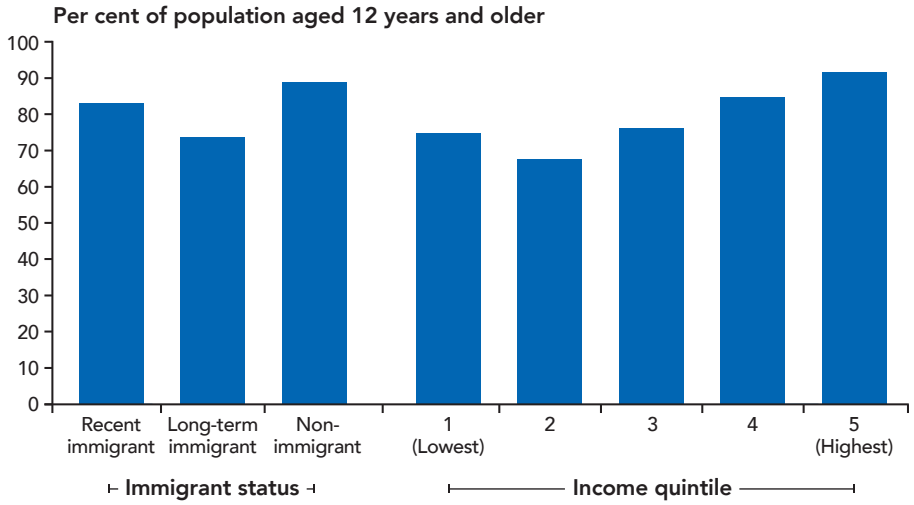
Higher levels of social capital (e.g., community cohesion, reciprocity and belonging), the presence of supportive social relationships and strong community involvement enhance mental well-being. In Peel, 79% of residents have a high level of social support.[H9] This is comparable to Ontario (83%).[H9] Young adults aged 19 to 29 years most frequently reported having a high level of social support (92%) while older adults (aged 65 years and older) had the lowest proportion (62%). Non-immigrants (89%) were more likely to have a high level of social support as compared to long-term immigrants (74%) (Figure 6.13). The proportion of Peel residents with a high level of social support was higher among individuals in the highest income quintile, as compared to those in the lowest quintile (Figure 6.13).

Measurement

Social support is measured by the Canadian Community Health Survey using the shortened version of the Social Provisions Scale. In this version, there are 10 items on five main social provisions: attachment, guidance, social integration, reliable alliance, and reassurance of worth. Scores can range from 10 to 40, where a higher score indicates a higher level of perceived social support. Respondents with a score of 30 or higher are classified as having a high level of social support.

Figure 6.13

High-Level of Social Support by Immigrant Status and Income Quintile, Peel, 2016



	Recent immigrant	Long-term immigrant	Non-immigrant	1 (Lowest)	2	3	4	5 (Highest)
Per cent (95% CI)	82.9 (68.8 – 91.5)	73.6 (65.7 – 80.2)	88.8 (83.2 – 92.7)	74.8 (65.7 – 82.2)	67.4 (51.9 – 79.8)	76.1 (64.3 – 84.9)	84.6 (76.5 – 90.3)	91.4 (83.9 – 95.6)

Notes: 95% CI reflects the 95% confidence interval of the estimated per cent.
A score of 30 or higher on the Social Provisions Scale was considered having a high-level of social support.
Survey participants who did not respond to the questions in the scale were included in the calculation of the denominator.
Source: Canadian Community Health Survey Share File, 2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Positive, close friendships are one of the most important elements of school that contribute to a child's mental health. Most Peel students in grades 7 to 12 (85%) feel close to people at their school.[U1] There are no data available for Peel adults on this concept.

Did You Know

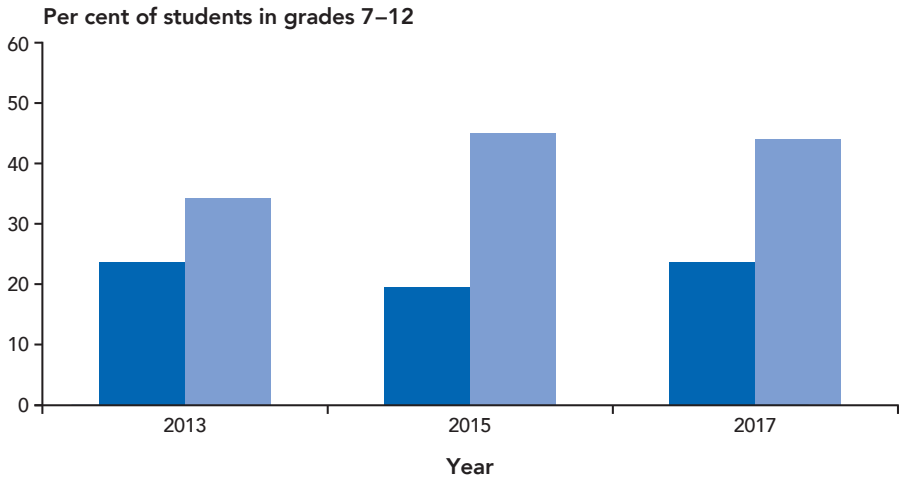
In Ontario, 6% of individuals aged 18 years and older report having no close friends or family members.[197]

Support for Mental Health or Emotional Issues

Among Peel students in grades 7 to 12, 33% felt like they "did not know who to turn to" when they wanted to discuss mental health or emotional health issues.[U1] This is similar to Ontario (31%).[U1] Female students (44%) more commonly reported feeling like this compared to male students (24%) (Figure 6.14). The proportion of female students who did not know who to turn to has increased over time between 2013 and 2017 (Figure 6.14).

Figure 6.14

Students in Grades 7–12 who Did Not Know who to Turn to when Wanting to Discuss a Mental or Emotional Health Issue by Sex, Peel, 2013, 2015, 2017



	2013	2015	2017
Male Per cent (95% CI)	23.6 (16.4–24.6)	19.4 (13.8–26.6)	23.6 (18.6–29.4)
Female Per cent (95% CI)	34.2 (30.9–37.7)	44.9 (39.0–50.8)	43.9 (37.9–50.1)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Ontario Student Drug Use and Health Survey, 2013- 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.

School Environment

In the school community, a child's mental well-being is positively influenced by a sense of belonging at school. In Peel and Ontario, most students in grades 7 to 12 feel that they are a part of their school (85%).[U1]

Workplace Environment

A positive workplace environment promotes mental well-being by providing a sense of fulfillment and opportunities for social interaction. However, a workplace environment causing stress can increase the risk of mental health disorders.

High job strain is experienced by workers in roles that are psychologically demanding but have little power to make decisions or use their skills.[198] Approximately 10% of individuals aged 15 to 74 years in Peel and Ontario experience high job strain.[H11]

Measurement

Job strain is measured by the Canadian Community Health Survey using seven items from the Job Content Questionnaire.

Neighbourhood Social and Built Environment

Community connectedness, trust and cooperation are conducive to mental well-being. Higher levels of community trust are associated with lower levels of psychological distress.[191] Currently, there are no Peel data available for this concept.

The built environment refers to buildings, spaces and products created or modified by people. This includes houses, roads, transport systems, buildings, public spaces and urban green space. Green space can promote mental health by reducing exposure to pollution and stress and increasing opportunities for physical activity, social connections and participation. Exposure to prolonged stressors in the built environment or as a result of neighbourhood crime contribute to poor mental health.[199] There are no Peel or Ontario level data available for this concept.

Did You Know

In Ontario, most adults aged 18 years and older (89%) and children 12 to 17 years of age (93%) report their neighbourhood is a place where neighbours help each other.[197]

Societal Determinants of Mental Well-being

Societal factors such as the level of inequality, the presence or absence of discrimination and stigma and political participation influence mental health (Table 6.5).

Inequality

Mental health disorders are more common in socially disadvantaged populations (e.g., in populations with less education, lower income and lower standard of living).[191] Measures of inequality, as they relate to mental health, are still in development by the Public Health Agency of Canada.

Discrimination and Stigma

Discrimination adversely impacts a person's sense of dignity and self-esteem. The isolation, fear and intimidation associated with discrimination can lead to social exclusion. In Peel, 35%* (*use estimate with caution) of individuals aged 15 years and older reported experiencing negative opinions or unfair treatment due to their mental health problem. This is similar to Ontario (28%).[H11]

Political Participation

Participation in activities that influence local decisions can increase self-esteem, self-efficacy and positively impact mental health. The municipal voter turnouts for Mississauga (37%), Brampton (36%) and Caledon (35%) are lower than the Ontario municipal average (43%).

Table 6.5

Societal Determinants of Mental Well-being and Associated Measures, Peel

Societal Determinants	Measures	Peel	
		Children† Per cent	Adults‡ Per cent
Inequality	(Measurement in development by Public Health Agency of Canada)	--	--
Discrimination and stigma	Experienced negative opinions or unfair treatment due to mental health problems[a]	--	34.9§
	Experienced disability discrimination in the workplace	NA	--
	Experienced unfair treatment at least once in the past year based on gender, race, age or appearance	--	--
Political participation	Registered electors who voted in the 2014 Mississauga municipal election[b]	NA	36.6
	Registered electors who voted in the 2014 Brampton municipal election[b]	NA	36.2
	Registered electors who voted in the 2014 Caledon municipal election[b]	NA	34.9

† Reflects respondents aged 12–17 years, unless otherwise stated
‡ Reflects respondents aged 18 years and older, unless otherwise stated
§ Reflects respondents aged 15 years and older
-- Data not available.
NA – Not applicable.
Sources:
[a] Canadian Community Health Survey Share File – Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[b] Association of Municipalities Ontario. 2014 Municipal Elections Voter Turnout Report [Internet]. C2015 [cited 2018 Sep 8]. Available from: https://greenstone.civicweb.net/document/11344

BURDEN OF MENTAL HEALTH DISORDERS

In Ontario, the burden of mental health disorders (as measured by years of life lost and year-equivalents of reduced functioning) is 1.5 times greater than all cancers combined and seven times greater than all infectious diseases combined.[200]

Prevalence, emergency department visits and mortality data associated with mental health disorders are presented in Table 6.6. While there appear to be few deaths associated with mental health disorders in Peel, the impact of mental health on mortality is likely to be underestimated.

Did You Know

Individuals diagnosed with severe mental health disorders are at least twice as likely than the general population to die from cardiovascular, respiratory and infectious diseases.[201] Those with substance-related mental health disorders and schizophrenia are most vulnerable to early death. Such disparities are explained by the different health-seeking behaviours, treatment compliance, lifestyle and social consequences associated with mental illness and diagnostic overshadowing (i.e., focus on mental illness and not physical health in those with severe mental illness).[202,203]

There are limited Peel data on the incidence and prevalence of mental health disorders. Among the disorders for which data are available, depression is the most prevalent (Table 6.6).

Table 6.6

Prevalence, Emergency Department Visits and Mortality for Mental Health Disorders, Peel, 2012, 2014, 2016

Mental health disorder	Prevalence (2012, 2014, 2016)		Emergency Department Visits (2016)[e,f]		Mortality (2012)[f,g]	
	Per cent	Number	Crude rate per 100,000	Number	Crude rate per 100,000	Number
Substance-related disorders	--	--	**381.1**	**5,590**	**1.1**	**15**
Alcohol abuse/ dependence	2.4*†[a]	28,189*†[a]	265.8	3,912	0.6	8
Cannabis abuse/ dependence	NR†[a]	NR†[a]	17.2	253	0	0
Other drug abuse/ dependence	NR†[a]	NR†[a]	96.7	1,423	0.51	7
Anxiety disorders	**2.2*†[a]**	**25,732*†[a]**	**307.3**	**4,507**	**0**	**0**
Mood disorders	--	--	**237.2**	**3,479**	**0.1**	**1**
Depression	4.3*[b]	53,000*[b]	176.3	2,595	0.1	1
Bipolar disorder	NR†[a]	NR†[a]	49.3	726	0	0
Schizophrenia/ psychotic disorders	--	--	**186**	**2,733**	**0.1**	**1**
Schizophrenia	0.8‡[c]	11,190‡[c]	--	--	--	--
Dementia	**5.6§[d]**	**10,872§[d]**	**23.2**	**340**	**31.9**	**435**
Personality disorders	--	--	**13.0**	**191**	**0**	**0**
Eating disorders	--	--	**3.2**	**47**	**0**	**0**
All mental health disorders	--	--	**1,272.6**	**18,728**	**34.1**	**465**

*Use estimate with caution
† Data from 2012 and reflects individuals aged 15 years and older
‡ Data from 2016 and reflects individuals aged 7 years and older
§ Data from 2014 and reflects individuals aged 65 years and older
NR – Not releasable due to small numbers.
-- Data not available.
Sources:
[a] Canadian Community Health Survey Share File – Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
[b] Canadian Community Health Survey Share File – Mental Health Module, 2015/2016, Statistics Canada. Ontario Ministry of Health And Long-Term Care.
[c] Schizophrenia, 2016, Institute for Clinical Evaluative Sciences
[d] Dementia, 2014, Institute for Clinical Evaluative Sciences. (Prevalence only)
[e] National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[f] Population Estimates, 2012,2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[g] Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Did You Know

Prior to 2006, all hospitalizations were captured under the Discharge Abstract Database (DAD). Effective April 1st 2006, all adult mental health-care bed stays are captured in the Ontario Mental Health Reporting System (OMHRS). To capture all hospitalizations related to mental health disorders, both databases are required. Hospitalization data for mental health disorders are not presented due to the limitations of the DAD.

Definition

Substance-related mental health disorders involve different intellectual, behavioural and biological symptoms resulting from continuous use of a substance despite experiencing substance-related issues.

Anxiety disorders include excessive and persistent fear, anxiety, muscle tension, vigilance and avoidant behaviours in anticipation of future threat or danger with symptoms lasting beyond the early years.

Mood disorders include depressive disorders, bipolar disorder and dysthymia. Individuals who suffer from mood disorders experience significant distress or impairment in social, occupational, educational or other important areas of functioning.

Bipolar disorders are classified into two types, bipolar I and bipolar II. Bipolar I disorder is characterized by a manic episode that may occur before or after a hypomanic or major depressive episode. Bipolar II disorders include the lifetime experience of at least one episode of major depression and at least one hypomanic episode which results in an unstable mood.

Depressive disorders are a type of mood disorder that include the presence of sad, empty or irritable mood alongside bodily and intellectual changes that affect the ability to function.

Schizophrenia and other psychotic disorders may include delusions (i.e., irrational beliefs), hallucinations and eccentric behaviour with such symptoms often being cyclical.

Personality disorders consist of inner experiences and behaviours which vary significantly from one's cultural expectations, are persistent and inflexible, are constant over time and lead to distress or impairment.

Eating disorders are categorized by a persistent disruption of eating or eating-related behaviour resulting in an altered consumption of food which significantly impairs health and functioning.[204]

Incidence and Prevalence of Mental Health Disorders

Incidence data are only available for schizophrenia and dementia.

Schizophrenia

The incidence of schizophrenia has remained relatively stable over time in Peel (data not shown). The incidence and prevalence of schizophrenia is higher among males compared to females. The incidence of schizophrenia is highest among individuals aged 18 to 25 years. Prevalence is highest among those aged 26 to 64 years (Table 6.7).

? *Did You Know*

In Ontario, schizophrenia spectrum disorder is present in 12% of suicides, despite the disorder affecting only 1% of the general population. Individuals with schizophrenia that died by suicide were more likely to have sought health care in the month prior to their suicide compared to those without schizophrenia.[205]

Table 6.7

Incidence and Prevalence of Schizophrenia by Sex and Age Group Peel, 2016

Mental health disorder		Incidence		Prevalence	
		Crude rate per 100,000	Number	Crude rate per 100,000	Number
Sex	**Male**	43	280	908	5,962
	Female	28	191	766	5,228
Age group (years)	**7–17**	12	26	18	37
	18–25	103	162	660	1,045
	26–39	40	112	1,058	3,015
	40–64	25	123	1,061	5,304
	65–74	20	22	990	1,099
	75+	35	26	927	690
Total (ages 7+)		**35**	**471**	**836**	**11,190**

Source: Schizophrenia, 2016, Institute for Clinical Evaluative Sciences

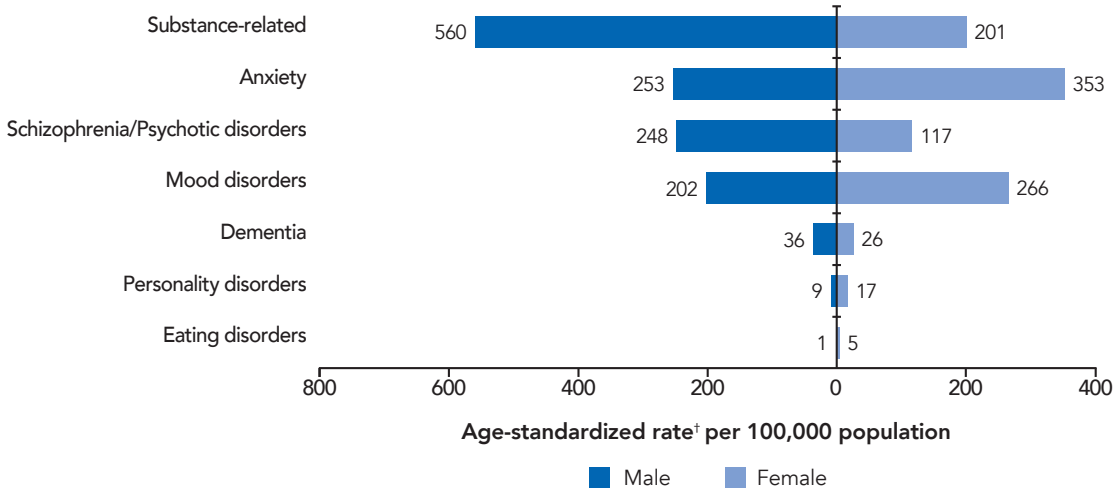
Emergency Department Visits for Mental Health Disorders

Emergency department (ED) visit rates show clear differences in the types of mental health disorders present among Peel residents by sex (Figure 6.15). Females have higher rates of ED visits for anxiety, mood, personality and eating disorders (Figure 6.15) whereas ED visits for substance-related and schizophrenia/ psychotic disorders are more common among males (Figure 6.15).

Mental health disorders resulting in an ED visit are most common among those aged 15 to 39 years old (Figure 6.16).

Figure 6.15

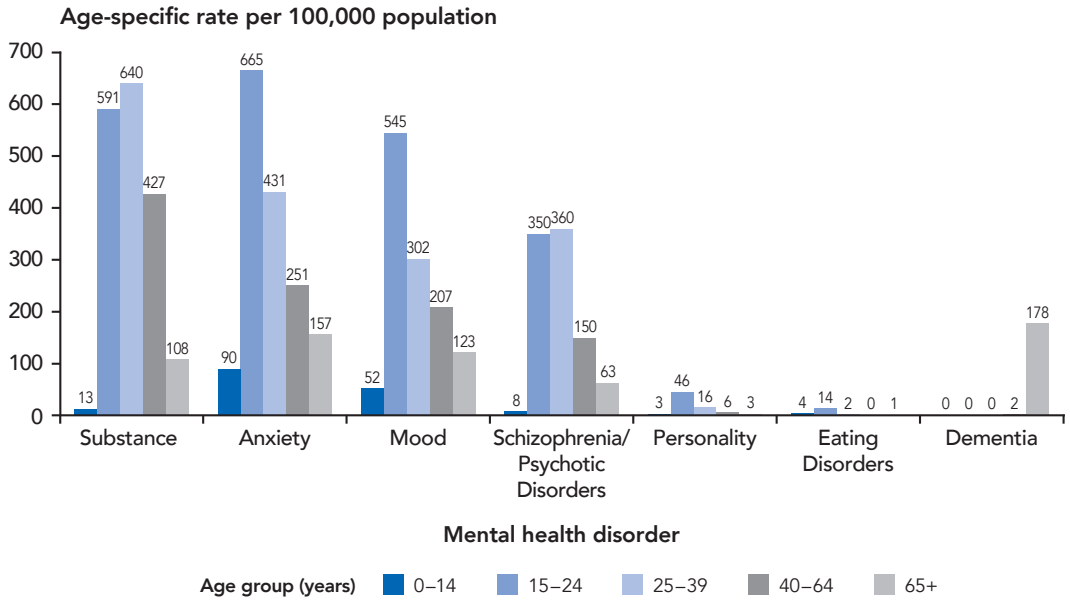
Emergency Department Visits for Mental Health Disorders by Sex, Peel, 2016



† Rates are age-standardized to the 2011 Canadian population.
Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

Figure 6.16

Emergency Department Visits for Mental Health Disorders by Age Group, Peel, 2016

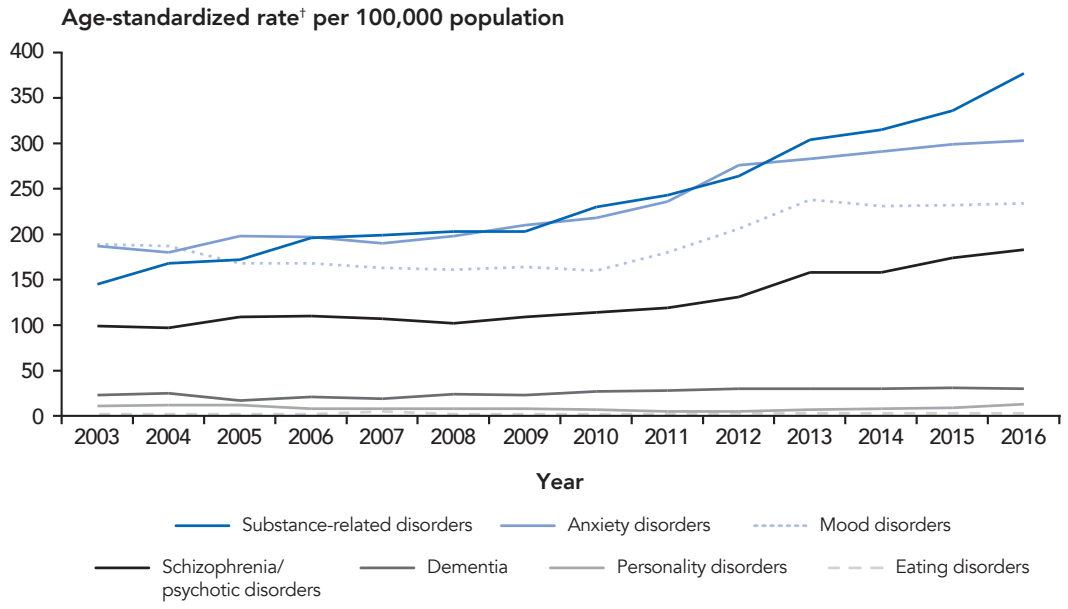


Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

ED visits for mental health disorders in Peel have increased over time (Figure 6.17). Between 2003 and 2016, substance-related mental health disorders and anxiety disorders had the greatest increase in ED visits (Figure 6.17). Among ED visits for substance-related mental health disorders, alcohol was the most commonly reported substance in 2016 (data not shown).[M]

Figure 6.17

Emergency Department Visits for Mental Health Disorders, Peel, 2003–2016



† Rates are age-standardized to the 2011 Canadian population

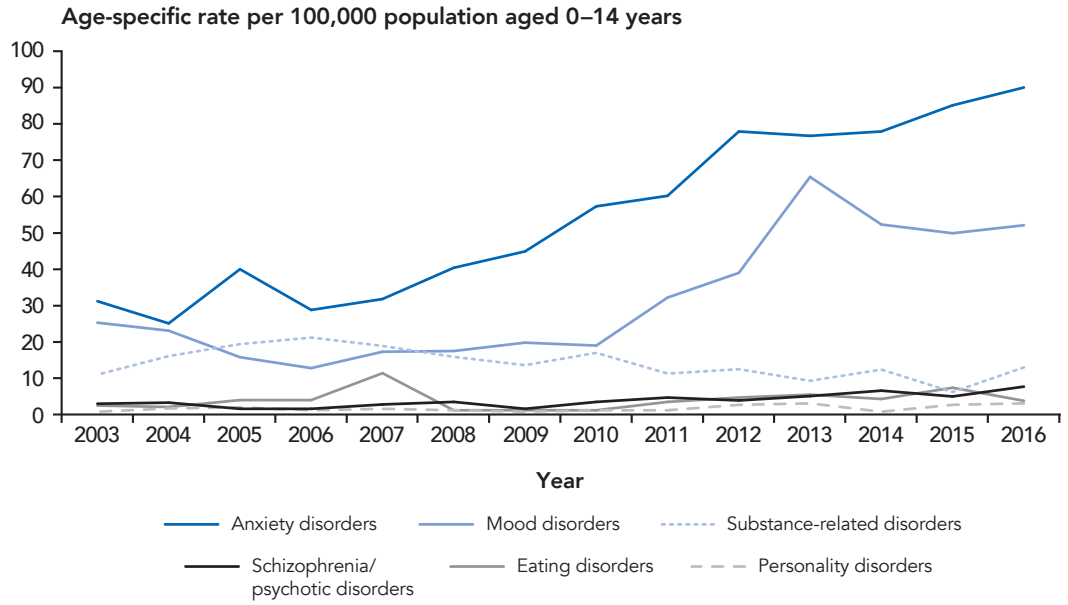
Sources: National Ambulatory Care Reporting System, 2003–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Population Estimates, 2003–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The increase in ED visits associated with substance-related mental health disorders is mainly due to the rise in the number of visits by individuals aged 25 to 39 years, which have increased three fold between 2003 and 2016 (data not shown).[M] For mood and anxiety disorders, ED visits have more than doubled among individuals younger than 14 years (Figure 6.18) and those 15 to 24 years old over the same period of time (Figure 6.19).

Figure 6.18

Emergency Department Visits for Mental Health Disorders Among Children Aged 0–14 Years, Peel, 2003–2016



Sources: National Ambulatory Care Reporting System, 2003–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

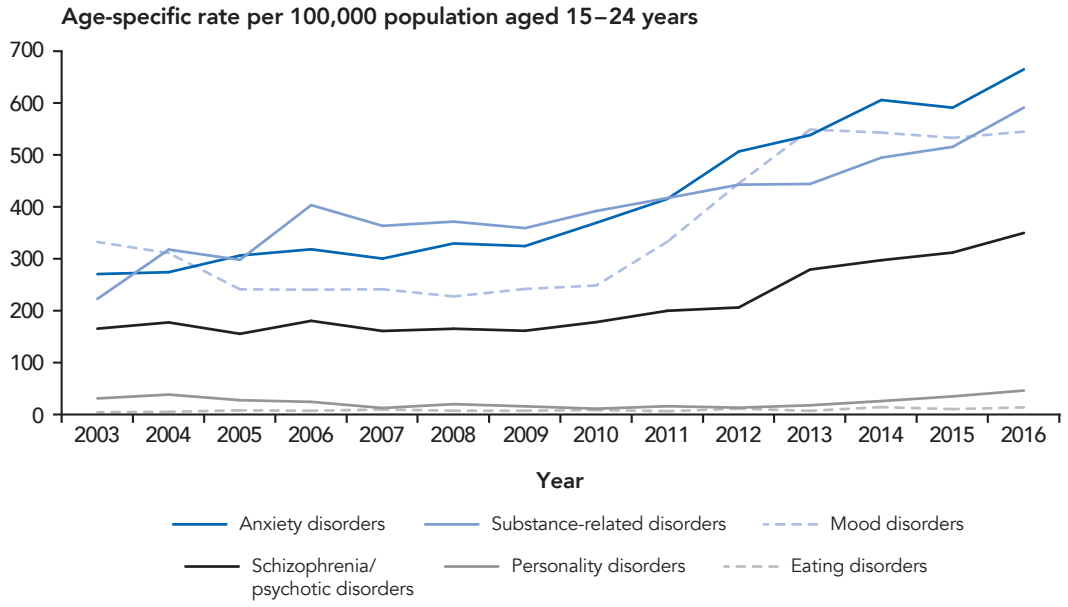
Did You Know

When an individual goes to the emergency department (ED) as their first contact for a mental health issue, this could indicate there is insufficient access to timely care in the community (e.g., community mental health services, family physician).

This could be a missed opportunity to prevent the worsening of a mental health crisis by intervening at an earlier time.[206] In Peel, 32% of adults with a mental-health related ED visit did not receive prior care from a physician.[W1]

Figure 6.19

Emergency Department Visits for Mental Health Disorders Among Individuals Aged 15–24 Years, Peel, 2003–2016



Sources: National Ambulatory Care Reporting System,2003- 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Dementia

Dementia is a neurocognitive disorder which is associated with a decline in memory, thinking, behaviour and the ability to perform every day activities.[186] Alzheimer's disease is the most common form of dementia and involves intellectual and behavioural symptoms such as memory and learning impairment and sometimes deficits in decision-making abilities.[186]

Incidence and Prevalence of Dementia

In Peel, 6% of adults aged 65 years and older have dementia (Table 6.8). This is similar to Ontario (7%).[W2] The incidence and prevalence rates of dementia are higher in females, compared to males, and the rates increase with age (Table 6.8). Since 2003, in Peel, the incidence of dementia has declined for those aged 75 years and older (Figure 6.20). Dementia prevalence has increased for those aged 85 years and older (Figure 6.21). It should be noted that the annual number of incident cases has increased from 1,317 in 2005 to 1,886 in 2015. The number of prevalent cases has almost doubled in the same time period.

Table 6.8

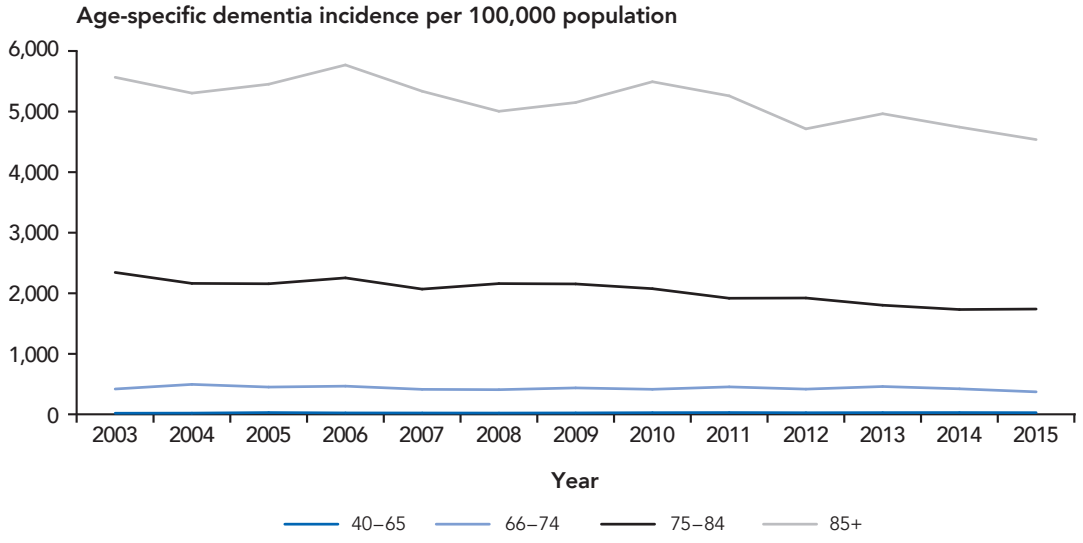
Incidence, Prevalence, Emergency Department Visits, Hospitalizations and Mortality for Dementia by Sex and Age Group, Peel, 2012, 2015, 2016

		Incidence[a] (2015)		Prevalence[a] (2015)		Emergency Department Visits[b,c] (2016)		Hospitalizations[c,d] (2016)		Mortality[c,e] (2012)	
		Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number
Sex	Male	273	878	1,243	4,051	24	172	16	117	22	109
	Female	339	1,153	1,890	6,560	23	168	19	143	41	208
Age group (years)	40–64	290	145	146	724	2	9	1	7	0.4	2
	65–74	373	391	1,575	1,676	54	60	29	33	24	21
	75–84	1,740	839	7,548	3,936	299	161	189	102	292	127
	85+	4,537	656	22,819	4,275	566	110	607	118	1905	285
Total		307	2,031	1,577	10,611	23	340	18	260	32	435

Sources:
[a] Dementia, 2015, Institute for Clinical Evaluative Sciences.
[b] National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[c] Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care
[d] Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[e] Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Health and Long-Term Care.

Figure 6.20

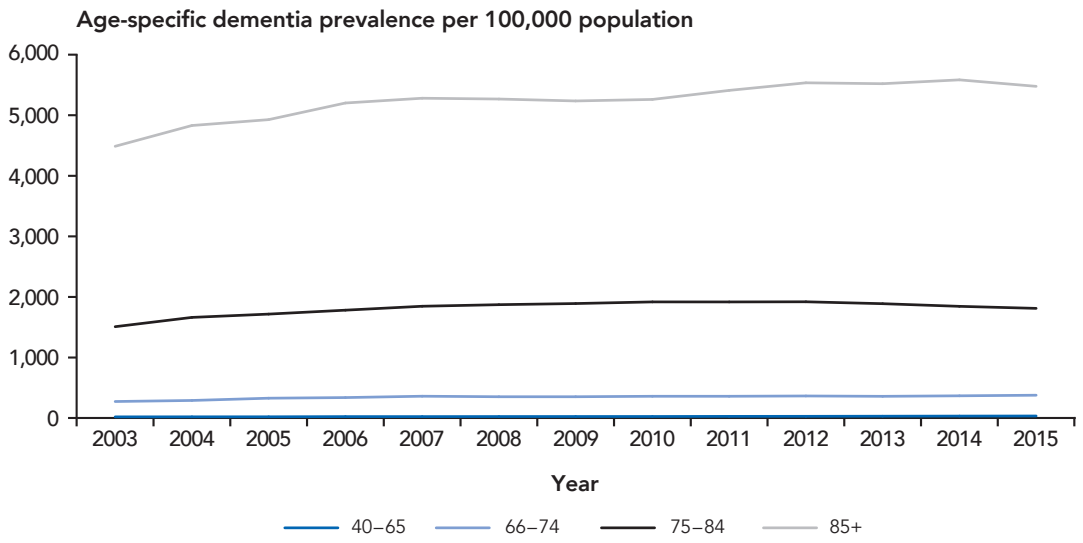
Incidence of Dementia by Age Group, Peel, 2003–2015



Source: Dementia, 2003-2015, Institute for Clinical Evaluative Sciences

Figure 6.21

Prevalence of Dementia by Age Group, Peel, 2003–2015



Source: Dementia, 2003-2015, Institute for Clinical Evaluative Sciences

Acute Care Use and Mortality due to Dementia

Compared to Ontario, Peel has lower rates of emergency department (ED) visits, hospitalizations and death for dementia (data not shown).[M,N,O] The rate of acute care visits and mortality due to dementia increases with age (Table 6.8). The female mortality rate for dementia is almost double that of the male mortality rate after adjusting for age (Table 6.8).

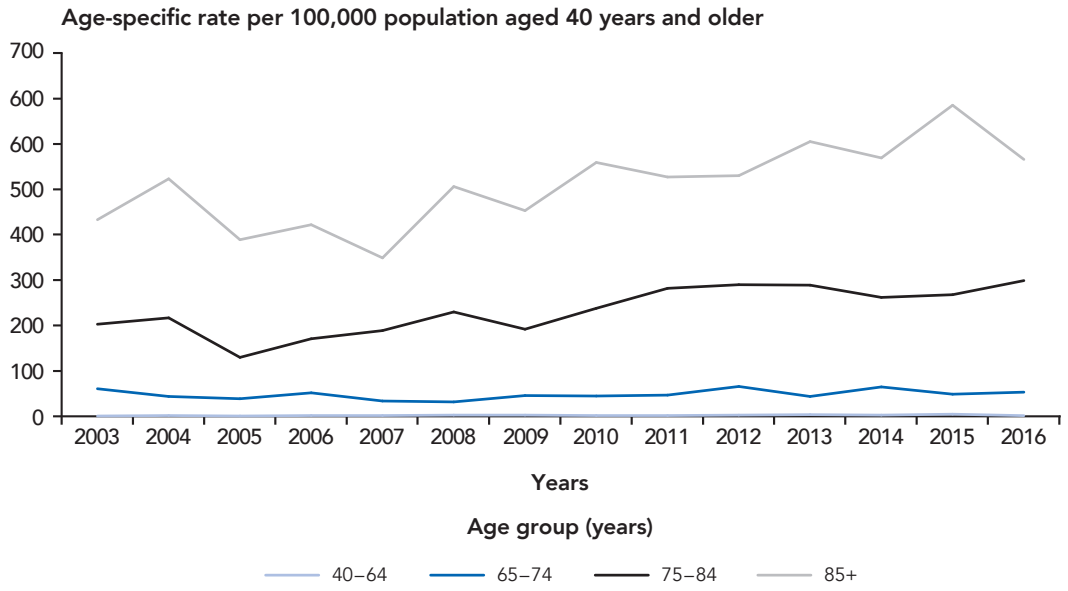
Between 2003 and 2016, the ED visit rate for dementia has increased among individuals aged 75 years and older (Figure 6.22). Hospitalization and mortality rates have remained relatively stable over time (data not shown).[N,O]

Measurement

Dementia incidence and prevalence is measured by an algorithm using health administrative data (hospitalizations, physician billing and drug prescriptions). While this algorithm has been validated to perform well in identifying and ruling out dementia[207], incidence rates and prevalence rates may be underestimated. Individuals who do not seek public medical care and missed diagnoses by family physicians are not captured by this algorithm.

Figure 6.22

Emergency Department Visits due to Dementia by Age Group, Peel, 2003–2016



Sources: National Ambulatory Care Reporting System, 2003–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Other Mental Health Disorders

Problem Gambling

Problem gambling can negatively affect a person's life and mental health. It can lead to problems with finances, relationships, school and work and may result in potential legal issues.[208] In Peel, 6% of secondary students have symptoms of a gambling problem. This is similar to Ontario (9%).[U1] Currently, there are no data available on problem gambling for Peel adults.

Did You Know

In Ontario, 2% of individuals aged 18 years and older have symptoms of a gambling problem.[173]

Measurement

Having a gambling problem is measured in the Ontario Student Drug Use and Health Survey using the Gambling Problem Severity Subscale (GPSS) of the Canadian Adolescent Gambling Inventory (CAGI). The GPSS consists of nine items related to gambling behaviours in the past three months.

Mental Health Disorders During Pregnancy

Mental health during pregnancy and the postpartum period is particularly important for the development of secure attachment. One in 10 women in Peel experience at least one mental health concern during pregnancy. Details about mental health disorders during pregnancy can be found in ***Chapter 4 – Health in Early Life***.

Neurodevelopmental Disorders

Neurodevelopmental disorders begin in early life and include deficits that affect personal, social, academic, or occupational functioning. Such disorders range from very specific limitations in learning or decision-making abilities to impaired social skills or intelligence.[204] Neurodevelopmental disorders include attention-deficit/hyperactivity disorder (ADHD), learning disabilities and autism spectrum disorders (Table 6.9). Among Peel students in grades 7 to 12, 19% of students have symptoms of ADHD, similar to Ontario (20%).[U1]

Definition

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder classified by:

- harmful levels of inattention and/or disorganization leading to the inability to stay on task, listen and hold on to materials; and/or
- hyperactivity-impulsivity leading to over activity, fidgeting, the inability to remain seated, intruding into other's activities; and
- an inability to wait.[204]

Learning disability is a neuro-developmental disorder with symptoms first observed during the formal schooling years and includes difficulties with learning basic reading, writing, and/or math skills due to specific challenges in the ability to efficiently and accurately perceive or process information.[204]

Autism spectrum disorders include impairments in social communication and social interaction as well as restricted, repetitive patterns of behaviour, interests, or activities that limit or affect every day functioning with symptoms becoming evident in early childhood.[204]

Table 6.9

Prevalence of Select Neurodevelopmental Disorders among Students, Peel, 2009/10 – 2011/12, 2017

	Neurodevelopmental Disorder		
	Attention-Deficit / Hyperactivity Disorder†[a] (2017)	Learning Disability‡[b] (2009/10 – 2011/12)	Autism Spectrum Disorder§[b] (2009/10 – 2011/12)
Prevalence per 100	19	4	1

† Reflects respondents in grades 7–12 who scored 14 or higher on the ADHD Self-Report Scale.
‡ Annualized prevalence of kindergarten – Grade 12 students with a learning disability in schools where English is the primary language of instruction
§ Annualized prevalence of kindergarten – Grade 12 students with autism spectrum disorder in schools where English is the primary language of instruction
Sources:
[a] Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.
[b] MHASEF Research Team. The mental health of children and youth in Ontario: A baseline scorecard. Toronto(ON): Institute for Clinical Evaluative Sciences; 2015 Mar.

Measurement

Attention-deficit/hyperactivity disorder (ADHD) is measured in the Ontario Student Drug Use and Health Survey using the ADHD Self-report Scale (ASRS). This instrument was designed to screen for symptoms of ADHD and was not intended to be used for clinical diagnosis.

SUICIDAL THOUGHTS, DELIBERATE SELF-HARM AND SUICIDE

Suicide and deliberate self-harm are outcomes of poor mental well-being. Deliberate self-harm occurs when an individual intentionally hurts oneself with or without intention of suicide.[209] Suicidal thoughts and suicide may be the result of an individual seeing no way out of a troubling situation, influence from substance use, or suffering from hallucinations.[210]

Suicidal Thoughts and Attempts

In Peel, 6% of residents aged 15 years and older had suicidal thoughts in their lifetime. This is similar to Ontario (6%).[H1] The following factors are associated with having suicidal thoughts: being less than 65 years of age, single or never married, low income, a family history of substance use or mental health problems, at least one chronic condition, a weak sense of belonging to the local community, or having experienced childhood maltreatment.[211]

Among Peel students in grades 7 to 12, 14% seriously considered attempting suicide and 4% attempted suicide in the past 12 months.[U1] This is similar to Ontario students. (data not shown).[U1] In Peel, the prevalence of suicidal thoughts is twice as high among female students (20%) as compared to male students (9%).[U1]

Acute Care Use and Mortality due to Deliberate Self-harm and Suicide

Compared to Ontario, Peel has lower rates of emergency department (ED) visits, hospitalizations and mortality for deliberate self-harm and suicide (data not shown).[M,N,O] Deliberate self-harm resulting in an emergency department visit or hospitalization is most common among females and individuals aged 15 to 24 years (Table 6.10). For additional details about the burden of suicide, refer to ***Chapter 8 – Injuries and Violence***.

The rate of death by suicide is three times higher in males compared to females in Peel (Table 6.10). The mortality rate for suicide increases with age. The highest suicide rate is among adults aged 40 years and older (Table 6.10).

The rate of ED visits and hospitalizations due to deliberate self-harm in Peel has decreased or remained stable over time for almost all age groups. Between 2000 and 2012, the age-standardized mortality rate for suicide has remained stable and ranged from 49 to 84 deaths per year (data not shown).[O]

Table 6.10

Emergency Department Visits, Hospitalizations and Mortality for Deliberate Self-harm and Suicide by Sex and Age Group, Peel, 2012, 2016

		Emergency Department Visits[a,b] (2016)		Hospitalizations[b,c] (2016)		Mortality[b,d] (2012)	
		Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number
Sex	**Male**	51.2	371	15.0	109	8.0	54
	Female	87.6	650	24.7	184	2.5	17
Age group (years)	**0–14**	15.7	41	7.6	20	0.0	0
	15–24	194.6	407	47.1	99	5.9	12
	25–39	91.7	283	20.5	64	2.4	7
	40–64	50.4	253	17.6	88	8.3	39
	65+	19.9	37	11.9	22	8.9	13
Total		**69.9**	**1,021**	**19.9**	**293**	**5.2**	**71**

Sources:
[a] National Ambulatory Care Reporting System,2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[b] Population Estimates,2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[c] Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
[d] Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

ACCESSING MENTAL HEALTH-CARE SERVICES

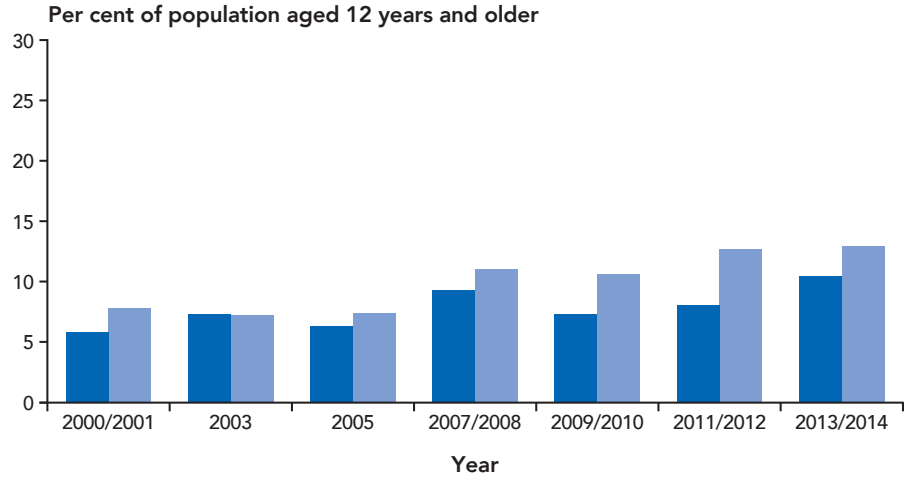
Access to mental health-care services is dependent on the availability of services and health-seeking behaviours. Available indicators for measuring access to mental health-care services include consultation with medical professionals and others about mental health; requests for police assistance; use of helplines; and psychiatric and family physician visits regarding mental health.

Consultation with a Medical Professional about Mental Health

In Peel, 10% of residents consulted with a medical professional about their mental health in the past year which is similar to Ontario (Figure 6.23). In Peel, the prevalence of consultations for mental health remained relatively stable over time (Figure 6.23). Females (14%) are twice as likely to have consulted a medical professional about their mental health than males (7%* - use estimate with caution).[H2]

Figure 6.23

Per cent of Population who Consulted with a Medical Professional about their Mental Health,
Peel and Ontario, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014



	2000/2001	2003	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	5.8 (4.7–7.2)	7.3 (5.9–8.9)	6.3 (5.2–7.7)	9.3 (7.6–11.4)	7.3 (5.9–8.9)	8.0 (6.8–9.8)	10.4 (8.3–12.9)
Ontario Per cent (95% CI)	7.8 (7.4–8.2)	7.2 (6.8–7.6)	7.4 (7.1–7.8)	11.0 (10.5–11.5)	10.6 (10.1–11.1)	12.7 (12.1–13.3)	12.9 (12.3–13.6)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health And Long-Term Care.

Did You Know

In Peel, half of all patients referred to a mental health specialist wait longer than one month (33 days) to see a psychiatrist.[W3] Median wait time is the longest among those aged zero to 29 years, where 25% of individuals wait more than three months for a consultation.[W3]

Use of Crisis Help-line or Online Help Site

A small proportion (2%) of Peel students in grades 7 to 12 used a crisis help-line or online help in the past year.[U1] This percentage has remained stable between 2013 and 2017 and is similar to Ontario (3%).[U1-U3] Data for this measure are not available for Peel adults.

Telepsychiatry Consultations

Telepsychiatry is the process of providing mental health services such as psychiatric evaluations, counselling, education, and medical consultation through technology, often through videoconferencing.[212]

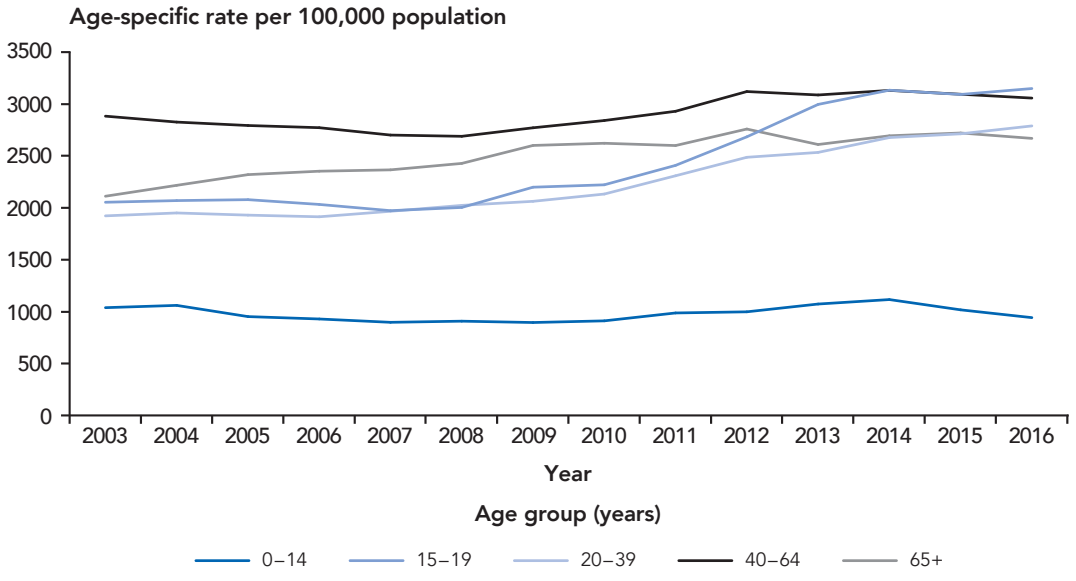
Since 2008, the number of telepsychiatry consultations in Peel has increased from less than five per year to 491 consultations in 2016.[W4] The Peel rate of telepsychiatry consultations (33 per 100,000 population) is lower than the Ontario rate (83 per 100,000 population).[W3]

Psychiatrist Visits

The total rate of Peel residents seen by a psychiatrist has increased over time between 2003 and 2016. This was greatest for youth and young adults (Figure 6.24). The rate at which females see a psychiatrist is similar to that of males (Table 6.11). Individuals in the lowest income quintile see a psychiatrist at a higher rate than those in the highest income quintile (Table 6.11).

Figure 6.24

Rate at which Persons were Seen by a Psychiatrist by Age Group, Peel, 2003–2016



Source: Persons seen by psychiatrist, 2003–2016, Institute for Clinical Evaluative Sciences

Table 6.11

Rate of which Persons were Seen by a Psychiatrist by Sex, Age Group, Immigrant Status and Income Quintile, Peel, 2016

		Persons Seen by a Psychiatrist	
		Crude rate per 100,000	Number
Sex	Male	2,377	17,055
	Female	2,709	20,056
Age group (years)	0–14	943	2,563
	15–19	3,149	3,045
	20–39	2,789	11,270
	40–64	3,057	15,283
	65+	2,669	4,950
Income quintile	1 (lowest)	3,009	5,629
	2	2,541	8,093
	3	2,411	10,498
	4	2,503	8,144
	5 (highest)	2,479	4,747
Immigrant status	Immigrant	2,124	9,541
	Non-immigrant	2,733	27,570
Total		**2,545**	**37,111**

Source: Persons seen by psychiatrist, 2016, Institute for Clinical Evaluative Sciences.

Office-based Physician Visits for Mental Health

In Peel, most office-based physician visits for mental health are provided by general practitioners (70%), followed by psychiatrists (20%) and pediatricians (3%) (Table 6.12). The rate of office-based physician visits has remained stable over time in Peel and is similar to Ontario (data not shown).[W5]

Males in Peel have a similar rate of office-based physician visits to females, although the number of males visiting a physician for mental health has increased over time (Figure 6.25).

Table 6.12

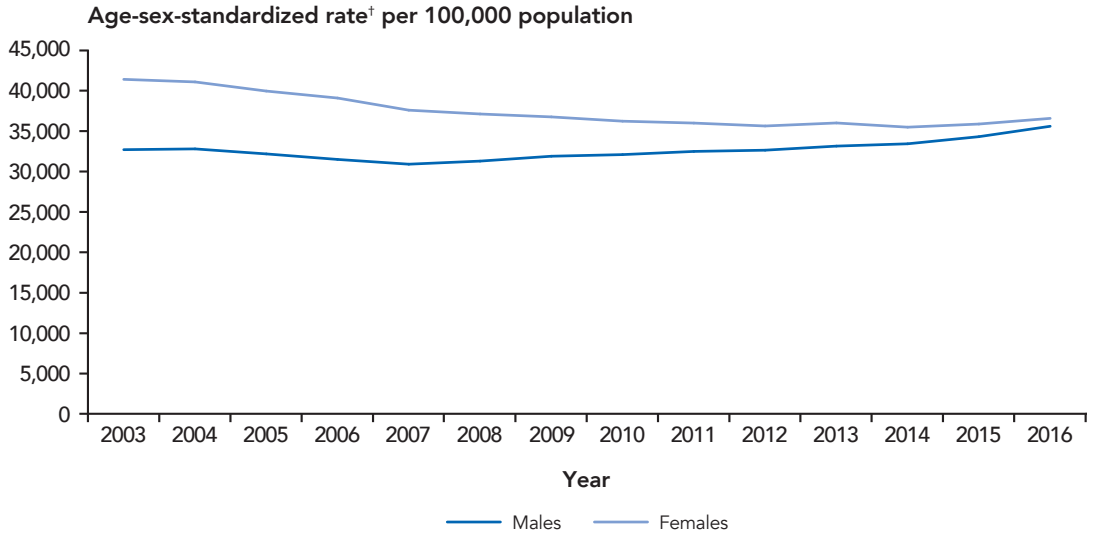
Office-based Physician Visits for Mental Health by Sex, Age Group, Immigrant Status and Income Quintile
Peel, 2016

		Office-based Physician visits for mental health	
		Crude rate per 100,000	Number
Sex	Male	35,892	348,605
	Female	37,763	377,217
Age group (years)	0–14	14,741	43,443
	15–19	28,419	33,770
	20–39	40,275	233,765
	40–64	42,102	300,000
	65+	43,555	114,844
Immigrant status	Immigrant	31,892	181,833
	Non-immigrant	38,855	543,989
Income quintile	1 (lowest)	39,771	104,892
	2	36,929	159,988
	3	36,187	211,234
	4	36,214	157,304
	5 (highest)	36,220	92,404
Total		**36,840**	**725,822**

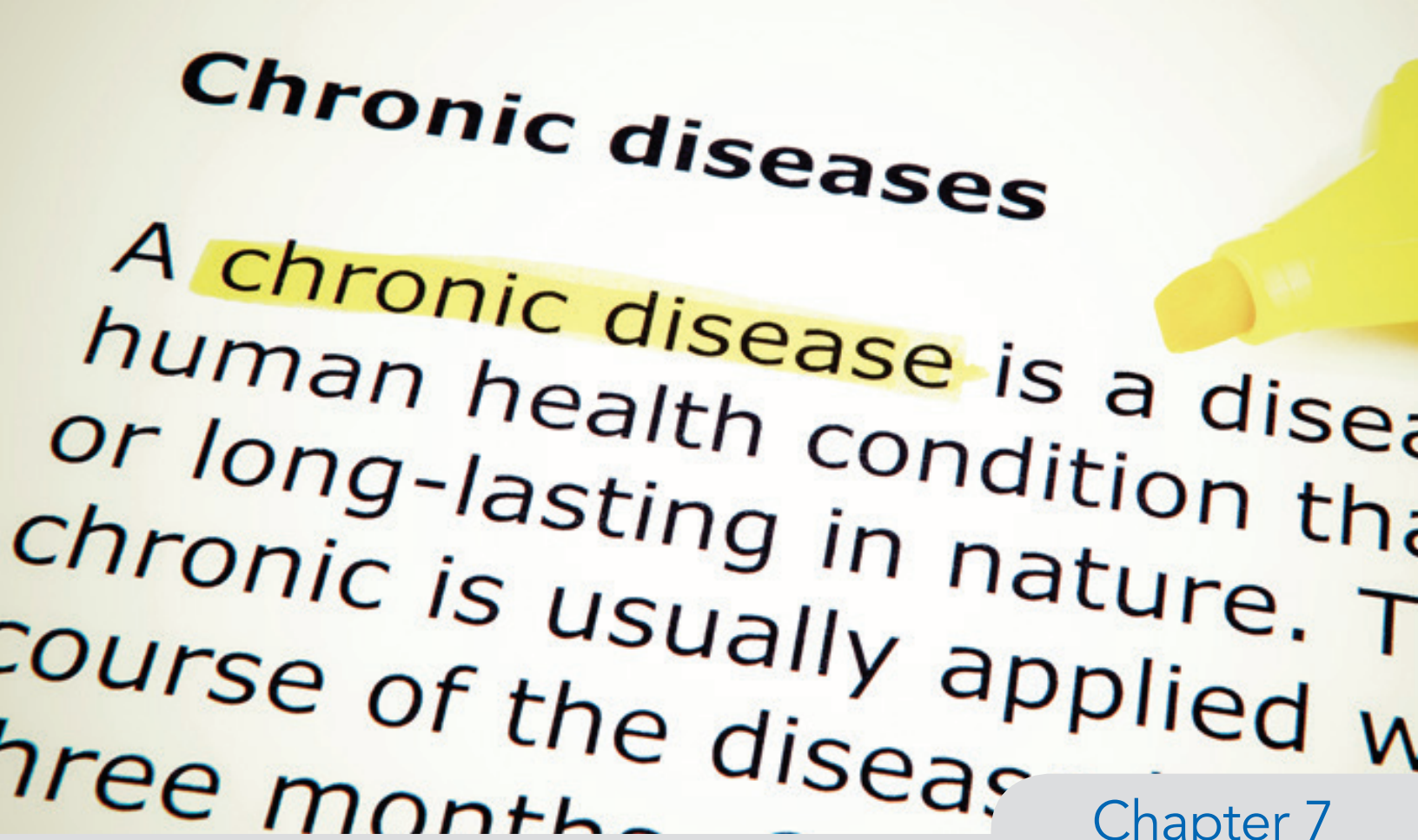
Source: Physician visits for mental health, 2016, Institute for Clinical Evaluative Sciences.

Figure 6.25

Office-based Physician Visits for Mental Health by Sex, Peel, 2003–2016



† Rates are age-sex-standardized to the 2011 Canadian population.
Source: Physician visits for mental health, 2003– 2016, Institute for Clinical Evaluative Sciences.



Chapter 7

Chronic Diseases

Key Messages

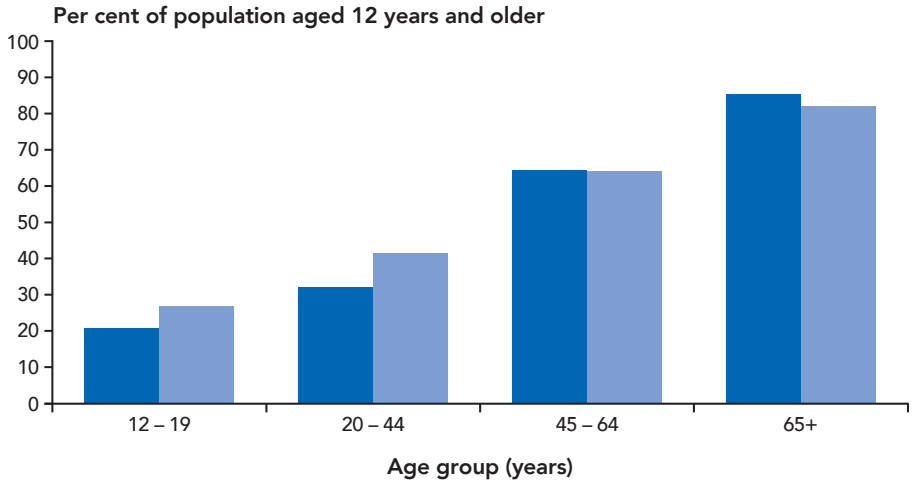
- Chronic diseases account for 80% of the leading causes of death in Peel. Chronic diseases are increasing due to Peel's aging and growing population.
- Cancer and cardiovascular disease continue to be leading causes of death; however, mortality rates for all cancers combined, ischaemic heart disease (IHD), and cerebrovascular disease have been declining in recent decades. This is also reflected in the incidence of IHD and cerebrovascular disease.
- In males, incidence and mortality rates for tobacco-related chronic diseases, including lung cancer and chronic obstructive pulmonary disease have been declining in Peel.
- The incidence of obesity-related chronic diseases, including diabetes, non-alcoholic fatty liver disease, and colorectal cancer in young to middle-aged adults is increasing.

Major chronic diseases, such as cardiovascular disease, cancer, respiratory disease and diabetes, place a significant burden on the daily living, productivity and health of individuals, as well as an increasing demand on the health-care system. In Ontario, approximately 76% of all deaths were attributable to chronic diseases in 2012[213], and in Peel, chronic diseases accounted for eight out of 10 of the leading causes of death the same year.[O]

In 2013/2014, 48% of Peel residents aged 12 and older reported having at least one chronic health disease diagnosed by a healthcare professional.[H2] The prevalence of chronic conditions increases by age group (Figure 7.1).

Figure 7.1

Per cent of Population with at Least One Self-Reported Chronic Condition† by Age Group, Peel and Ontario, 2013/2014



	12 – 19	20 – 44	45 – 64	65+
Peel Per cent (95% CI)	20.7 (15.5 – 27.1)	32.1 (27.6 – 37.0)	64.4 (57.7 – 70.6)	85.4 (80.0 – 89.6)
Ontario Per cent (95% CI)	26.9 (24.9 – 28.9)	41.5 (40.0 – 43.1)	64.1 (62.2 – 65.9)	82.1 (80.8 – 83.3)

† Diagnosed by a health care professional.
Notes: 95% CI reflects the 95% confidence interval of the estimate.
Chronic conditions include, Alzhiemers/dementia, effects of stroke, cancer, scoliosis, stomach or intestinal ulcers, COPD, bowel disorder/Crohn's disease or colitis, urinary incontinence, heart disease, anxiety, mood disorder, asthma, diabetes, migraine headaches, back problems, arthritis and high blood pressure.
Source: Canadian Community Health Survey Share File, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

In this chapter, the burden of chronic diseases in Peel and Ontario is discussed. Leading chronic diseases are reviewed within the following groupings:

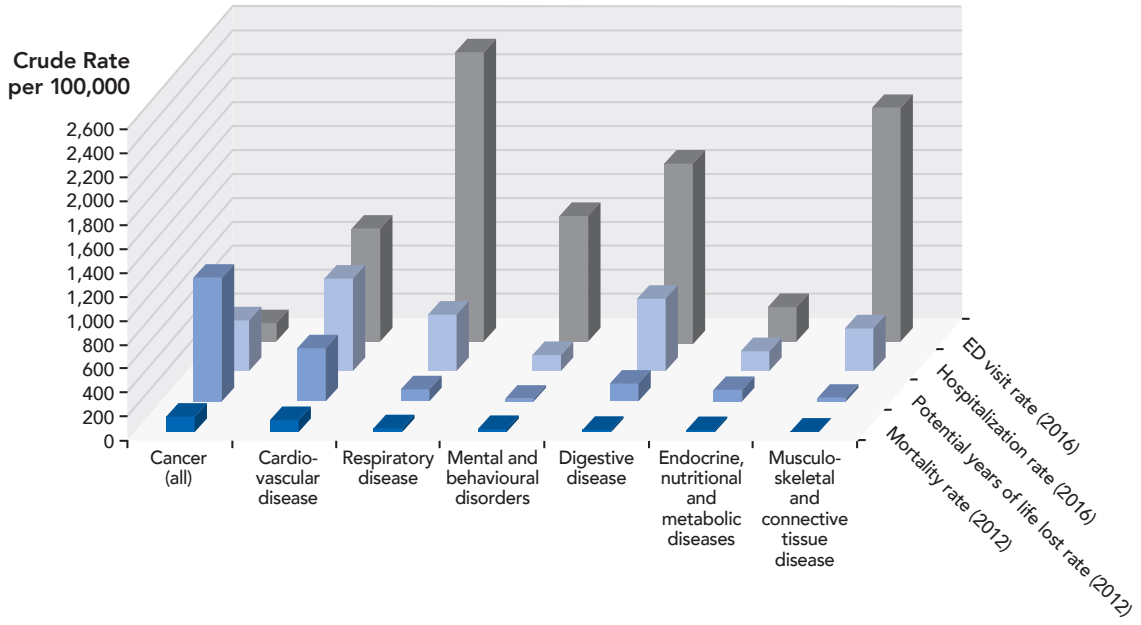
- cardiovascular diseases
- cancer
- respiratory diseases
- endocrine, nutritional and metabolic diseases
- musculoskeletal diseases and conditions
- diseases of the digestive system

Each disease grouping presents a different profile in terms of emergency department (ED) visits, hospitalizations, mortality and potential years of life lost.

Cancer and cardiovascular disease have the highest mortality rates and cardiovascular disease has the highest rate of hospitalization. Respiratory disease, digestive disease, and musculoskeletal and connective tissue disease have high rates of ED visits (Figure 7.2).

Age and sex are non-modifiable factors that often contribute to the risk and burden of chronic diseases. In Peel, the proportion of residents that have at least one chronic disease or condition increases with age (data not shown).[H2] Sex as a risk factor can vary by disease type (Figure 7.3).

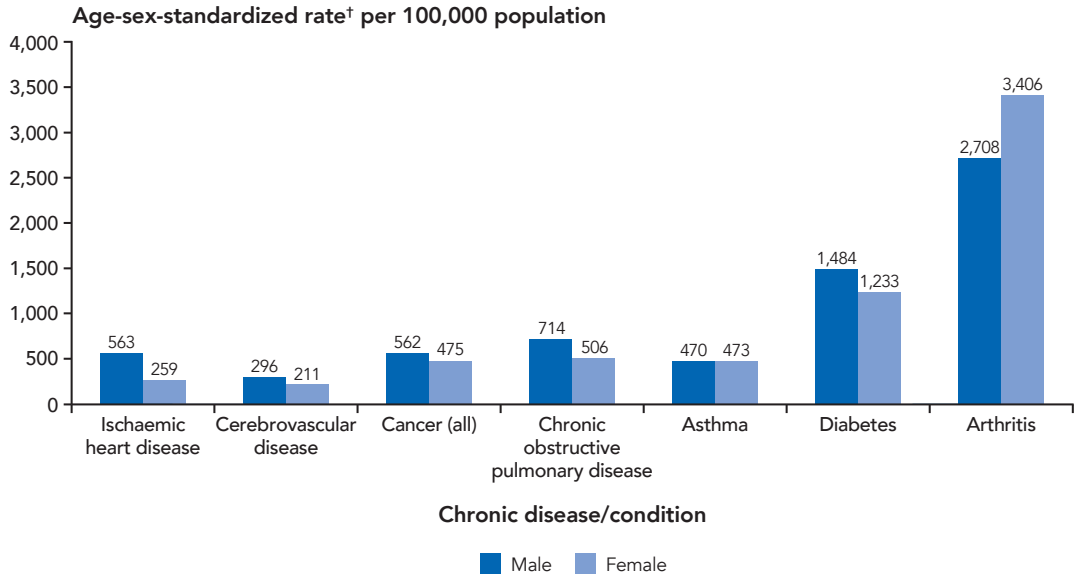
Figure 7.2
Burden of Selected Chronic Conditions, Peel, 2012, 2016



Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 7.3

Incidence of Selected Chronic Conditions by Sex, Peel, 2012, 2015



† Rates are age-sex-standardized to the 2011 Canadian population.
Notes: Cancer incidence rates are for 2012. Incidence rates for other diseaes are based on 2015 data.
Arthritis includes osteoarthritis and rheumatoid arthritis.
Ischaemic heart disease, cerebrovascular disease, diabetes, and arthritis rates are for persons aged 20 years or older.
Chronic obstructive pulmonary disease rates are for persons aged 40 years or older.
Asthma rates are for persons aged one year or older.
Incidence data are avaialbe for a limited number of diseases.
Sources: Ischaemic heart disease, Cerebrovascular disease, Chronic obstructive pulmonary disease, Asthma, Diabetes, Arthritis, 2016, Institute for Clinical Evaluative Sciences.
Ontario Cancer Incidence Database, 2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
Population Estimates, 2012, 2015, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

CARDIOVASCULAR DISEASE

Cardiovascular disease (CVD) refers to diseases and conditions of the circulatory system.

CVD is the second leading cause of mortality in Canada[214,215] and Peel, after cancer. Within CVDs, ischaemic heart disease (IHD) is responsible for the highest rate of death, potential years of life lost, and hospitalizations in Peel (Table 7.1).

Other diseases of the circulatory system that rank high in Peel deaths and health-care utilization include cerebrovascular disease, heart failure, and hypertensive disease (Table 7.1). Additional data about heart failure will not be described in this chapter.

Table 7.1

Leading Causes of Circulatory System Disease, Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
Ischaemic heart disease	2,002	136.0	4,376	297.4	698	51.1	3,276	250.8
Cerebro-vascular disease	2,111	143.4	1,639	111.4	285	20.9	1,225	93.8
Heart failure	2,327	158.1	1,758	119.5	73	5.3	95	7.3
Hypertensive disease	3,211	218.2	236	16.0	58	4.2	237	18.1
Cardiac arrhythmias	2,527	171.7	1,093	74.3	50	3.7	159	12.2
Nonrheumatic valve disorders	30	2.0	277	18.8	40	2.9	66	5.1
All diseases of the circulatory system	**16,764**	**1,139.2**	**11,292**	**767.3**	**1,350**	**98.9**	**6,005**	**440.0**

Note: Diagnoses shown reflect the top six selected causes of death, person years of life lost, hospitalizations and emergency department visits and is not an exhaustive list.
Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Did You Know

In 2014, Canadians in the lowest household income quintile were twice as likely to report living with CVD compared to those in the highest household income quintile.[214]

In 2013/2014 Peel residents aged 20 years and older with heart disease were more likely to report ever being a smoker, being overweight or obese, and having been diagnosed with diabetes or hypertension (data not shown).[H2]

Ischaemic Heart Disease (IHD)

In Peel, IHD is not only the leading cause of CVD-related deaths, but it is also the leading cause of all deaths and the second leading cause of all potential years of life lost and hospitalizations.[N,O]

Incidence and Prevalence of IHD

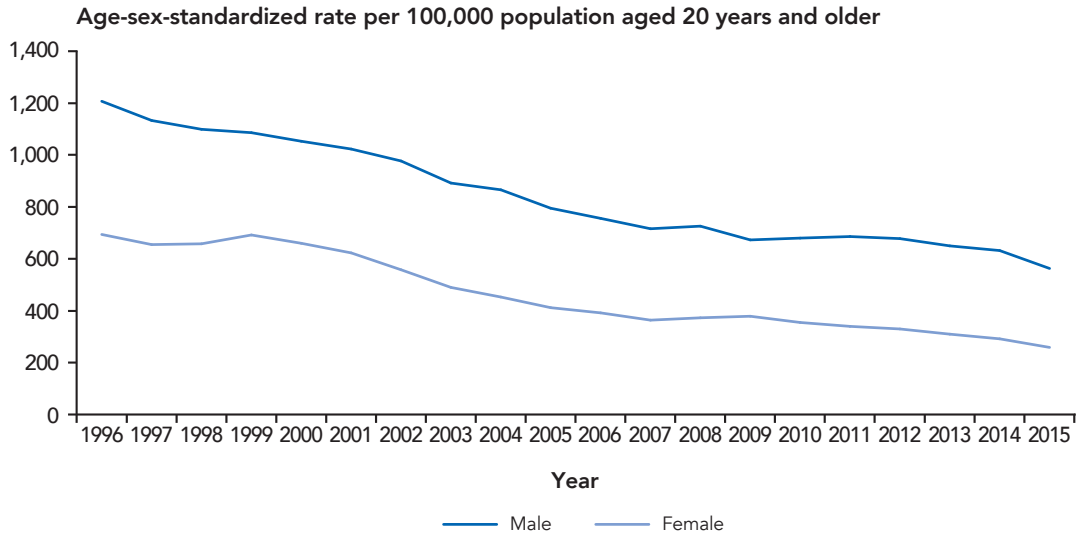
In 2015 in Peel, the crude incidence rate of IHD was 341 per 100,000 (3,516 cases) and the crude prevalence rates was 4,649 per 100,000 (50,000 cases) aged 20 years and older.[W7] Since the mid-1990s, the age-standardized incidence rates of IHD have been decreasing in Peel (Figure 7.4) and Ontario (data not shown).[W7]

The incidence of IHD in Peel is similar to Ontario (data not shown). The incidence of IHD increases with age (data not shown).[W7] The sex disparity in the incidence of IHD is approximately twice as high among Peel males compared to females and has been similar since 1996 (Figure 7.4). Men typically experience heart disease at an earlier age than women.[216]

While the incidence of IHD in Peel has been declining for at least two decades, the prevalence rate did not start declining until 2005. The prevalence of IHD in Peel is similar to that of Ontario (data not shown).[W7]

Figure 7.4

Incidence of Ischaemic Heart Disease by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Ischaemic heart disease, 1996-2015, Institute for Clinical Evaluative Sciences.

Did You Know

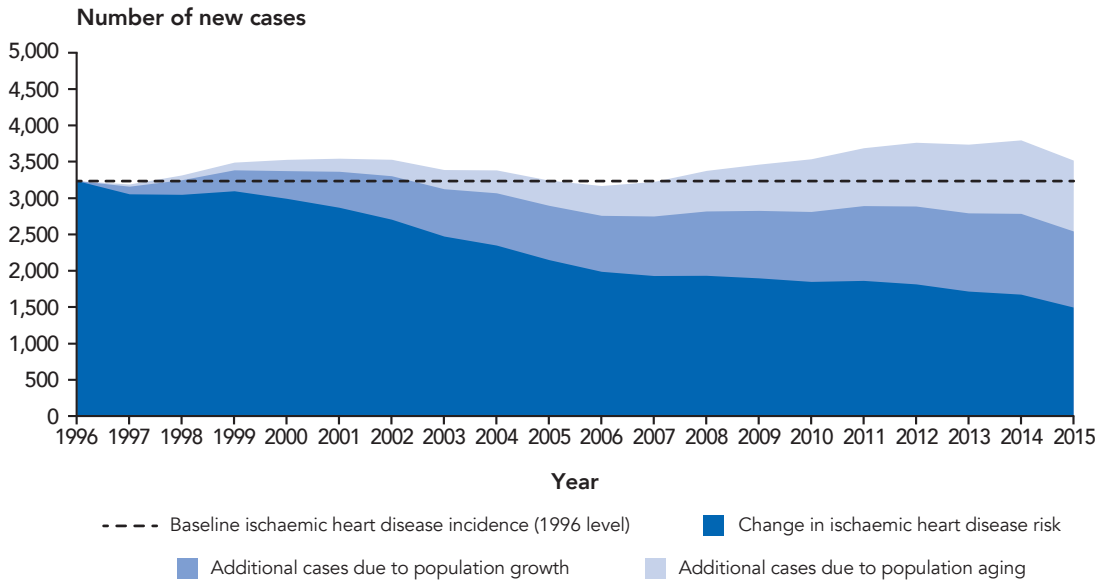
When a decrease in disease incidence is observed, a decrease in prevalence may lag behind. This is because in order for a prevalent case to no longer be prevalent, one must either be cured, move out of the population or die. Factors that contribute to a delay in the timing between an observed decrease in disease incidence and a corresponding decrease in prevalence may include:

- diseases of long duration;
- improvements in survival and the prolongation of life without a cure;
- in-migration of cases and/or susceptible people into the population; and
- outmigration of healthy people from the population.[217]

Although the incidence rate of IHD has decreased over time, there has been an increase in the number of IHD cases among Peel residents since 1996. This is primarily due to the aging population and population growth which are contributing to more cases. Fewer cases are occurring as a result of changes in IHD disease risk (Figure 7.5).

Figure 7.5

Incidence Attributed to Changes in Ischaemic Heart Disease Risk, Population Growth and Aging, Peel, 1996–2015



Sources: Ischaemic heart disease, 1996–2015, Institute for Clinical Evaluative Sciences.
Population Estimates, 1996–2015, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

Emergency Department Visits and Hospitalizations from IHD

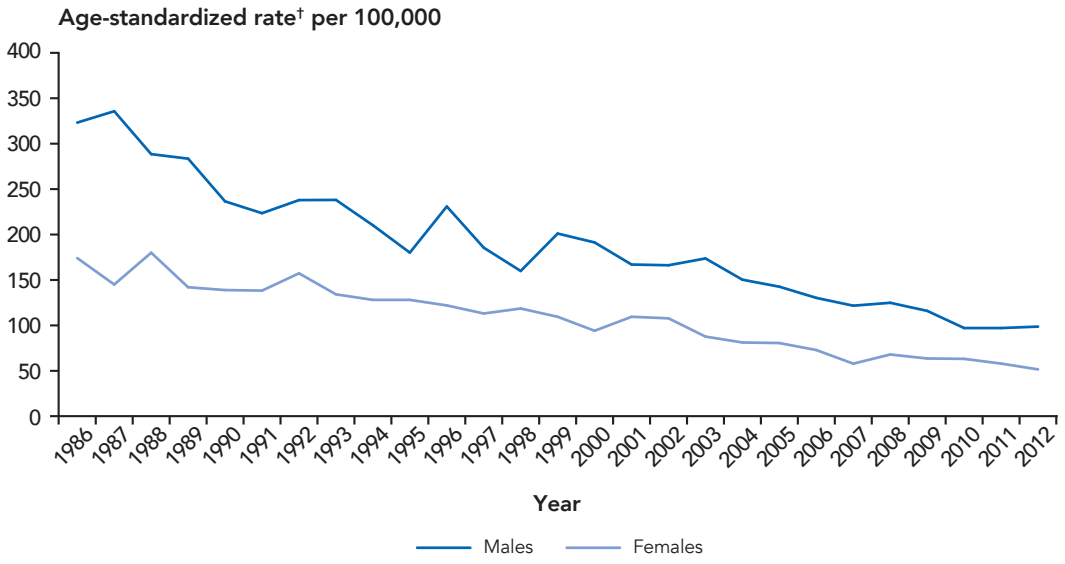
The declining rate of ED visits due to IHD between 2003 and 2016 are similar to the declining trends observed for IHD incidence (data not shown).[M] IHD hospitalization rates have also declined.[N] This is congruent with national data, and may be attributable to decreased population risk (e.g., reductions in smoking rates, improved treatment and management of high blood pressure and cholesterol) and advances in treatment of IHD outside of the hospital setting (data not shown).[216]

IHD Mortality

In Peel, in 2012, there were 698 deaths due to IHD.[O] Peel's mortality rate from IHD is lower than Ontario and both have been declining since the mid- to late-1980's.[O] While this trend is similar for males and females, the mortality rate from IHD for males is 1.9 times higher than that of females – a disparity that is the same as it was 25 years ago (Figure 7.6). The decline in IHD mortality is consistent with Canadian trends.[216]

Figure 7.6

Deaths due to Ischaemic Heart Disease by Sex, Peel, 1986–2012



† Rates are age-standardized to the 2011 Canadian population.
Sources: Ontario Mortality Database, 1986–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care.
Population Estimates, 1986–2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Cerebrovascular Disease (CVD)

Cerebrovascular disease or stroke includes disorders of the brain blood vessels, brain ischemia (i.e., lack of oxygen) and brain hemorrhage (i.e., bleeding).[216] Stroke is the second-leading cause of CVD-related deaths and potential years of life lost, as well as third and fourth-leading causes of hospitalizations and ED visits in Peel, respectively.

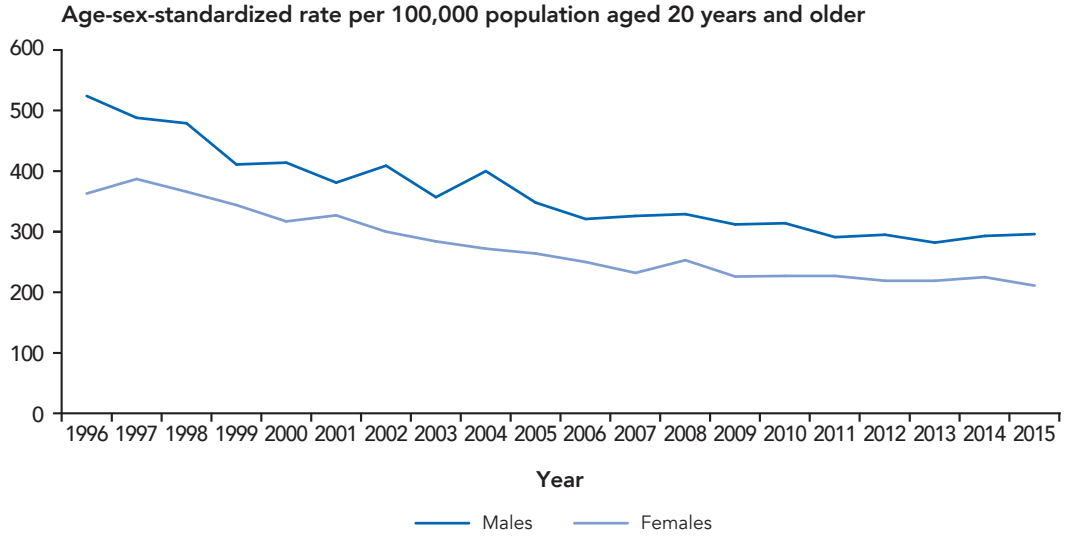
Incidence and Prevalence of Cerebrovascular Disease

In 2015 the CVD incidence rate was 223 per 100,000 (2,361 cases) and the crude prevalence rate was 1,937 per 100,000 (20,849 cases).[W8] Incidence rates of cerebrovascular disease have decreased in Peel (Figure 7.8) and Ontario since 1996 (data not shown).[W8] Factors contributing to this decline may include improvements in managing conditions (e.g., high blood pressure, high cholesterol), preventive treatment with aspirin, reductions in other risk factors (e.g., declining smoking rates) and changes in healthcare patterns such as improved care outside of the hospital setting.[216]

The incidence of cerebrovascular disease increases with age (data not shown).[W8] The age-standardized incidence rate for males is 1.4 times higher than that of females and has been similar for the past two decades (Figure 7.7).

Figure 7.7

Incidence of Cerebrovascular Disease by Sex, Peel, 1996–2015



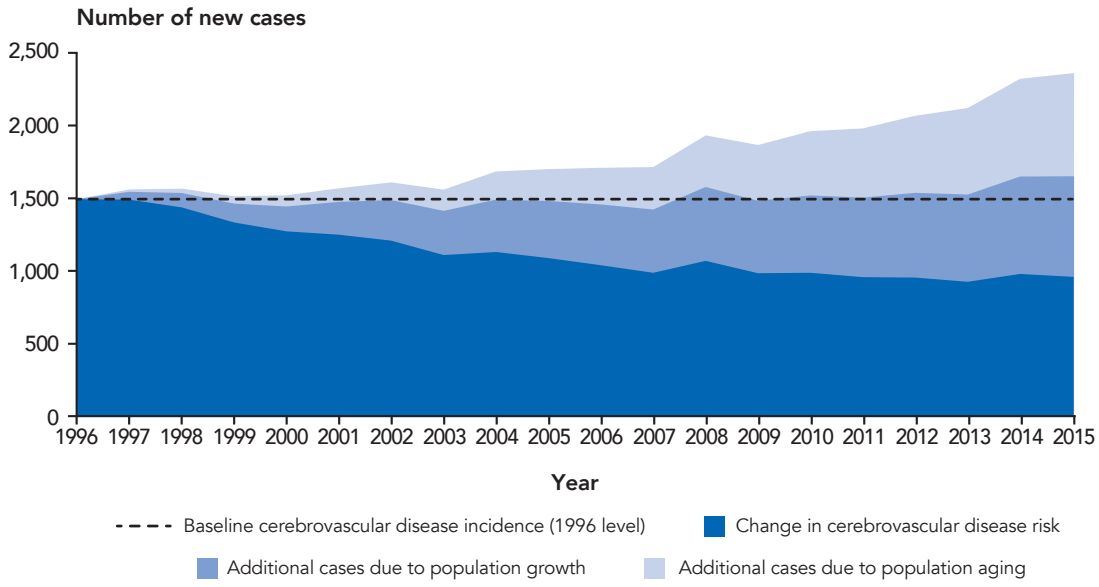
Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Cerebrovascular disease, 1996-2015, Institute for Clinical Evaluative Sciences.

Although the incidence of cerebrovascular disease is declining in Peel and Ontario, Peel's prevalence rate increased between 1996 and 2002, and has since stabilized (data not shown).[W8] The prevalence of cerebrovascular disease in Peel is similar to Ontario (data not shown).[W8] Improved care and survival rates of stroke likely have contributed to the increase of cerebrovascular disease prevalence in Peel.[218]

While the incidence rate of cerebrovascular disease has decreased over time, the number of new cases among Peel residents increased by 58% between 1996 and 2015. The increase is primarily due to an aging and growing population (Figure 7.8).

Figure 7.8

Trend in Incidence Attributed to Changes in Cerebrovascular Disease Risk, Population Growth and Aging, Peel, 1996–2015



Sources: Cerebrovascular disease, 1996–2015, Institute for Clinical Evaluative Sciences.
Population Estimates, 1996–2015, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Emergency Department Visits and Hospitalizations from Cerebrovascular Disease

In 2016, there were 2,111 ED visits and 1,639 hospitalizations due to cerebrovascular disease in Peel. Between 2003 and 2016, rates of ED visits due to cerebrovascular disease have increased for Peel and Ontario, while rates of hospitalization have decreased (data not shown).[M,N]

Peel's rates of ED visits and hospitalization are typically higher for males than females, across all age groups (data not shown).[M,N]

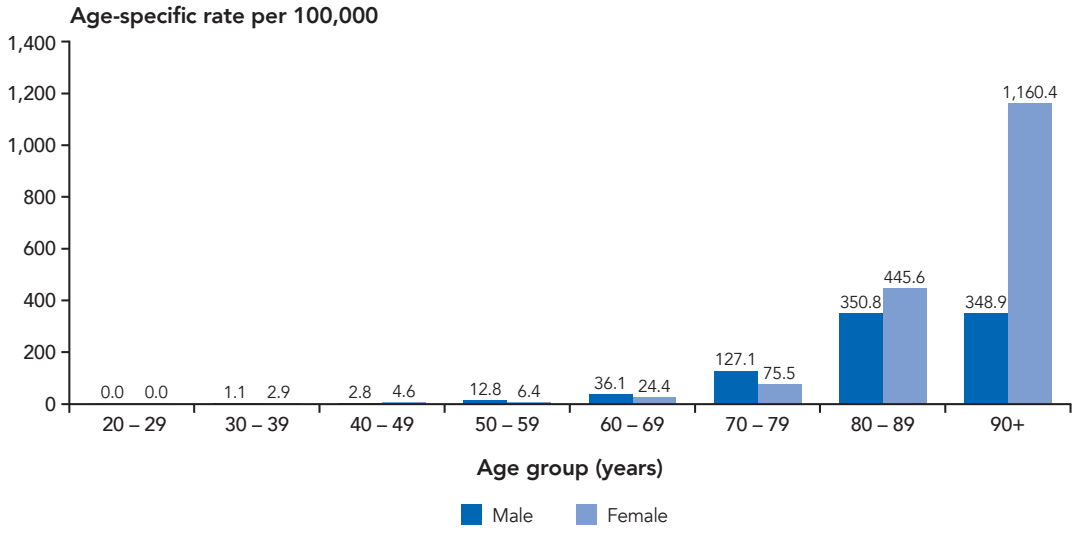
Rates of ED visits may portray a more accurate account of healthcare utilization related to cerebrovascular disease than hospitalization rates, as hospitalization rates do not account for those who suffered a minor stroke (e.g., transient ischaemic attacks) and were discharged from the ED or other institution.[216]

Cerebrovascular Disease Mortality

In 2012, there were a total of 285 deaths due to cerebrovascular disease in Peel. Mortality rates due to cerebrovascular disease have declined in Peel and Ontario between 1986 and 2012.[O] Peel's mortality rates due to cerebrovascular disease are 13% higher for females compared to males (data not shown)[O] with the highest rates seen in females aged 80 years and older (Figure 7.9). The higher mortality rates among females appear to be largely due to older age at stroke onset, greater stroke severity and poorer pre-stroke health status.[219]

Figure 7.9

Deaths due to Cerebrovascular Disease by Age Group and Sex, Peel, 2012



Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care.
Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

Hypertension

Consistently high blood pressure, also known as hypertension, is not only a disease of the circulatory system but a leading risk factor for CVD and a risk factor for other diseases and conditions such as diabetes and non-alcoholic fatty liver disease.[214]

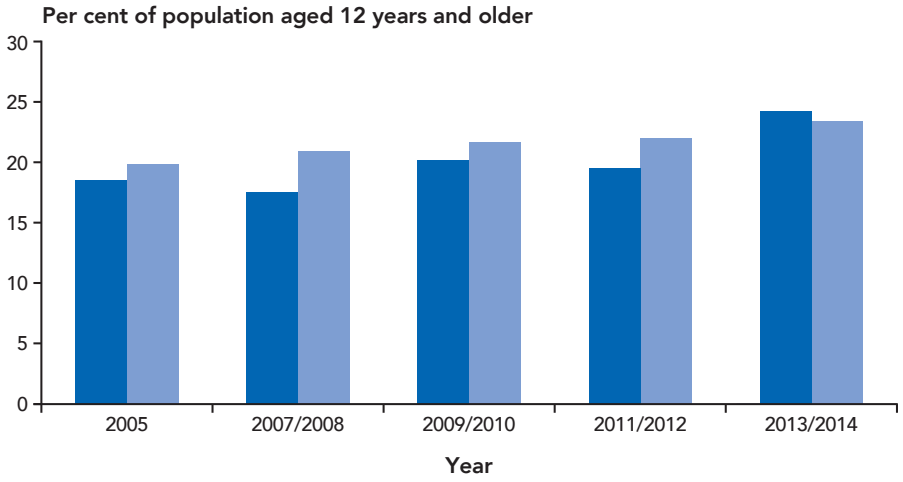
Definition

Hypertension is generally referred to as consistent diastolic blood pressure greater or equal to 90 mmHg or systolic blood pressure greater than or equal to 140 mmHg.

In 2013/2014, 24% of Peel residents reported having been diagnosed with hypertension in their lifetime (Figure 7.10). This is similar to Ontario (23%)[H2] but significantly higher than previous Peel estimates between 2007/08 and 2005. In Peel, the rate of hypertension is higher among those aged 45 years and older, as well as long-term immigrants (data not shown). Similar differences by age and immigrant status are also observed for Ontario (data not shown).[H2]

Figure 7.10

Per cent of Population who Reported Ever Being Diagnosed with High Blood Pressure by Year, Peel, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014



	2005	2007/2008	2009/2010	2011/2012	2013/2014
Peel Per cent (95% CI)	18.5 (16.3–20.9)	17.5 (15.4–19.8)	20.2 (17.7–22.9)	19.5 (17.1–22.2)	24.2 (21.2–27.5)
Ontario Per cent (95% CI)	19.8 (19.3–20.4)	20.9 (20.3–21.5)	21.7 (21.0–22.4)	22.0 (21.3–22.8)	23.4 (22.6–24.2)

Note: Excludes respondents who did not respond to the survey question
95% CI reflects the 95% confidence interval of the estimate.
Source: Canadian Community Health Survey Share File, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

CANCER

Approximately half of Canadians will develop cancer during their lifetime, and one in four will die as a result of cancer. Cancer is the leading cause of death, accounting for 30% of all deaths; and the leading cause of premature death in Canada.[220]

The demands on the healthcare system will continue to evolve as the population ages, and survival rates improve through early detection and treatment advances.[220]

Definition

Relative survival ratios (RSRs) specify the likelihood of survival over a given period of time after a diagnosis compared to like individuals (e.g., individuals of the same age and sex) in the general population.[221]

In Ontario between 2009 and 2013 the five-year relative survival ratio (RSR) was 65% for all cancers combined, which has improved over time. Survival is significantly higher for females. Among cancers commonly occurring in both sexes, five-year survival was highest for thyroid cancer, Hodgkin lymphoma, and melanoma; and lowest for pancreatic, esophageal, lung and liver cancers.

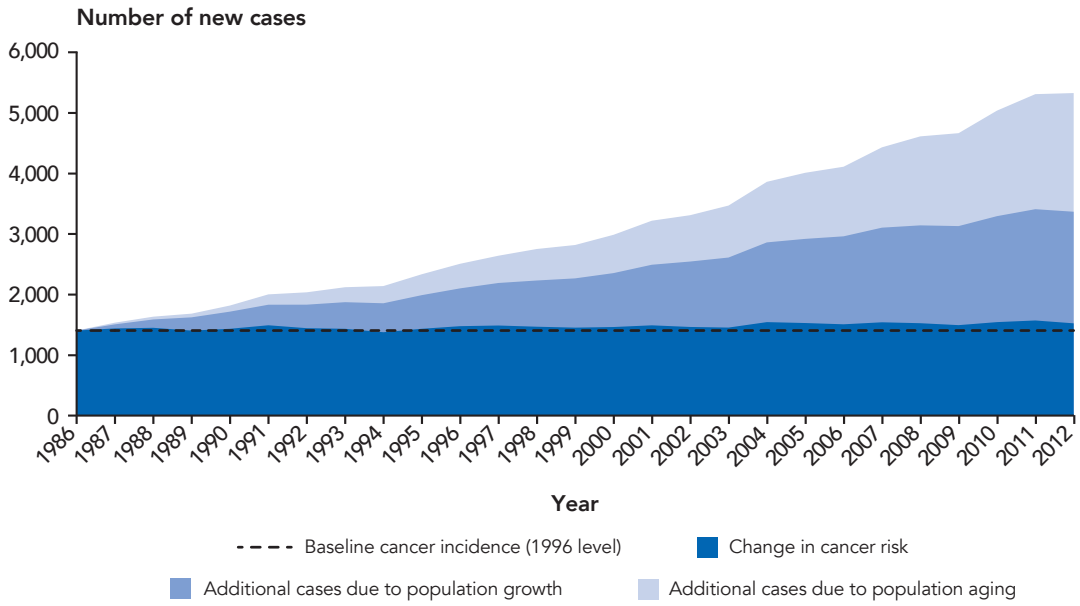
Both modifiable and non-modifiable risk factors influence cancer risk. Modifiable risk factors commonly associated with cancer include smoking, poor nutrition, physical inactivity, being overweight and obese, alcohol use, infections, and exposure to environmental and occupational carcinogens.[220,221] Non-modifiable risk factors include genetic susceptibility, sex and age.

All Cancers Combined

In Peel, between 1986 and 2012, the increase in new cancer cases was primarily due to an aging and growing population, as opposed to changes or increases in cancer risk over time (Figure 7.11).

Figure 7.11

Incidence Attributed to Changes in Cancer Risk, Population Growth and Aging, Peel, 1986–2012



Sources: Ontario Cancer Incidence Database, 1986–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015). Population Estimates, 1986–2012, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

Between 1986 and 2012, incidence rates for all cancers combined remained relatively stable for both Peel males and females (data not shown). This is similar to Ontario.[Z1] With respect to cancer-related mortality, there has been a decreasing trend among both sexes in Peel and Ontario (data not shown).[Z2] This trend may be attributable to cancer prevention and control efforts[220], a reduction in risk factors, earlier detection, and treatment advances.

Peel females have lower incidence and mortality rates for all cancers combined between 1986 and 2012 (data not shown).[Z1,Z2] This trend is reflected in Ontario, which has been consistent since 1983.[221] Higher rates of cancer among males have been attributed to behavioural, immunological and hormonal differences. However, for some cancer types, the underlying reason is still unknown.[221]

Leading Causes of Cancer

Table 7.2 summarizes the leading cancer sites for Peel's population as a whole using the top five leading causes for incidence prevalence, hopsitalizations, deaths and potential years of life lost.

In 2018 in Ontario, the most commonly diagnosed cancers were expected to be breast cancer (females only), colorectal cancer and lung cancer, which were projected to account for about 40% of all new cancers.[221]

Table 7.2

Leading Causes of Cancer, Peel, 2012, 2016

Leading Cause Diagnosis	Incidence (2016)		Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
Breast cancer	865	63.4	76	5.2	203	13.8	126	9.2	1,785	136.6
Prostate cancer	711	52.1	27	1.8	305	20.7	96	7.0	324	24.8
Lung cancer	587	42.3	238	16.2	339	23.0	349	25.6	2,404	184.0
Colorectal cancer	577	43.0	101	6.9	503	34.2	174	12.7	1,068	81.8
Bladder cancer	293	21.5	27	1.8	265	18.0	63	4.6	244	18.7
Thyroid cancer	369	27.0	8	0.5	455	30.9	9	0.7	70	5.4
Lymphoma	280	24.2	80	5.4	171	11.6	59	4.3	409	31.3
Leukaemia	184	13.5	86	5.8	199	13.5	73	5.3	620	47.5
Pancreatic cancer	137	10.0	74	5.0	114	7.7	106	7.8	686	52.5
Liver cancer	77	5.6	68	4.6	132	9.0	84	6.2	791	60.5
Brain cancer	71	5.2	86	5.8	166	11.3	58	4.2	774	59.2
Benign, in situ and cancers of uncertain or unknown behaviour	–	–	667	45.3	1,462	99.4	33	2.4	241	18.4
All cancers	**5,740**	**420.5**	**2,229**	**151.5**	**6,187**	**420.4**	**1,725**	**126.4**	**14,002**	**1,025.9**

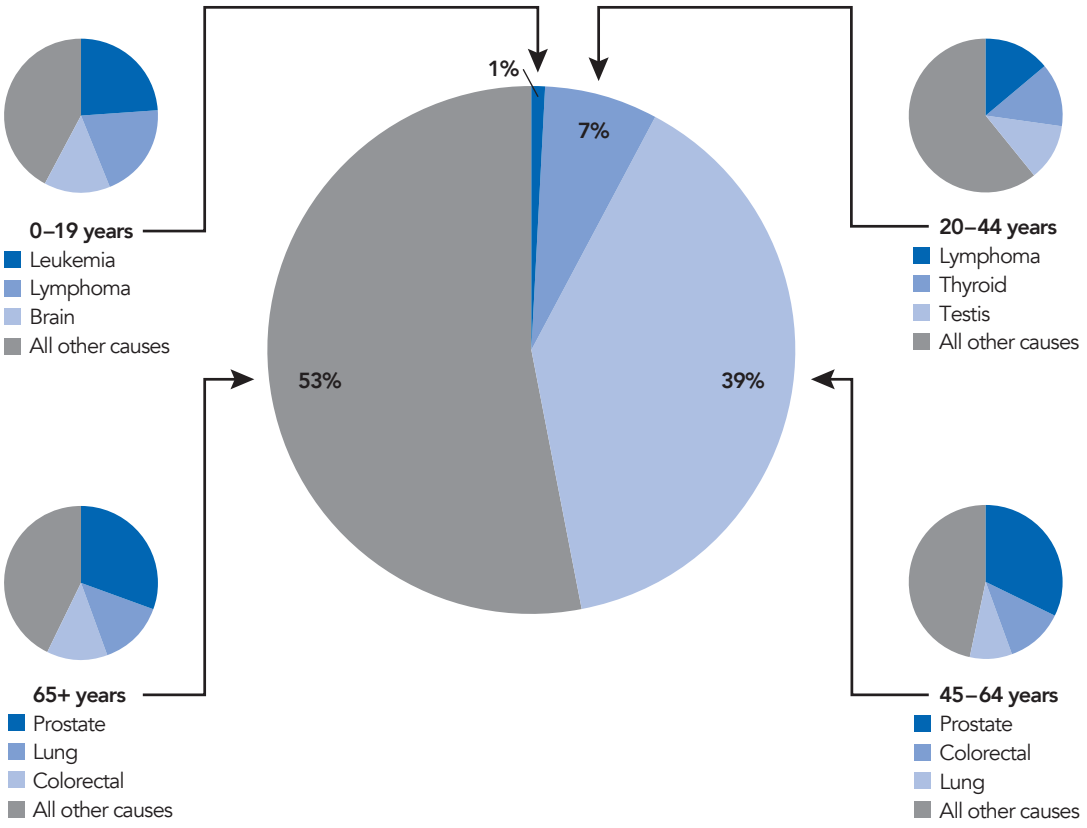
– Data not available.
Note: The top five new cancers and the top five cancers resulting in death, potential years of life lost, hospitalizations and emergency department visits differ and are all reflected above.
Sources: Ontario Cancer Incidence Database, 2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015). National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Prostate cancer is the leading cancer among Peel males (Figure 7.12) while breast cancer is the leading cancer for females (Figure 7.13). Leukemia, thyroid, lymphoma and cancers of the brain and nervous system are among the more common cancer types diagnosed in younger age groups (Figure 7.12 and Figure 7.13).

In the early 2000s, 82% of Canadian children and 85% of adolescents and young adults survived five years past diagnoisis for all cancers combined.[222,223]

Figure 7.12

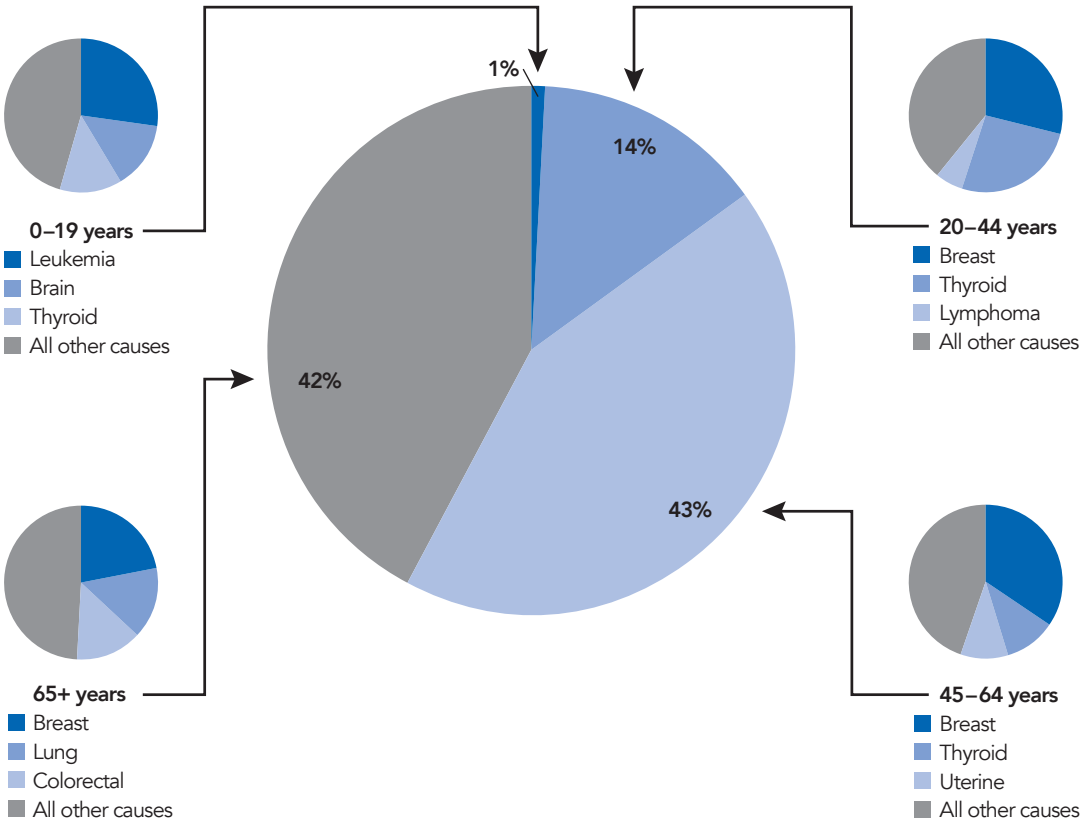
Per cent of Incident Cases for Males by Age Group and Top Three Sites of Incident Cases in Each Age Group, Peel, 2008–2012 Combined



Sources: Ontario Cancer Incidence Database, 2008–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).

Figure 7.13

Per cent of Incident Cases for Females by Age Group and Top Three Sites of Incident Cases in Each Age Group, Peel, 2008–2012 Combined



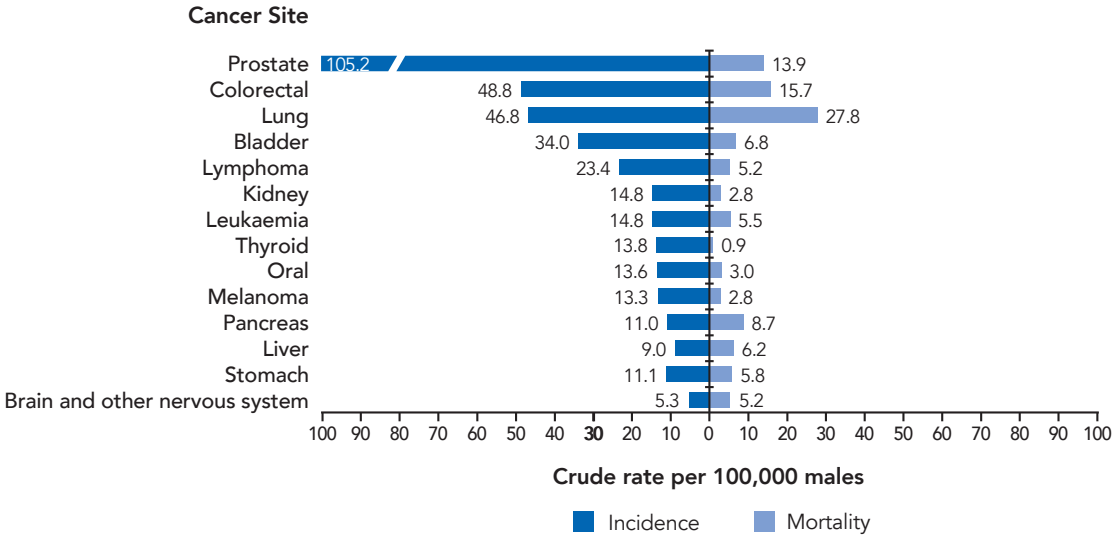
Source: Ontario Cancer Incidence Database, 2008–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).

For both children and adolescents, little is known of the risk factors contributing to cancer. Prenatal and congenital factors may play a stronger role in children, while environmental factors may be of greater importance in adolescents.[223]

Lung cancer is the top contributor to mortality from cancer among both sexes in Peel (Figure 7.14 and Figure 7.15).

Figure 7.14

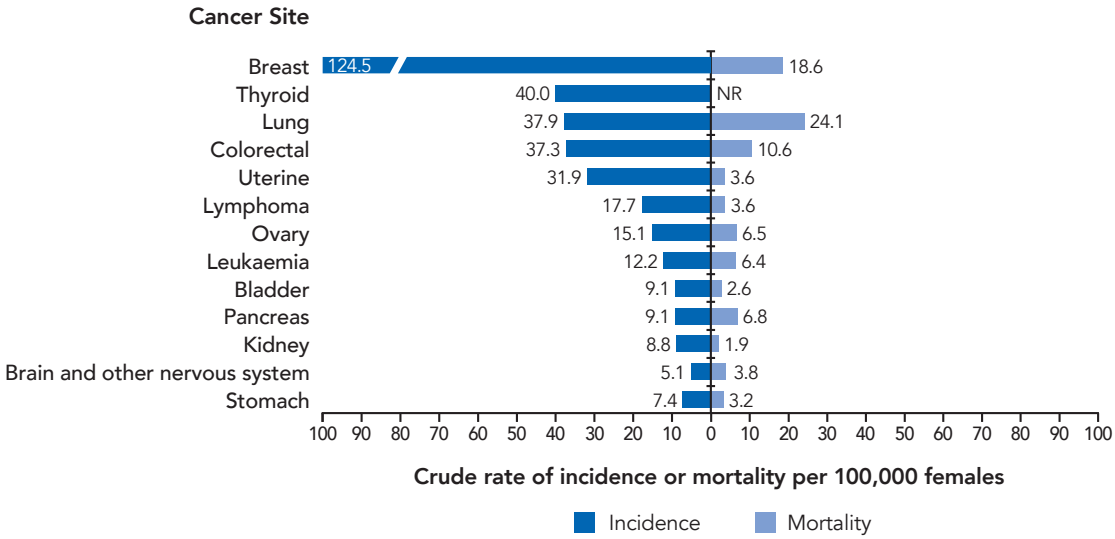
Top 10 Causes of Incident Cancer Cases and Cancer Deaths for Males, Peel, 2012



Note: Cancer sites shown reflect the top 10 sites of new cancers and cancer deaths. For cancer sites that are one of the top causes for incidence but not mortality, the corresponding mortality rate is also shown.
Sources: Ontario Cancer Incidence and Mortality Database, 2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

Figure 7.15

Top 10 Causes of Incident Cancer Cases and Cancer Deaths for Females, Peel, 2012



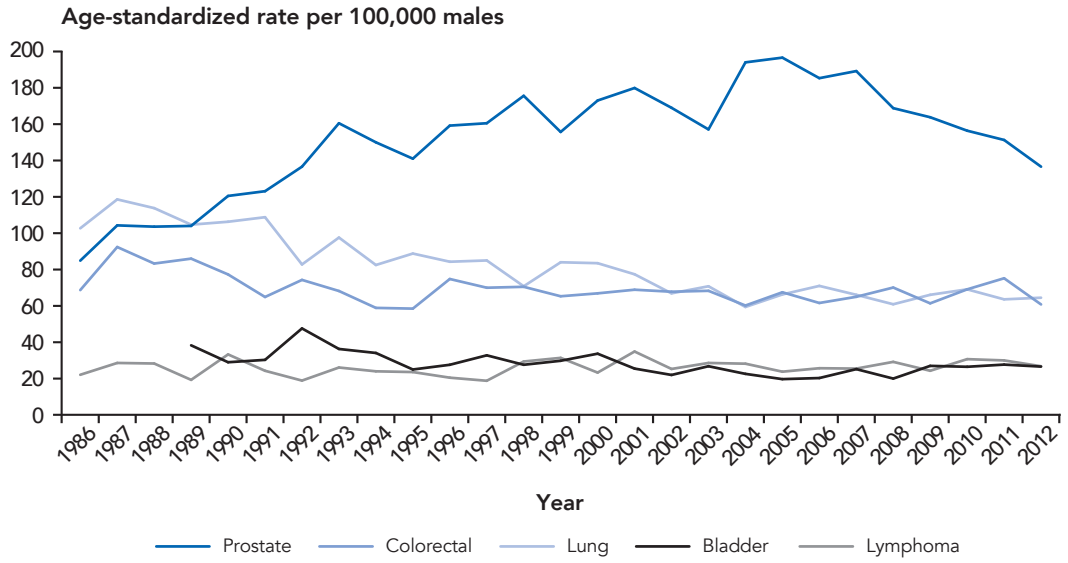
NR - Not releasable due to small numbers.
Note: Cancer sites shown reflect the top 10 sites of new cancers and cancer deaths. For cancer sites that are one of the top causes for incidence but not mortality, the corresponding mortality rate is also shown.
Sources: Ontario Cancer Incidence and Mortality Database, 2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

The incidence trends of the top five cancer types among Peel males since 1986 show a decline in lung cancer and bladder cancer and an increase in prostate cancer until 2005 (Figure 7.16).

Among Peel females during the same time period, incidence trends of the top five cancer types show an increase in thyroid cancer, a slight increase in uterine cancer, and relatively stable rates of breast, colorectal and lung cancers (Figure 7.17).

Figure 7.16

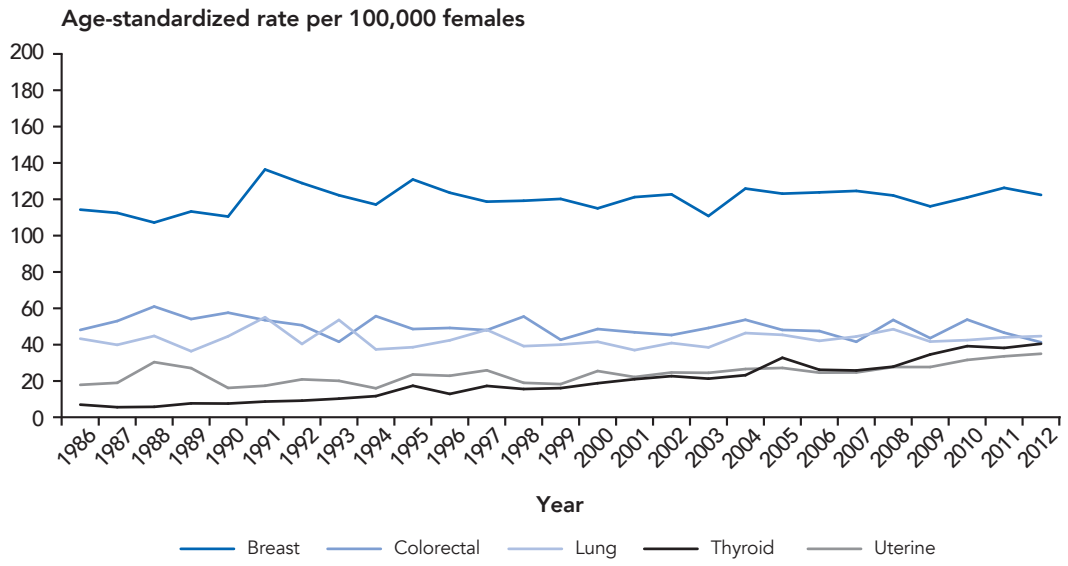
Top Five Causes of Cancer Incidence Among Males, Peel, 1986–2012



Notes: Rates are age-standardized to the 2011 Canadian population
Bladder cancer rates reported from 1989 instead of 1986 due to a classification change.
Sources: Ontario Cancer Incidence Database, 1986–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
Population Estimates, 1986-2012, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

Figure 7.17

Top Five Causes of Cancer Incidence Among Females, Peel, 1986–2012



Note: Rates are age-standardized to the 2011 Canadian population
Sources: Ontario Cancer Incidence Database, 1986–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015). Population Estimates, 1986-2012, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

Breast Cancer

While breast cancer incidence rates have been stable, mortality rates declined in Peel between 1986 and 2012; both trends are also reflected in Ontario (data not shown).[Z1,Z2] The decline in mortality rates are likely due to a combination of treatment advances and routine mammography screening.[220,221]

Lung Cancer

In Peel's population, there have been decreasing trends in the rates of lung cancer incidence and mortality between 1986 and 2012 (data not shown).[Z1,Z2] Rates for males have been consistently higher than females for both incidence and mortality, although these trends have narrowed over time (data not shown).[Z1,Z2]

Smoking tobacco is the predominant risk factor for lung cancer, attributable for over 85% of lung cancer cases in Canada[224] and an estimated 71% in Peel. Canada's declining smoking rates are reflected in the drop in lung cancer rates following a latency period of about 20 years.

Other contributing causes of lung cancer include exposure to radon, asbestos, environmental tobacco smoke and air pollution.[221]

Prostate Cancer

In both Peel and Ontario, there was an increasing trend in the incidence of prostate cancer between 1986 and the early-to-mid 2000s which coincides with the introduction of prostate-specific antigen (PSA) testing between 1988 and 2014. Since early 2000, these rates have declined (data not shown).[Z1] Since the mid-1990s, mortality rates due to prostate cancer have also declined.[Z2] The PSA is not currently recommended in Canada as a population-based screening tool.[220]

The decline in mortality is likely a result of improved treatment.[220,221]

Thyroid Cancer

The rise in thyroid cancer incidence among Peel females between 1986 and 2012 is consistent with Ontario (data not shown).[Z1] The rising incidence is attributable to advances and more frequent use of diagnostic technology that can detect subclinical tumours.[220,221,225]

Colorectal Cancer

While colorectal cancer incidence rates have remained relatively stable, mortality rates have declined in both Peel and Ontario between 1986 and 2012 (data not shown).[Z2]

The decline in mortality rates is likely due to early detection through screening, treatment advances, and changes in risk and protective factors.[220,221] Both incidence and mortality rates for colorectal cancer are consistently higher in Peel males compared to females (data not shown).[Z1,Z2]

In young to middle-aged adults, incidence rates for colorectal cancer have been increasing nationally and in Ontario.[220,226] This trend is also reflected in Peel, with a spike that began in the early-to-mid 2000s (data not shown). While epidemiological research is only speculative about this trend, early detection and the increase in obesity prevalence over time may be contributing factors.[226,227]

Uterine Cancer

There has been a slight increasing trend in the incidence of uterine cancer between 1986 and 2012 for both Peel and Ontario. Mortality rates have remained stable in Ontario; however, they are inconclusive for Peel due to small numbers (data not shown).[Z1,Z2] Some examples of modifiable risk factors for uterine cancer include being overweight or obese, and diabetes.[220,228]

Bladder Cancer

In Peel and Ontario, bladder cancer incidence rates have shown a declining trend between 1989 and the early 2000s, and have remained relatively stable through to 2012 (data not shown).[Z1] Mortality rates for bladder cancer have also remained relatively stable over the same time period for both Peel and Ontario (data not shown).[Z2]

The earlier decline in the incidence of bladder cancer may be attributed to the decline in smoking rates and reduced exposure to occupational chemicals.[220]

Lymphoma

While incidence rates for lymphoma in Peel have fluctuated between 1986 and 2012, there has been a decreasing rate of lymphoma-related mortality (data not shown). Provincial rates show an increase in incidence in the same time-frame, and a decrease in mortality between 2001 and 2012 (data not shown).[Z1,Z2]

The decline in mortality rates provincially and regionally is attributable to improvements in treatment specifically for non-Hodgkin lymphoma.[220]

Cervical Cancer

There has been a decline in both the incidence and mortality rates of cervical cancer between 1986 and 2012 for both Peel and Ontario (data not shown).[Z1,Z2] This can be largely attributed to screening using the Pap test to identify precancerous lesions.[220] As high risk human papillomavirus (HPV) is the predominant risk factor for cervical cancer[229], HPV immunization is another form of effective prevention. Through Ontario's publicly-funded school-based program, the HPV vaccine is available to all Grade 7 students in the province.

Cancer Prevention

The burden of cancer can be substantially reduced through the adoption of healthy living behaviours and effective policies and programs that protect the health of individuals (e.g., cancer screening).

Cancer Screening

Provincially organized screening programs are available for the early detection of breast, cervical and colorectal cancers.

Factors associated with the participation in Peel are outlined in Table 7.3.

Table 7.3

Provincially Organized Screening Programs and Factors Associated with Low Participation, Peel

Screening Program	Target Population	Screening Test	Participation in Peel	Factors Associated with Lower Participation in Peel
Ontario Breast Screening Program (OBSP)	Women aged 50–74 years	Mammography	Participation rates have remained steady between 2009 and 2014, with 56% of eligible women participating in the program in 2013/2014.	• Age less than 60 years • Visible minority status, particularly South Asian • Recent immigrant status • Lower income status
Ontario Cervical Screening Program (OCSP)	Women aged 21–69 years who are or have ever been sexually active	Cytology test (Pap test)	Participation rates decreased between 2009 and 2014, with 56% of eligible women participating in the program between 2012 and 2014.	• Age between 65–69 years and 21–24 years • Recent immigrant status • South Asian visible minority status • Lower income status
ColonCancerCheck (CCC)	Men and women aged 50–74 years	Guaiac fecal occult blood test (gFOBT) which will be transitioned to the fecal immuno-chemical test (FIT) in 2018	There has been a decreasing trend in percentage overdue for screening between 2011 and 2014, with 42% of eligible residents overdue in 2014.	• Males • Recent immigrant status • Visible minority status, particularly South Asian women • Lower income status

Sources: Cancer Care Ontario. Ontario Cancer Screening Performance Report 2016. Toronto: Cancer Care Ontario, 2016.
Cancer Care Ontario, Peel Public Health. Cancer Incidence and Screening, 2004–2008: Peel Region Summary Report. 2011.
Cancer Care Ontario. Transition to Fecal Immunochemical Testing (FIT). Toronto: Cancer Care Ontario, 2017.
Cancer Screening Evaluation and Reporting, Cancer Care Ontario, May 2016.

RESPIRATORY DISEASES

Chronic respiratory diseases affect the structure of the lungs, including the airways. Important respiratory diseases include chronic obstructive pulmonary disease (COPD), asthma, occupational lung diseases, lung cancer, and cystic fibrosis.[230]

Among the leading causes of respiratory disease in Peel, COPD has the highest mortality, and second-highest for potential years of life lost (PYLL) and hospitalizations (Table 7.4). Influenza and pneumonia also have high mortality rates, and rank first in PYLL and hospitalizations. Diseases in Table 7.4 were selected based on the top causes of deaths. This section will describe data related to COPD and asthma. For more information about influenza and pneumonia refer to ***Chapter 9 – Infectious Diseases***.

Primary risk factors for chronic respiratory disease include tobacco use and exposure to second-hand smoke as well as indoor and outdoor air quality.[230] Refer to ***Chapter 5 – Health and Behaviours*** and ***Chapter 10 – Environment and Health*** for more information about tobacco use and air quality, respectively.

Table 7.4

Leading Causes of Respiratory Disease, Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
Chronic obstructive pulmonary disease	3,392	230.5	1,235	83.9	155	11.4	359	27.5
Influenza and pneumonia	8,081	549.1	2,125	144.4	125	9.2	389	29.8
Pulmonary oedema	212	14.4	173	11.8	66	4.8	256	19.6
Asthma	3,223	219.0	634	43.1	11	0.8	158	12.1
Respiratory failure	141	9.6	375	25.5	6	0.4	21	1.6
Acute respiratory infections other than flu or pneumonia	16,899	1,148.3	906	61.6	2	0.1	75	5.7
All diseases of the respiratory system	**35,366**	**2,403.2**	**6,885**	**467.9**	**418**	**30.6**	**1,426**	**104.5**

Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Chronic Obstructive Pulmonary Disease (COPD)

Chronic obstructive pulmonary disease (COPD) is a major respiratory disease in Canada. It is preventable and treatable, albeit not reversible, and is largely underdiagnosed.[231, 232]

Tobacco smoke is the main cause of COPD, and accounts for 80% to 90% of all cases.[232] Second-hand smoke can also worsen symptoms. Additional risk factors for COPD include exposure to occupational dusts and chemicals, and outdoor and indoor air pollution which can also exacerbate symptoms among those who already have the disease.[230,232]

Living with COPD can have significant implications on an individual's physical and mental health as well as their ability to perform regular activities of daily living. Anxiety and depression significantly affect those with COPD more so than other advanced chronic diseases, and as the severity of the disease increases, so too do the impacts of anxiety and depression.[231,233-236] Refer to ***Chapter 6 – Mental Health*** for more information about anxiety and depression.

Cardiovascular disease, particularly ischaemic heart disease and malnutrition are directly caused by COPD. Osteoporosis, glaucoma and cataracts, anemia, cancer and metabolic syndrome are also associated with COPD.[231,237]

Incidence and Prevalence of COPD

In 2015, the crude incidence rate of COPD was 566 per 100,000 (3,504 cases) and the crude prevalence rate of COPD was 7,963 per 100,000 (53,266 cases) for Peel residents aged 40 years and older.[W9] Since 1996, the age-standardized incidence rates of COPD have decreased in both Peel (Figure 7.18) and Ontario (data not shown)[W9] and have been consistently higher among males.

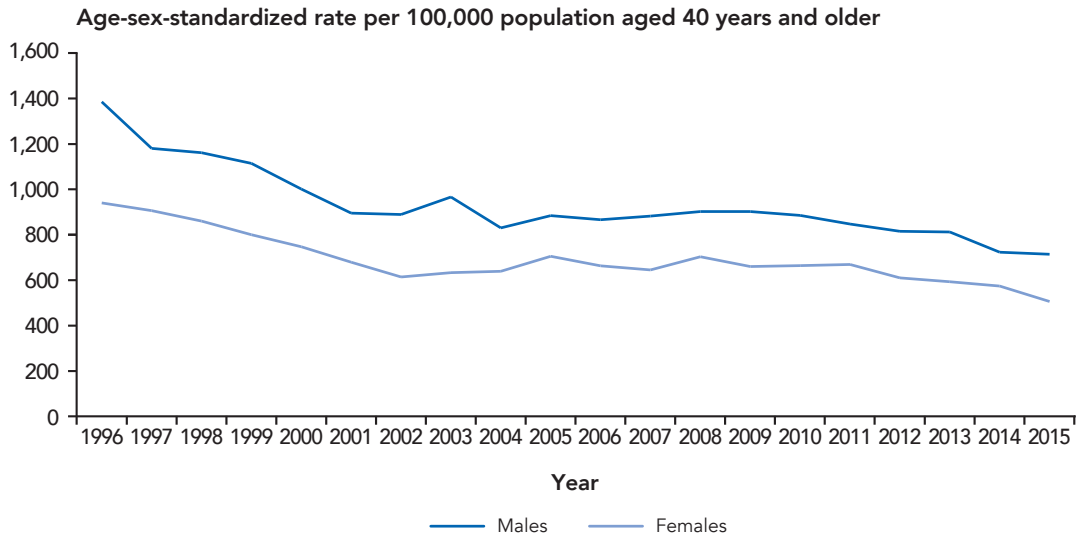
The prevalence rate has gradually increased for Peel between 1996 and 2010 and over the past five years has remained stable (data not shown).[W9] The incidence and prevalence of COPD in Peel is consistently lower than Ontario, which may be related to the lower smoking rates observed in the region.[W9]

Although the incidence rate of COPD has decreased over time, the number of new cases among Peel residents increased by 33% between 1996 and 2015.[W9] The increase is primarily due to the aging population and population growth, while fewer cases are occurring due to changes in COPD risk (Figure 7.19).

COPD is primarily diagnosed in older adults. In both Peel and Ontario, the incidence and prevalence rates for COPD increase across increasing age groups (data not shown).[W9]

Figure 7.18

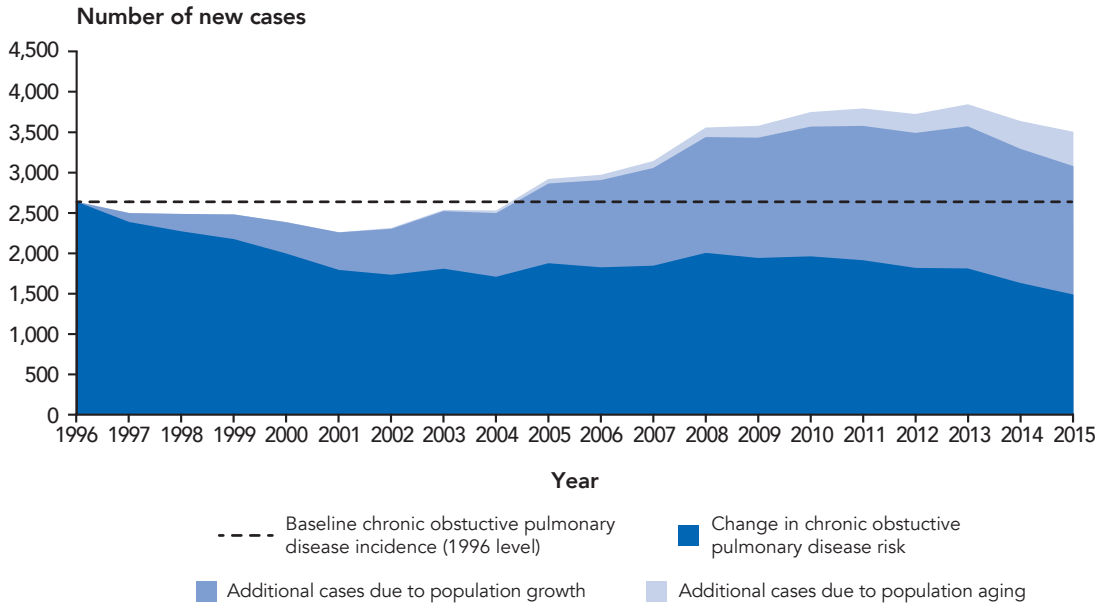
Incidence of Chronic Obstructive Pulmonary Disease by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Chronic obstructive pulmonary disease, 1996–2015, Institute for Clinical Evaluative Sciences.

Figure 7.19

Incidence Attributed to Changes in Chronic Obstructive Pulmonary Disease Risk, Population Growth and Aging, Peel, 1996–2015



Sources: Chronic obstructive pulmonary disease, 1996–2015, Institute for Clinical Evaluative Sciences.
Population Estimates, 1996–2015, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Emergency Department Visits and Hospitalizations due to COPD

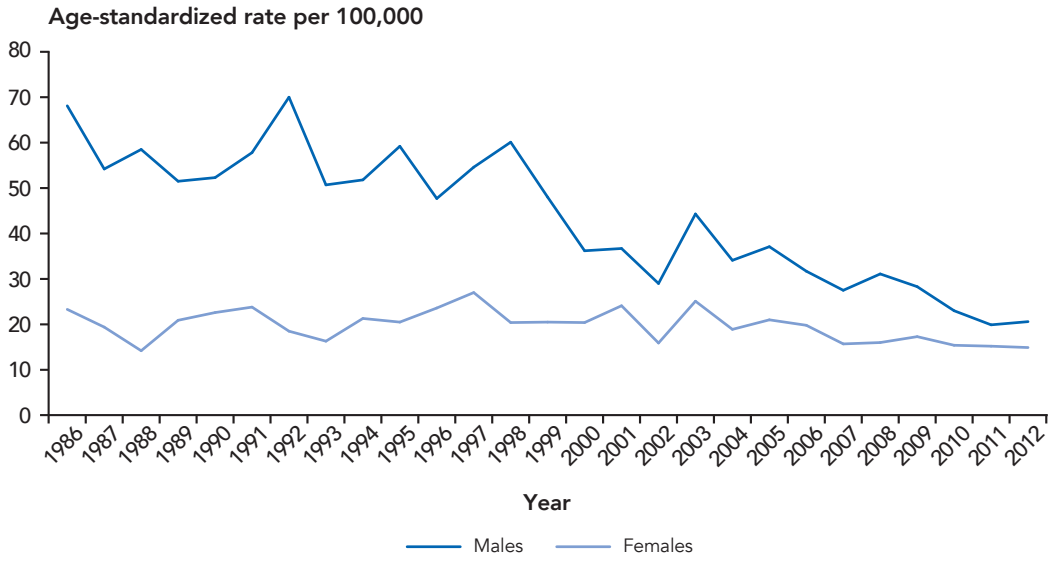
In 2016, there were approximately 3,392 ED visits due to COPD among Peel residents and 1,235 hospitalizations (data not shown). Peel's rates of ED visits and hospitalizations are lower than that for Ontario. Between 2003 and 2016, ED visit rates remained stable in Peel while hospitalization rates have declined (data not shown).[M,N]

COPD Mortality

In 2012, Peel reported 155 deaths due to COPD. Peel's mortality rate is lower than that of Ontario and has declined over the past 25 years for males whereas the rate has fluctuated for females over this time. The rate of mortality from COPD is 1.4 times higher among Peel males than females (Figure 7.20) and increases with age (data not shown).[O] This sex disparity shows a marked improvement from 25 years ago when the mortality rate for males was 2.9 times higher than females.

Figure 7.20

Deaths due to Chronic Obstructive Pulmonary Disease by Sex, Peel, 1986–2012



Note: Rates are age-standardized to the 2011 Canadian population.
Sources: Ontario Mortality Database, 1986-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care.
Population Estimates, 1986-2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Asthma

Asthma accounts for approximately 80% of chronic respiratory disease and impacts an estimated 8% of the Canadian population.[238] Although asthma prevalence is highest in children, it can impact individuals of all ages.[238]

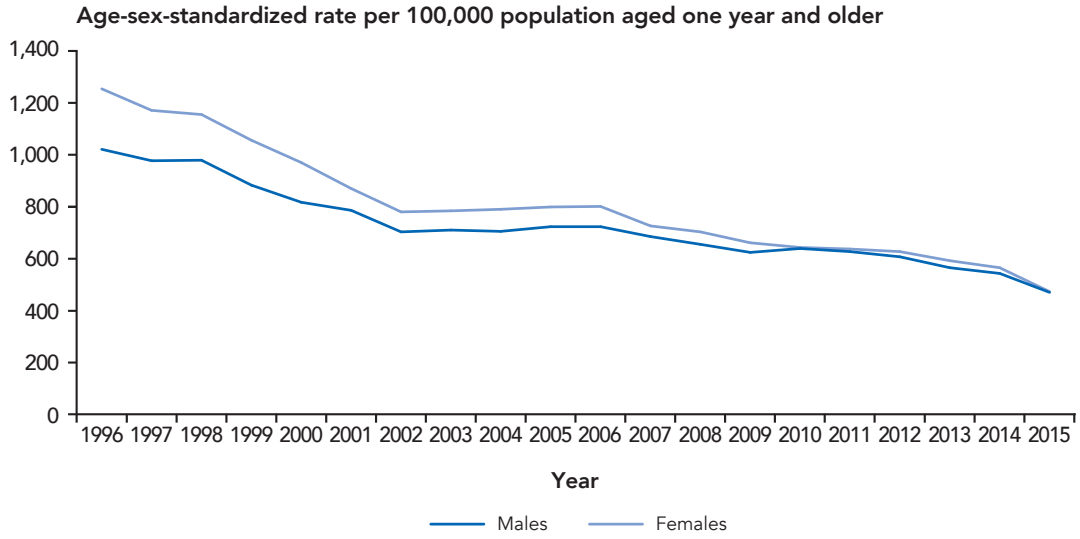
Risk factors for developing asthma include family history, exposure to indoor and outdoor allergens and irritants (e.g., pets, tobacco smoke, air pollution), frequent childhood respiratory infections, and low birth weight.[239]

Incidence and Prevalence of Asthma

In 2015,the crude incidence rate of asthma was 498 per 100,000 (6,039 cases) and the crude prevalence rate was 13,905 per 100,000 (197,789 cases).[W10] During the past two decades, the age-standardized incidence rate of asthma has decreased in both Peel (Figure 7.21) and Ontario (data not shown).[W10] While females previously had rates that were 23% higher than males, the gap has narrowed.

The incidence of asthma is highest among children one to nine years of age. In this age group, boys have a higher incidence rate than girls (Figure 7.22).

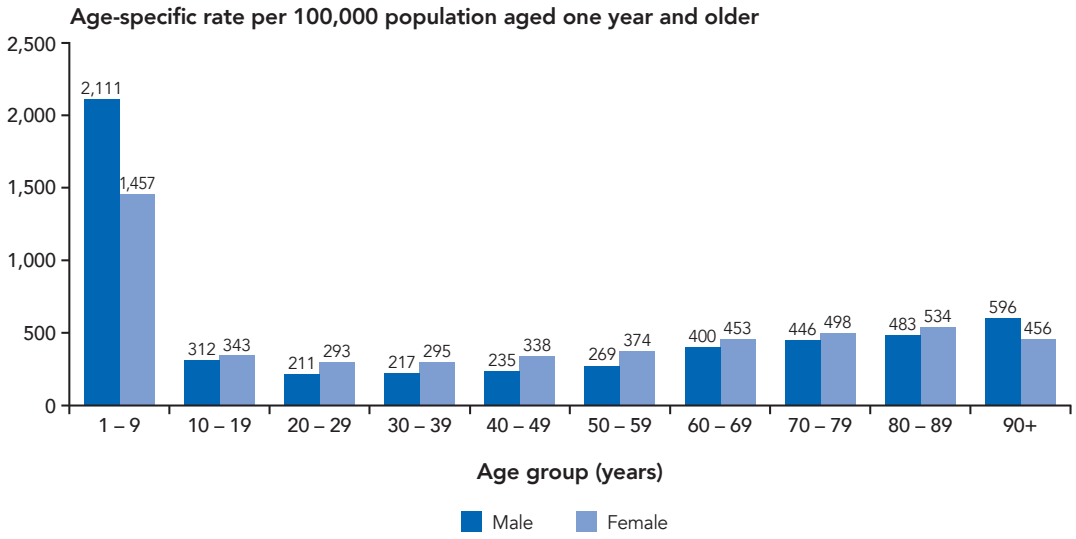
Figure 7.21
Incidence of Asthma by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Asthma, 1996-2015, Institute for Clinical Evaluative Sciences.

Figure 7.22

Incidence of Asthma by Age Group and Sex, Peel, 2015



Source: Asthma, 2015, Institute for Clinical Evaluative Sciences.

Although the incidence of asthma is declining in Peel, the prevalence rate has gradually increased over the past two decades (data not shown). Peel's prevalence rate of asthma is higher than that for Ontario.[W10]

Emergency Department Visits and Hospitalizations for Asthma

In Peel, in 2016, there were 3,223 ED visits and 634 hospitalizations due to asthma.[M,N] Between 2003 and 2016, asthma-related ED visit and hospitalization rates have declined in both Peel and Ontario (data not shown). During this time, rates for ED visits were lower and hospitalizations were higher in Peel compared to Ontario (data not shown).[M,N]

Asthma Mortality

In Peel, between 2008 and 2012, there was an average of eight deaths per year from asthma. In both Peel and Ontario, asthma-related mortality rates have declined since the late 1980s (data not shown), with Peel's rates highest among the 80 to 90 year old age group.[O] While rates have fluctuated over the years, the death rate due to asthma are higher among Peel females than males (data not shown).[O]

ENDOCRINE, NUTRITIONAL AND METABOLIC DISEASES

Among the leading causes of endocrine, nutritional and metabolic disorders, diabetes mellitus presents the highest burden for Peel with respect to mortality, potential years of life lost (PYLL), and health-care utilization (e.g., hospitalizations) (Table 7.5). Diabetes will be the only disease described in this section. Diseases for Table 7.5 were selected based on the top causes of death.

Table 7.5

Leading Causes of Endocrine, Nutritional and Metabolic Diseases, Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
Diabetes mellitus	2,220	150.9	1,176	79.9	161	11.8	920	70.4
Metabolic disorders	1,546	105.1	702	47.7	32	2.3	225	17.2
Obesity and other hyper-alimentation	6	0.4	218	14.8	6	0.4	48	3.7
Disorders of thyroid gland	246	16.7	159	10.8	5	0.4	9	0.7
Malnutrition	5	0.3	5	0.3	1	0.1	0	0.0
All diseases of the endocrine, nutritional and metabolic diseases	**4,197**	**285.2**	**2,415**	**164.1**	**208**	**15.2**	**1,283**	**94.0**

Note: Diagnoses shown reflect the top five selected causes of death and is not an exhaustive list.
Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Diabetes Mellitus

Diabetes mellitus is the fastest growing chronic disease in Canada.[240] Ontario is projected to face the largest increase in prevalence over the next decade when compared to all provinces in Canada.[241]

? *Did You Know*

Diabetes is a chronic disease characterized by the body's inability to produce or properly use insulin, a hormone that regulates glucose levels in the blood. There are three predominant types of diabetes[242]:

- ***Type 1 diabetes*** occurs when the immune system destroys the insulin-producing cells of the pancreas. This form of diabetes typically occurs in children and youth, but can also occur in adults (often before the age of 30).
- ***Type 2 diabetes*** occurs when the pancreas does not produce enough insulin and/or when the body does not adequately use the insulin produced. While this form of diabetes typically appears in adults older than 40 years, it is increasingly being diagnosed in children and youth.
- ***Gestational diabetes*** occurs in pregnant women, where high glucose levels develop due to the body's improper use of insulin. This form of diabetes often disappears after delivery; however, it is associated with an increased risk of type 2 diabetes late in life.

Please note that diabetes prevalence data contained in this section assume that once diagnosed with diabetes, a person has it for life.

Type 2 diabetes accounts for 90% of all diagnosed cases in Canada.[242] While Type 1 diabetes is not yet considered preventable[240,243] there are a number of well-established behavioural and modifiable risk factors for Type 2 diabetes. These include maintaining a healthy body weight, consuming a nutritious diet, staying physically active and eliminating tobacco use.[241,244] Hypertension and high cholesterol are also risk factors for diabetes.[244]

Important non-modifiable risk factors for diabetes include age, sex, family history and ethnicity.[244] Certain ethnic groups, including Asian, South Asian, Arab, African, Hispanic and Indigenous populations, are at an increased risk of Type 2 diabetes.[241,243-246] This may be due to genetic susceptibility, altered fat distribution (e.g., more visceral fat with greater insulin resistance) and higher prevalence of metabolic syndrome.[245]

Did You Know

There are noteworthy differences in diabetes prevalence by household income, with Canadian households in the lower income quintiles more likely to report a diabetes diagnosis.[241,247] As there are out-of-pocket costs for diabetes-related medications and supplies in Ontario[241], there are added implications for diabetes management in low-income households.

Diabetes and its related sequelae place a significant burden on the economy and healthcare system. In 2010, the direct cost of diabetes in Ontario was estimated to be just below $1.1 billion. Provincial costs are projected to grow 62% by 2020.[248] In Peel alone, the projected cost of diabetes is estimated to be $689 million in 2024.[249]

Incidence and Prevalence of Diabetes

In 2015, the crude incidence of diabetes among Peel residents aged 20 years and older was 1,192 per 100,000 (11,045 cases).[W11] The incidence rate of diabetes has increased in both Peel and Ontario since 1996, and has stabilized since 2006. Peel's 2015 age-stadardized incidence rates are 1.4 times higher than those for Ontario (data not shown).[W11]

The number of incident cases of diabetes in Peel increased by 182% between 1996 and 2015. This increase is due to the aging and growing population, and changes in diabetes risk (Figure 7.24).

Peel's incidence rates of diabetes are 1.2 times higher among males compared to females, a gap that has narrowed since 1996 (Figure 7.23).

Older Peel residents, those aged 60 to 79 years, have the highest incidence of diabetes. However, younger individuals are increasingly being diagnosed with diabetes. Over the last two decades, the incidence rate for those aged 20 to 49 years doubled – a trend not seen in other age groups.[W11]

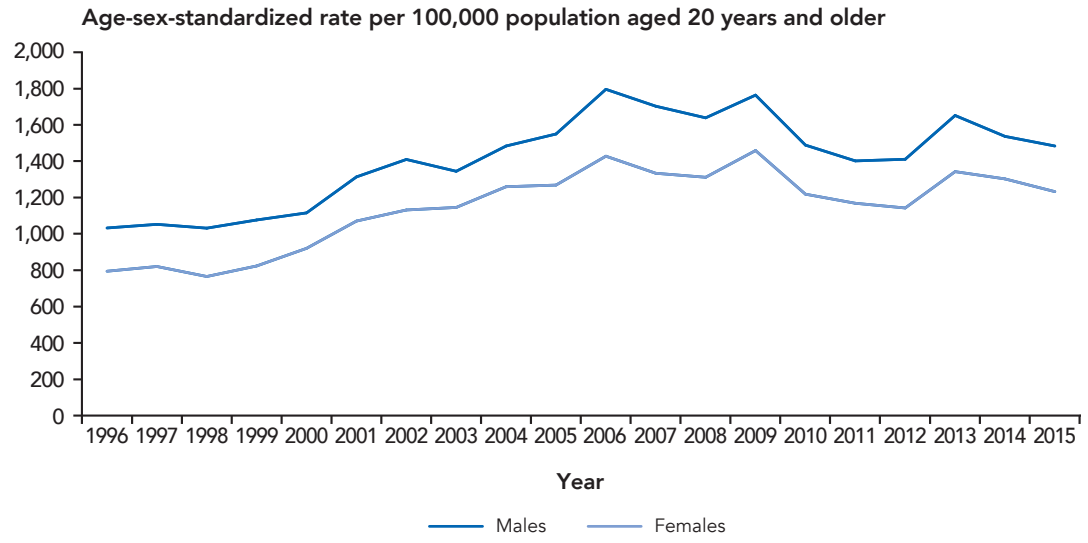
In 2015 in Peel, the crude prevalence rate of diabetes among residents aged 20 years and older was 14,986 per 100,000 (161,342 cases).[W11] The prevalence rates of diabetes have more than doubled since 1996 (Figure 7.25). Peel's rates are higher than those for Ontario.

Overall, an increase in the total number of diabetes cases is expected given the rising rates of obesity[250] and changing demographics. By 2024, it is projected that there will be a total of 894,802 new cases of diabetes in Ontario, including 100,194 new diabetes cases in Peel.[249]

Due to the region's ethnic make-up, which includes ethnicities at higher risk of Type 2 diabetes, there is variation in diabetes incidence within the population, particularly by world region of birth (Figure 7.26). In 2016, 52% of Peel residents were immigrants.[A1]

Figure 7.23

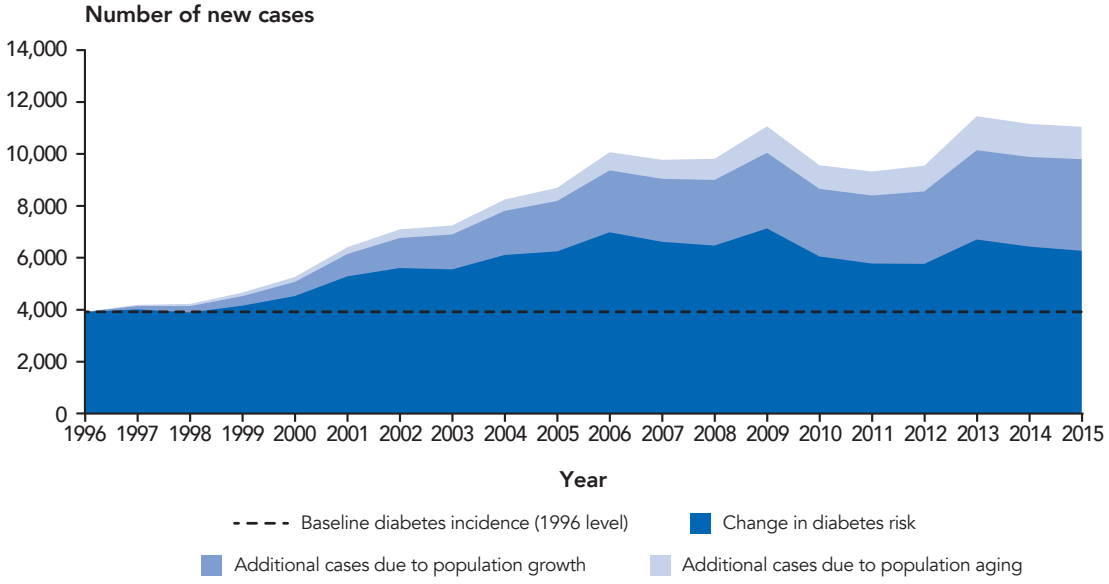
Incidence of Diabetes by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Diabetes, 1996-2015, Institute for Clinical Evaluative Sciences.

Figure 7.24

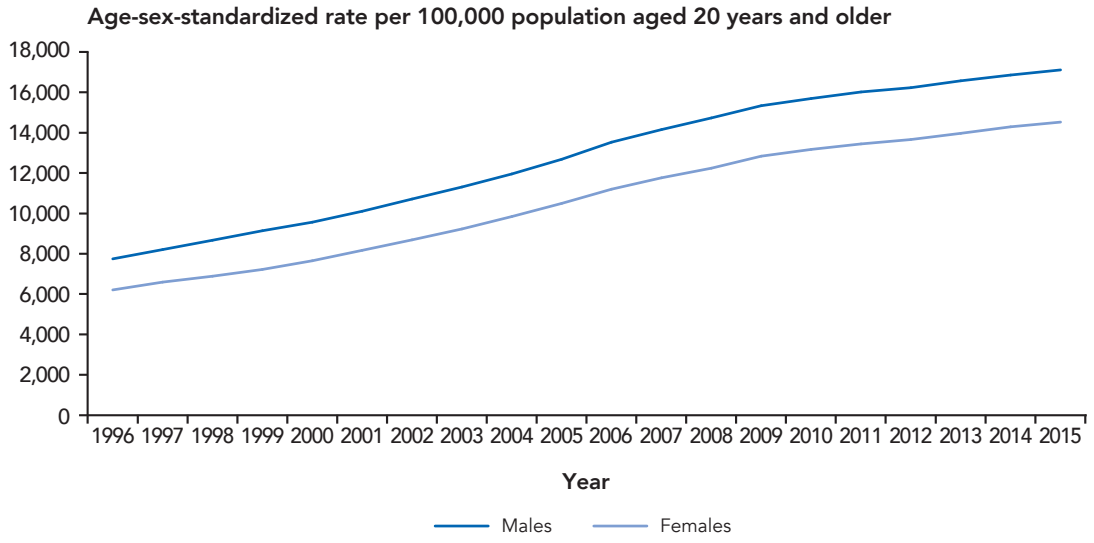
Incidence Attributed to Changes in Diabetes Risk, Population Growth and Aging, Peel, 1996–2015



Sources: Diabetes, 1996–2015, Institute for Clinical Evaluative Sciences.
Population Estimates, 1996–2015, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 7.25

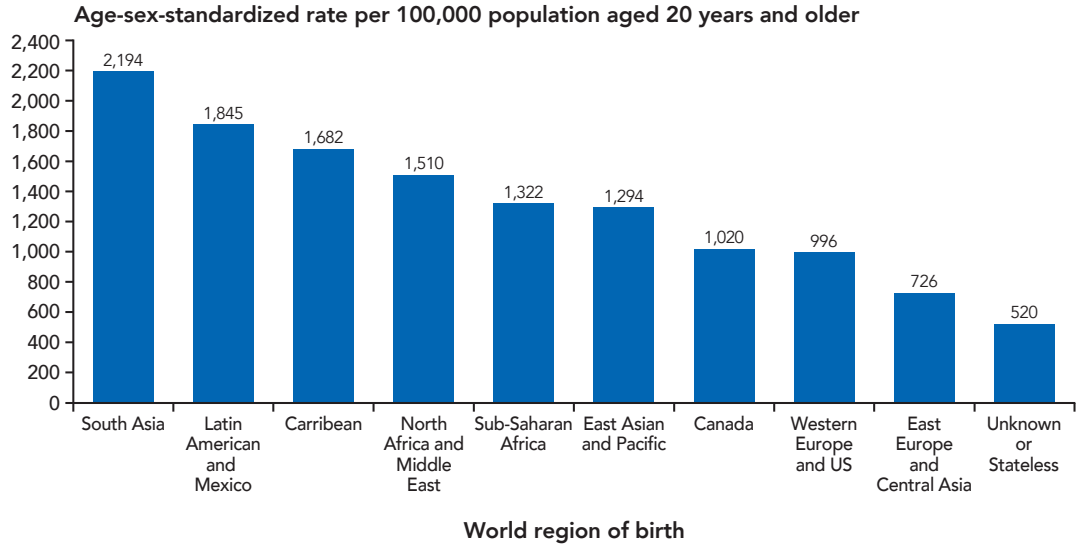
Prevalence of Diabetes by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Diabetes, 1996-2015, Institute for Clinical Evaluative Sciences.

Figure 7.26

Diabetes Incidence by World Region of Birth, Peel, 2012



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Diabetes, 2012, Institute for Clinical Evaluative Sciences.

Individuals with diabetes are at risk of experiencing significant adverse health outcomes including cardiovascular disease, eye disease or retinopathy which may lead to vision loss, kidney disease, and amputations.[241,243] In fact, diabetes is the leading cause of blindness, end-stage renal disease and non-traumatic amputation in Canadian adults.[243] CVD is the leading cause of death in individuals with diabetes, and occurs two- to four-times more often than in people without diabetes.[243,251]

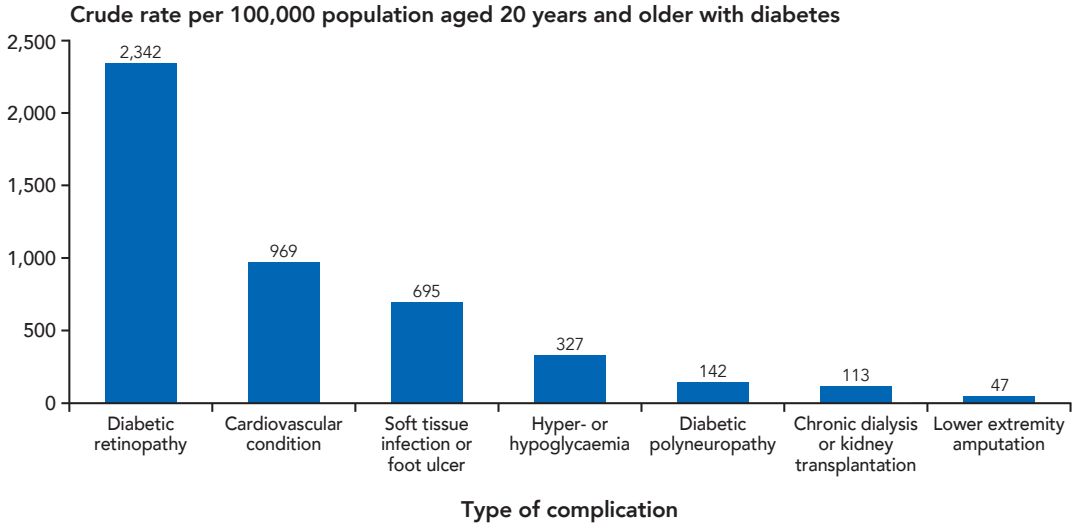
Specific to Peel, the most common types of complications include diabetic retinopathy, CVD conditions and soft tissue infections or foot ulcers (Figure 7.27). The incidence rates of many of these complications in Peel are lower than rates of Ontario (data not shown).[W15]

Emergency Department Visits and Hospitalizations from Diabetes

Although the rate of emergency department (ED) visits and hospitalizations due to diabetes has increased since 2003, rates have been relatively stable since 2010 (data not shown).[M,N] Peel's rate of ED visits due to diabetes is lower than the rate in Ontario, while its rate of hospitalization is similar (data not shown).[M,N]

Figure 7.27

Incidence of Selected Complications of Diabetes, Peel, 2015



Source: Diabetes Sequelae, 2015, Institute for Clinical Evaluative Sciences.

Did You Know

Diabetes may also be an underlying reason for healthcare utilization given the number of complications and sequelae associated with this disease. For example, people with diabetes are three times more likely to be hospitalized with cardiovascular disease, 12 times more times more likely to be hospitalized with end-stage renal disease and 20 times more likely to be hospitalized for a non-traumatic lower limb amputation compared to the general population in Canada.[243]

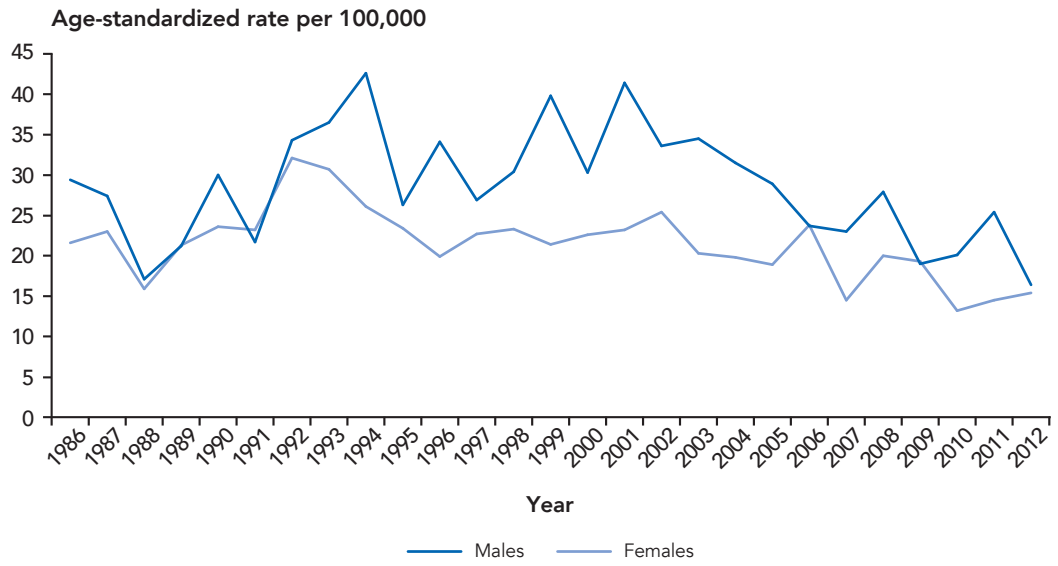
Diabetes Mortality

In 2012, there were 161 deaths due to diabetes among Peel residents (Table 7.5).[O] The age-standardized mortality rates for diabetes have decreased over the past two decades in Peel (Figure 7.28) and in the past 10 years in Ontario (data not shown).[O] While a decrease in diabetes mortality is observed, it should be noted that deaths for diabetes are underreported. Diabetes itself, is not typically reported as the primary cause of death[252] even though its many complications and sequelae are associated with increased mortality. Between 2004 and 2008, diabetes was more than twice as likely to be coded as a contributing cause, rather than the underlying cause of death in Canada.[252]

Did You Know

In Ontario, all death certificates are to record the immediate cause of death as well as antecedent causes which are those that contribute to the immediate cause of death. Other significant conditions contributing to the death, but not causally related to the immediate cause are also recorded.[253]

Figure 7.28
Deaths due to Diabetes by Sex, Peel, 1986–2012



Note: Rates are age-standardized to the 2011 Canadian population.
Source: Ontario Mortality Database, 1986-2012. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care. Population Estimates, 1986-2012, Statistics Canada. IntelliHEALTH Ontario Ministry of Health and Long-Term Care.

MUSCULOSKELETAL DISEASES AND CONDITIONS

Diseases of the musculoskeletal system are generally accompanied by pain (ranging from mild to severe), fatigue and limitations of physical functioning. Everyday activities, such as work and social commitments, are often restricted.[254]

> ? *Did You Know*
>
> Musculoskeletal disorders are the leading lost-time work injury reported to the Workplace Safety and Insurance Board (WSIB) in Ontario.[255]

Musculoskeletal conditions include back pain, repetitive strain injuries, arthritis[254,256] and osteoporosis.

Arthritis/rheumatism is a leading cause of disease of the musculoskeletal system in Peel (Table 7.6). It is also a significant cause of health-care utilization. Overall in Peel, it is the third-leading cause of emergency department visits in Peel (data not shown).[M,N]

Arthritis

The term "arthritis" encompasses over 100 diseases and conditions that affect the joints, tissues surrounding the joints and other connective tissue.[256] The main symptoms of arthritis include joint pain, stiffness and swelling, all of which can lead to significant disability.

Table 7.6

Selected Leading Causes of Diseases of the Musculoskeletal System and Connective Tissue, Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
Arthritis/ rheumatism	16,268	1,105.5	4,339	294.9	28	2.1	326	25.0
Osteoporosis	13	0.9	34	2.3	4	0.3	0	0.0
All diseases of the musculoskeletal system and connective tissue	**28,557**	**1,940.5**	**5,194**	**352.9**	**37**	**2.7**	**387**	**28.4**

Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntrelliHEALTH Ontario, Ministry of Health and Long-Term Care.

? *Did You Know*

The following are the most prevalent forms of arthritis in the Canadian population:

- ***Osteoarthritis*** is a progressive joint disease that is characterized by the deterioration of cartilage in one or more joints leading to pain, stiffness and swelling. This type of arthritis occurs in roughly 13% of the population.[256]
- ***Gout*** is caused by high levels of uric acid in the blood leading to the formation of crystals and inflammation commonly in one joint, often the big toe. This type of arthritis has a comparatively low impact on functional health[254], and occurs in roughly 3% of the population.[256]
- ***Rheumatoid arthritis*** is a chronic autoimmune disease that targets the body's joints leading to pain, inflammation and joint damage. This type of arthritis occurs in roughly 1% of the population.[256]
- ***Systematic lupus erythematosus*** is a chronic, rheumatic autoimmune disease that attacks the body's own healthy tissue including tissue of the joints, kidney, heart and other organs. This type of arthritis occurs in less than 0.5% of the population.[256]

Different types of arthritis have different profiles of modifiable and non-modifiable risk factors. Common non-modifiable risk factors for arthritis include age, sex, hormones, and genetic predisposition. Physical activity, diet, overweight or obesity, smoking and infection are common modifiable factors.[257]

Incidence and Prevalence of Osteoarthritis

In 2015, the Peel crude incidence rate of osteoarthritis was 2,379 per 100,000 (16,558 cases) and the prevalence rate was 34,994 per 100,000 (374,620 cases).[W12] Peel's age-standardized incidence rate of osteoarthritis is higher than that of Ontario (data not shown), but has decreased over the past two decades (Figure 7.29). Females have a rate that is approximately 20% higher than males (i.e., 1.2 times higher) (Figure 7.29).

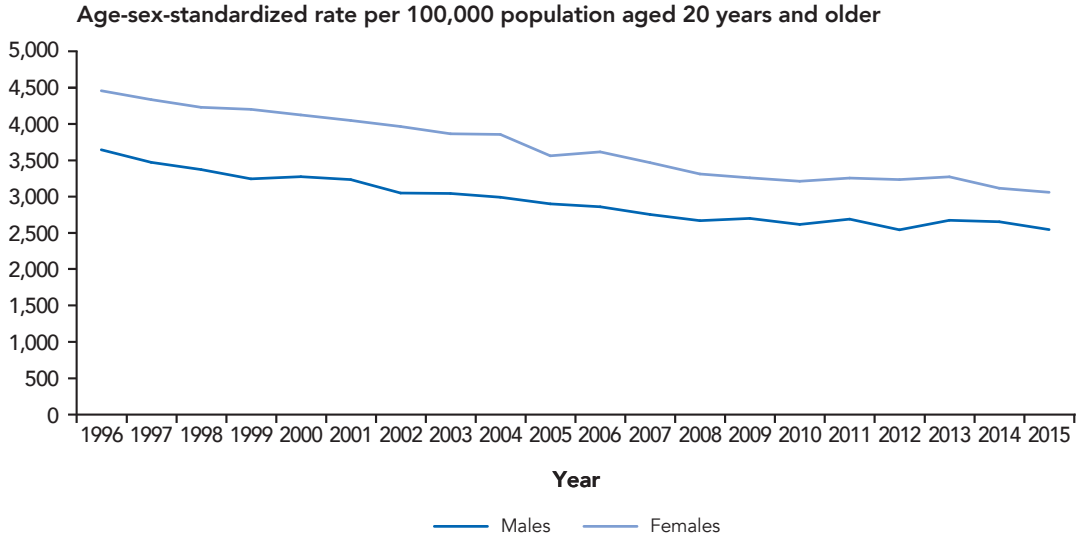
Peel's prevalence of osteoarthritis is higher than that of Ontario, and is approximately 14% higher in females compared to males (data not shown).[W12]

Incidence and Prevalence of Rheumatoid Arthritis

In 2015, the crude incidence rate of rheumatoid arthritis was 71 per 100,000 (755 cases) and the crude prevalence was 918 per 100,000 (9,824 cases).[W13] The age-standardized incidence rate of rheumatoid arthritis is similar to that of Ontario (data not shown)[W13], and has fluctuated over the past two decades (Figure 7.30). The incidence of rheumatoid arthritis increases with age, peaking among adults aged 70 to 79 years (data not shown).[W13] In addition, females have a rate that is more than 2.2 times higher than that of males (Figure 7.30).

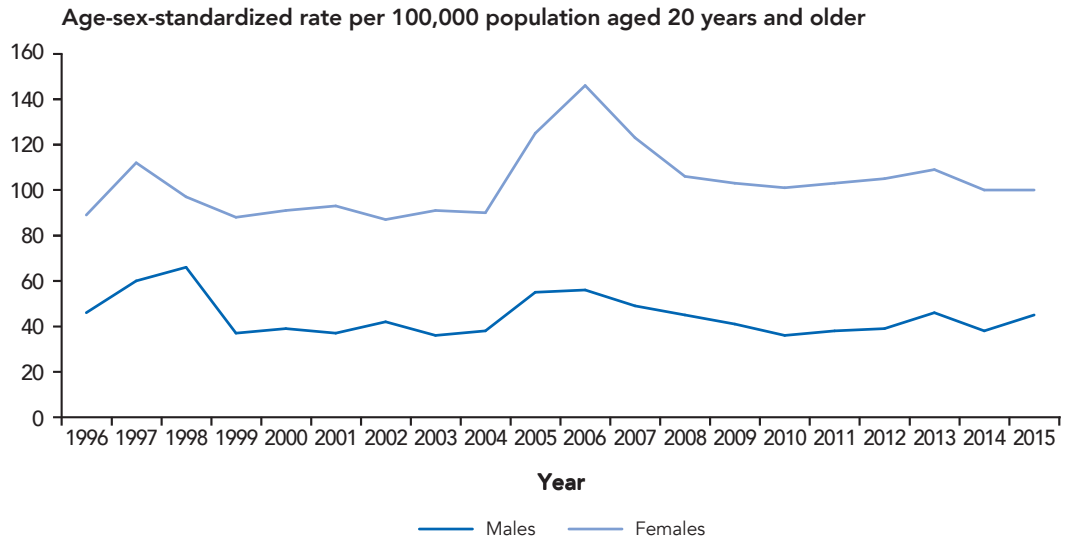
Figure 7.29

Incidence of Osteoarthritis by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Osteoarthritis, 1996-2015, Institute for Clinical Evaluative Sciences.

Figure 7.30
Incidence of Rheumatoid Arthritis by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population.
Source: Rheumatoid arthritis, 1996-2015, Institute for Clinical Evaluative Sciences.

The prevalence of rheumatoid arthritis has increased over the past two decades (data not shown).[W13] Prevalence among females in Peel is 2.6 times higher than males. Peel's prevalence of rheumatoid arthritis is similar to that of Ontario.[W13]

Emergency Department Visits and Hospitalizations due to Arthritis

In 2016 there were 16,268 emergency department (ED) visits and 4,339 hospitalizations due to arthritis/rheumatism in Peel.[M,N]

The rate of ED visits from arthritis/rheumatism has been increasing in Peel for over the past decade whereas hospitalization rates have remained relatively stable.

Osteoporosis

Osteoporosis is a disease where bone loss occurs more rapidly than normal resulting in low bone density. Individuals with osteoporosis are at an increased risk of fractures, which can lead to significant pain and disability, health-care utilization, and premature death.[258] Fractures of the hip, spine, wrist and shoulder are common[258,259], while fractures of the hip and spine are particularly burdensome as they are associated with premature death.[260,261] Osteoporosis is asymptomatic until a fracture occurs.[254]

Did You Know

Hip fractures nearly always require hospitalization. In 20% of cases they are fatal and 50% of those affected are permanently disabled. Only 30% of patients fully recover.[261]

While osteoporosis is most common among older individuals, this disease can affect people of all ages. For adults younger than 50 years of age, rheumatoid arthritis may lead to osteoporosis.[259,262] Irrespective of age, one in four women over the age of 50 suffer from osteoporosis.[263] Women's susceptibility to osteoporosis is generally due to lower bone density and a higher rate of bone loss as they age.[259]

Modifiable risk factors that influence osteoporosis include nutrition (consumption of calcium and vitamin D), smoking, physical activity, medication and alcohol consumption.[258,262]

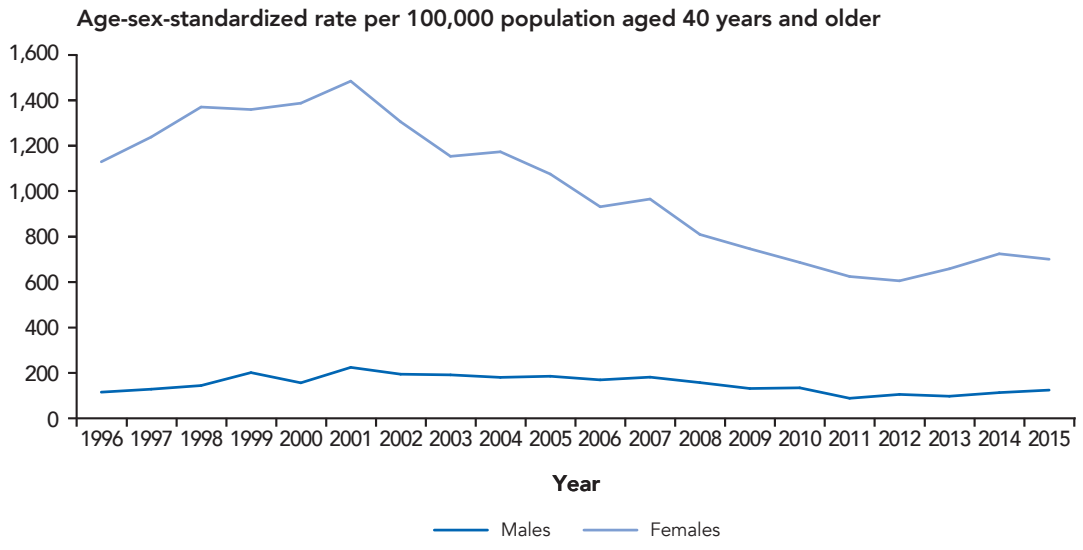
Incidence and Prevalence of Osteoporosis

In 2015, the crude incidence of osteoporosis among Peel residents aged 40 years and older was 361 per 100,000 (2,304 cases) and the crude prevalence was 5,258 per 100,000 (35,384 cases).[W14] Since 2001, incidence rates of osteoporosis have decreased in Peel (Figure 7.31) and Ontario (data not shown).[W14]

The incidence of osteoporosis increases with age and is 5.6 times higher for females than males in Peel, a disparity that has improved over the past 20 years.

Figure 7.31

Incidence of Osteoporosis by Sex, Peel, 1996–2015



Note: Rates are age-sex-standardized to the 2011 Canadian population
Source: Osteoporosis, 1996-2015, Institute for Clinical Evaluative Sciences.

DISEASES OF THE DIGESTIVE SYSTEM

Within diseases of the digestive system, cirrhosis and other diseases of the liver are the leading causes of mortality, and rank highest in the number of potential years of life lost (PYLL). Diseases of the oral cavity rank third in emergency department visits (Table 7.7). Diseases for Table 7.7 were selected based on the leading causes of death.

Diseases of the Oral Cavity

Oral health is an essential component of overall health. In Peel and Ontario in 2013/2014, 85% of the population reported having excellent, very good or good oral health (i.e., "positive oral health"). This has been stable since 2003 (data not shown). However, positive oral health is lowest among those aged 65 years and older.[H2]

Common diseases of the oral cavity include dental caries or tooth decay, periodontal disease (e.g., gingivitis and periodontitis), soft deposits or debris, and hard deposits. While these diseases are continually prevalent in Canada, routine data about the oral health status of Peel's

Table 7.7

Leading Causes of Diseases of the Digestive System, Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
Cirrhosis and other diseases of the liver	529	35.9	441	30.0	101	7.4	1,380	105.6
Appendicitis, hernia and intestinal obstruction	3,980	270.5	3,085	209.6	34	2.5	77	5.9
Diseases of the oesophagus	3,766	255.9	754	51.2	22	1.6	91	7
Noninfective enteritis and colitis	458	31.1	395	26.8	8	0.6	71	5.4
Cholelithiasis, cholecystitis and other diseases of the gallbladder	2,613	177.6	1,236	84.0	3	0.2	71	5.4
Diseases of the oral cavity	2,853	193.9	228	15.5	1	0.1	75	5.7
All diseases of the digestive system	**5,061**	**1,703.0**	**8,834**	**600.3**	**238**	**17.4**	**2,005**	**146.9**

Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

population is limited to children in junior kindergarten (JK), senior kindergarten (SK) and Grade 2. Generalizable data and data specific to older children and adults are not available.

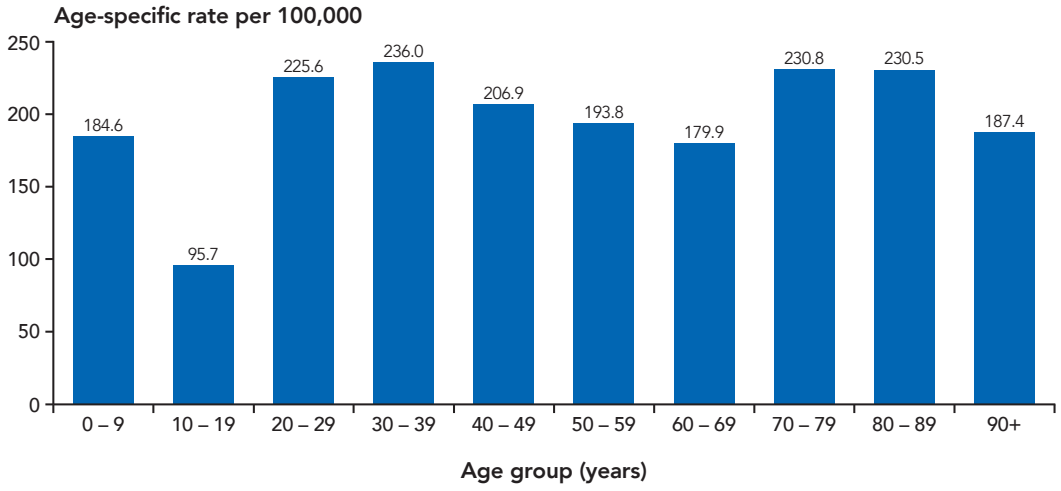
Most oral diseases are preventable through regular dental visits, proper oral hygiene, the use of fluoridated dental products at home or by a dental professional, and population-level interventions such as community water fluoridation. Additional factors such as the consumption of high sugar foods and beverages, and the use of specific medications also influence the risk of oral diseases.

Individuals without access to dental care visit emergency departments (EDs) for their dental needs.[264] In Peel, in 2016, there were a total of 2,853 ED visits due to diseases of the oral cavity, salivary glands and jaw (crude rate of 193.9 visits per 100,000)[M], which is higher than the total number of ED visits for oral-related injuries in the same year (data not shown). The age-standardized rate of ED visits due to diseases of the oral cavity, salivary glands and jaw is similar to the rate a decade ago and are lower in Peel compared to Ontario (data not shown).[M]

In Peel, those between 20 and 39 years of age as well as those 70 to 89 years of age have the highest ED visit rate for diseases of the oral cavity, salivary glands and jaw (Figure 7.32).

Figure 7.32

Emergency Department Visits due to Diseases of the Oral Cavity, Salivary Glands and Jaw by Age Group, Peel, 2016



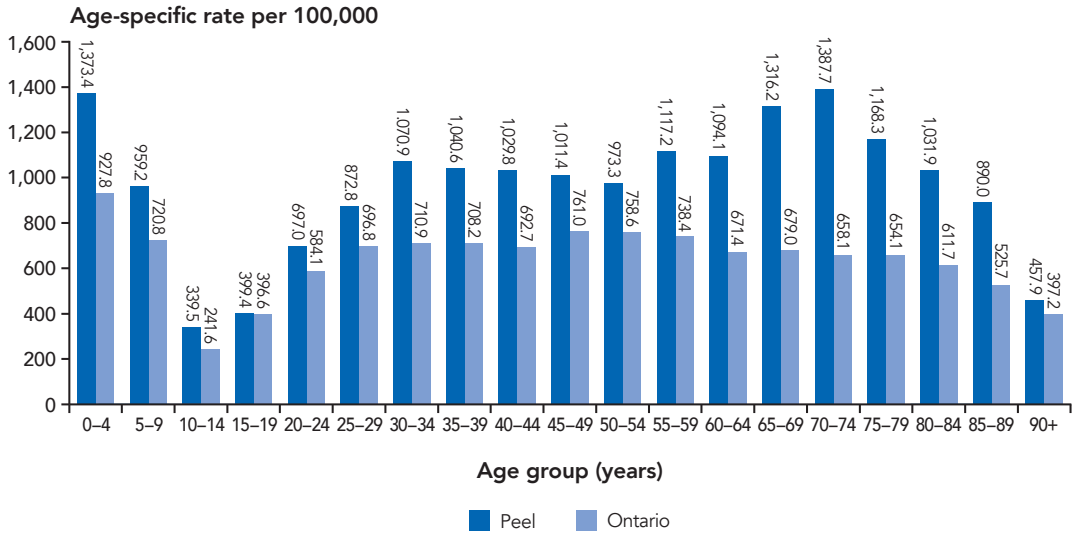
Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Visits to a General Practitioner for Diseases of the Oral Cavity

In 2015, there were 13,685 visits to a general practitioners or family physician for dental caries, gingivitis, toothache or dental abscess in Peel (crude rate of 965.4 visits per 100,000). Of all visits, 43% were due to a toothache or dental abscess, 37% were due to dental caries, and 20% were due to gingivitis.[L] The rate of visits to a general practitioner or family physician for oral health-related conditions is highest among those aged zero to four years as well as those 65 to 79 years. In general, visit rates are higher among Peel residents regardless of age when compared to Ontario (Figure 7.33).

Figure 7.33

Visits to General Practitioners or Family Physicians for Oral Health Consultation by Age Group, Peel and Ontario, 2015



Notes: Visits were counted for patients having one or more oral health diagnoses that saw physicians for assessment or consultation, with the service location being either a community physician office, or unknown (i.e., hospital locations were filtered out as much as possible). Patients could be seen more than once, but only one visit was counted per day. Note that there may have been other, additional diagnoses associated with the assessment or consultation.
Sources: Medical Services (Ontario Health Insurance Plan) Database, 2015, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2015, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Liver Disease

There are a range of liver diseases and conditions with varying causes. Liver diseases include infectious (e.g., hepatitis B or hepatitis C) and non-infectious hepatitis (e.g., autoimmune hepatitis), cirrhosis due to long-lasting scarring and inflammation of the liver, liver cancer, alcoholic liver disease, and non-alcoholic fatty liver disease.[265,266] Refer to ***Chapter 9 – Infectious Diseases*** for more information about infectious hepatitis.

The burden of chronic liver disease has been increasing. Mortality from chronic liver disease and cirrhosis rose significantly in Canada between 2000 and 2015.[267]

The most common chronic liver diseases, including non-alcoholic fatty liver disease and alcoholic liver disease, are of public health relevance as they are largely associated with obesity and alcohol use respectively. This is increasingly important as non-alcoholic fatty liver disease and alcoholic liver disease are both increasing in prevalence in Canada[268], and are often diagnosed only at advanced stages.[269,270]

Non-Alcoholic Fatty Liver Disease

Non-alcoholic fatty liver disease (NAFLD) is the most common liver disease in Canada, and is increasing in incidence.[268] This form of liver disease is caused by a build-up of fat in the liver in people who drink little or no alcohol. High levels of fat in the liver are also associated with an increased risk of cardiovascular disease and diabetes.[271]

NAFLD is preventable. Its modifiable risk factors and conditions include overweight or obesity, Type 2 diabetes, hypertension, high cholesterol, and smoking.[271]

? *Did You Know*

Between 3% and 15% of patients with non-alcoholic fatty-liver disease (NAFLD) develop cirrhosis. Patients may be asymptomatic until they present with findings of advanced-stage cirrhosis; however, the progression of NAFLD to end-stage liver disease can take decades.[272]

Data for NAFLD are not available for Peel and Ontario.

Alcoholic Liver Disease

Alcoholic liver disease (ALD) is the result of excessive alcohol consumption,[268,269,273] however, it can also affect those that are not addicted to alcohol, but consume alcohol regularly.[268] ALD results in fatty liver, alcoholic hepatitis, and alcoholic liver cirrhosis[269,273] through the progression of the disease. Liver cancer is also a complication of ALD.[269]

Additional modifiable risk factors that influence ALD include hepatitis C and cigarette smoking and sex, with females being at an increased risk.[269]

Alcohol abstinence is the most effective strategy to prevent disease progression[275], and is the first line of treatment for those with ALD.[268,269]

Data for the incidence and prevalence of ALD are not available for Peel, Ontario or Canada.

Emergency Department Visits and Hospitalizations from ALD

In 2016, there were 85 emergency department visits (crude rate of 5.8 per 100,000) and 165 hospitalizations (crude rate of 11.2 per 100,000) from ALD among Peel residents (data not shown).[M,N] Peel's rate of ED visits and hospitalizations from ALD are lower than that of Ontario (data not shown). While Peel's rates of both ED visits and hospitalizations have fluctuated since 2003, ED visit rates have been relatively stable since 2008 (data not shown).[M,N]

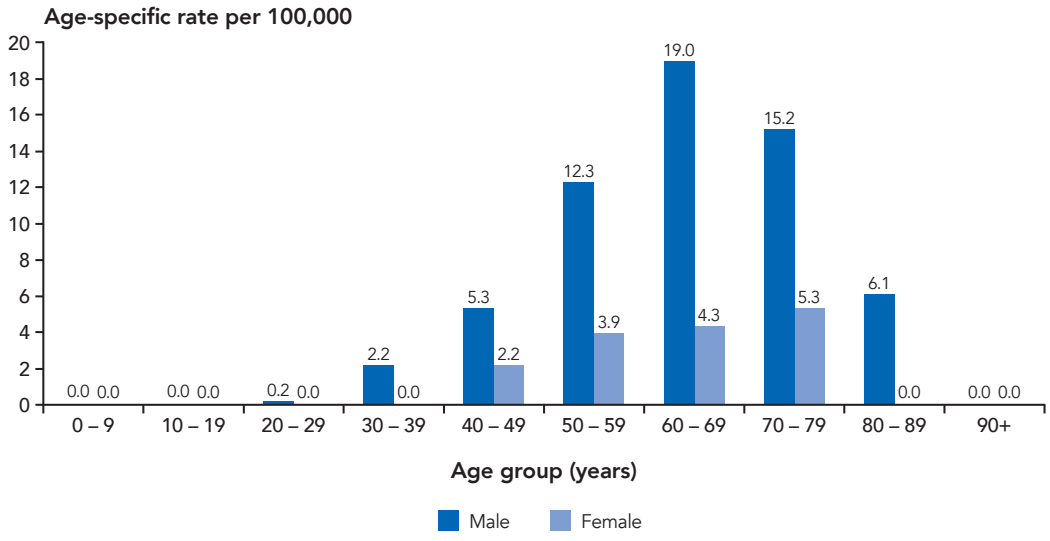
Rates of ED visits and hospitalizations from ALD are approximately twice as high among Peel males compared to females (data not shown), and peak among males in their 50s.[M,N]

Alcoholic Liver Disease Mortality

In 2012, among Peel residents, there were 52 deaths from ALD (data not shown).[O] Peel's ALD mortality rate increased slightly between 2001 and 2012, and is similar to that of Ontario (data not shown).[O] The mortality rate from ALD is 2.6 times higher for males compared to females and peaks among those aged 60 to 69 years (Figure 7.34).

Figure 7.34

Deaths due to Alcoholic Liver Disease by Age Group and Sex, Peel, 2008 to 2012 Combined



Sources: Ontario Mortality Database, 2008–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2008–2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Chapter 8

Injuries and Violence

Key Messages

- Injury is the leading cause of emergency department visits, hospitalization and potential years of life lost (PYLL) in Peel and it is the fourth-leading cause of death.
- Peel's rates of injury-related emergency department visits, hospitalizations and deaths are lower than those of Ontario.
- The leading causes of injury in Peel that have resulted in premature death, as measured by PYLL, are suicide, poisonings, motor vehicle collisions, assault and other transport accidents.
- Falls are the only leading cause of injury-related emergency department visits that have increased in Peel; rates of hospitalization and death due to falls have either fluctuated or remain stable.
- Although rates of hospitalization and deaths from motor vehicle collision injuries have decreased over the past decade, motor vehicle collisions remain among the top causes of premature death from injuries.
- Data about violence and health are emerging in Peel, and further work will be required to understand this issue in more depth. At this time, routine health status data about violence in Peel are limited to emergency department visits, hospitalizations and deaths from assault-related injuries, experiences of bullying among students, and police-reported data on criminal incidents that occur within the community.

In Canada, injuries are the leading cause of death for those aged one to 44 years.[274]

In 2010, injuries cost Ontarians $8.8 billion, a per capita cost of $667. Injuries resulted in 72,289 hospitalizations, approximately 1.35 million visits to the emergency room, 18,660 cases of permanent partial disability, and 1,456 instances of permanent total disability. In 2010, there were 44 injury-related deaths per 100,000 Ontarians, and 1,128 potential years of life lost per 100,000 people.[275]

Injury Burden in Peel

In 2013/2014, approximately 12% of Peel residents (154,000 people) had sustained an injury in the past year that was serious enough to limit their normal activity.[H2] Injury is also the leading cause of emergency department (ED) visits, hospitalization and potential years of life lost (PYLL) in Peel and the fourth leading cause of death.[M,N,O] Death rates, and the demand on health-care resources vary according to injury type. Table 8.1 illustrates the top external causes of injury resulting in these outcomes.

Definition

The number of ***potential years of life lost (PYLL)*** is a measure of premature death. It is the sum of all the years not lived by all the individuals in a population who die prior to age 75. PYLL weights death at a young age more heavily than death at an old age.

In Peel in 2012, the top causes of injury resulting in premature death, as measured by PYLL, were falls, suicide, poisonings, motor vehicle collisions, and assault (Figure 8.1 and Table 8.1).

Definition

An ***external cause of injury*** refers to the environmental factors or circumstances that caused the injury. An example would be a fall from a ladder. It is used by the International Statistical Classification of Diseases and Related Health Problems (ICD-10-CA) as an additional code to indicate the nature of a condition related to injury morbidity and mortality.[113]

Leading Causes of Injuries

The leading causes of injury resulting in an emergency department visit vary by sex among Peel residents. Falls are the top cause of injury among females whereas exposure to inanimate and animate mechanical forces is the leading cause for males (Figure 8.1). In 2016 in Peel, males had higher rates for select causes of injury compared to females, including injuries from exposure to inanimate and animate mechanical forces and assault.[M]

Table 8.1

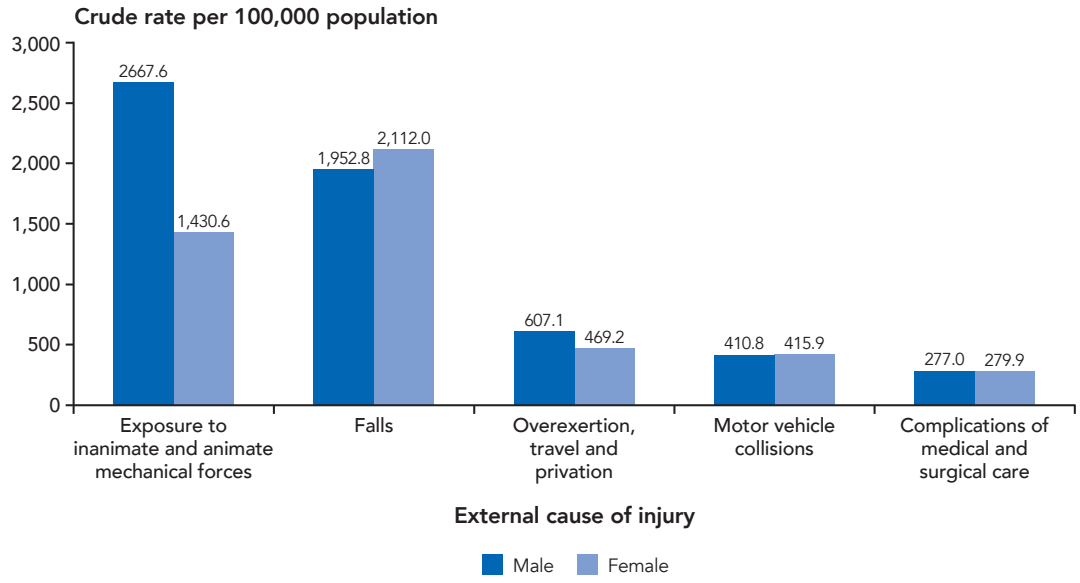
Selected Leading Causes of Injury, Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number
Falls	2,033.4	29,924	156.2	2,299	7.5	102	32.2	420
Suicide	50.9	749	15.2	223	5.2	71	146.4	1,913
Poisoning	99.6	1,466	11.8	173	3.3	45	95.1	1,242
Motor vehicle collisions	413.4	6,083	23.2	341	1.5	20	48.7	636
Land transport accidents (other)	42.6	627	1.1	16	1.1	15	37.4	488
Pedestrian collisions	44.1	649	7.2	106	1.0	14	27.6	361
Suffocation including choking	2.9	42	5.7	84	1.0	14	11.0	144
Assault	123.3	1,814	8.8	130	0.9	12	40.0	523
Drowning or submersion	2.5	36	0.4	6	0.8	11	20.7	270
Exposure to inanimate and animate mechanical forces	2,041.9	30,049	25.3	372	0.3	4	12.6	165
Overexertion, travel and privation	537.4	7,908	3.9	58	0.0	0	0.0	0
Cycling collisions	94.3	1,387	5.2	77	0.3	4	7.7	100
Complications of medical and surgical care	278.5	4,098	136.8	2,013	0.2	3	0.0	0
Water transport accidents (excluding drowning)	3.5	52	0.5	8	0.2	3	0.0	0

Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.1

Leading External Causes of Injury Resulting in Emergency Department Visits by Sex, Peel, 2016



Note: External causes shown reflect the top five causes for males and females.
Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The leading types of injuries for ED visits and hospitalization vary by age (see Table 8.2 and Table 8.3).

In 2016, the leading causes of injury-related ED visits for all age groups in Peel were falls, and 'exposure to inanimate and animate mechanical forces' (Table 8.2).

Definition

Exposure to ***inanimate and animate mechanical forces*** consists of a group of external causes of injuries including, but not limited to the following:

- struck by or against an object or person;
- occupational and machine-related injuries;
- cut/pierced by an object (including plants);
- firearm, including undetermined intent;
- explosion; and
- bitten, struck, or stung by an animal or insect.

Table 8.2

Top Five External Causes of Injury Resulting in Emergency Department Visits by Age Group, Peel, 2016

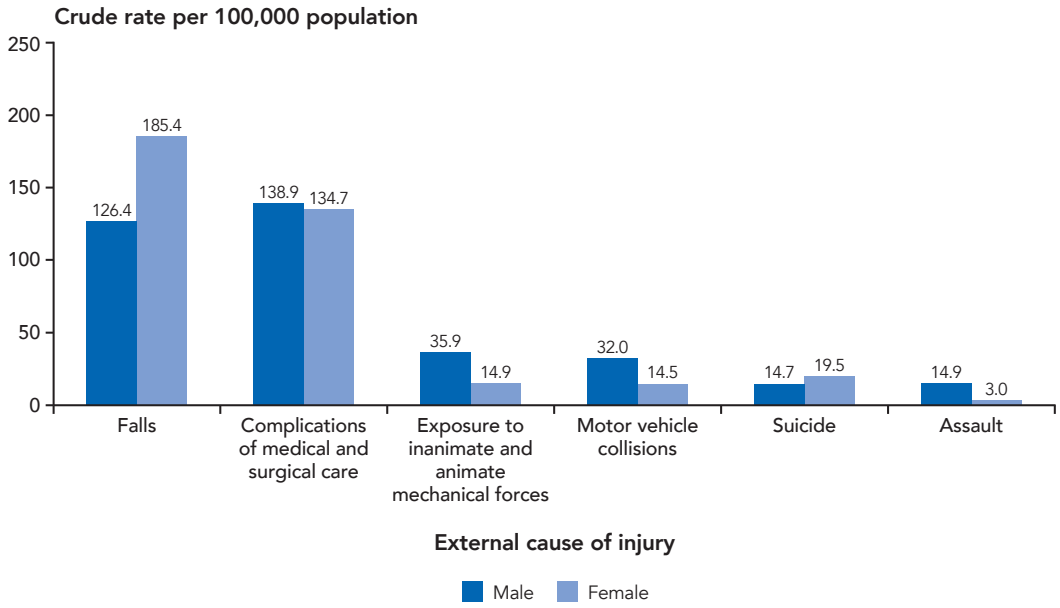
Rank	Age Group (Years)			
	0–19	20–44	45–64	65+
	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)
1	Exposure to inanimate and animate mechanical forces 2,874.1 (10,418)	Exposure to inanimate and animate mechanical forces 2,198.7 (11,583)	Falls 1,612.5 (6,399)	Falls 3,975.0 (7,373)
2	Falls 2,809.0 (10,182)	Falls 1,133.2 (5,970)	Exposure to inanimate and animate mechanical forces 1,589.4 (6,307)	Exposure to inanimate and animate mechanical forces 938.6 (1,741)
3	Overexertion, travel and privation 736.6 (2,670)	Overexertion, travel and privation 589.2 (3,104)	Overexertion, travel and privation 428.2 (1,699)	Complications of medical and surgical care 695.5 (1,290)
4	Motor vehicle collisions 216.3 (784)	Motor vehicle collisions 585.4 (3,084)	Motor vehicle collisions 426.9 (1,694)	Motor vehicle collisions 280.9 (521)
5	Cycling collisions 188.2 (682)	Assault 216.4 (1,140)	Complications of medical and surgical care 325.3 (1,291)	Overexertion, travel and privation 234.5 (435)

Notes: Complications of medical and surgical care include sequelae.
Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In 2016, the leading causes of injury-related hospitalizations in Peel were falls, followed by complications of medical and surgical care (Figure 8.2).[N] This was similar for both Peel males and females, as well by age group (Table 8.3). However, there are sex disparities in the rates of hospitalization due to other causes of injury (Figure 8.2).

Figure 8.2

Leading External Causes of Injury Resulting in Hospitalizations by Sex, Peel, 2016



Note: External causes shown reflect the top five causes for males and females. Although assault is among the top five causes for males but not females, the corresponding rate for females is shown. Similarly, suicide is among the fop five causes for females, but not males, and the corresponding rate for males is also shown.
Sources: Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In 2012 in Peel and Ontario, falls, suicide and all types of poisoning were the three leading causes of injuries resulting in death for both males and females (Figure 8.3).○ After adjusting for age, Peel's injury-related mortality rates for these leading causes are lower than Ontario's rates.○

Table 8.3

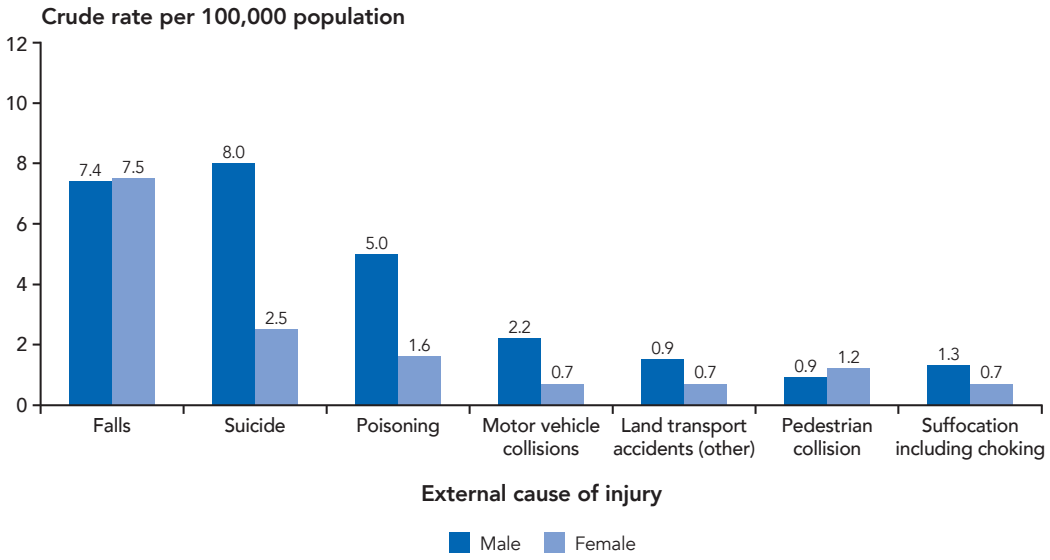
Top Five External Causes of Injury Resulting in Hospitalizations by Age Group, Peel, 2016

Rank	Age Group Years)			
	0–19	20–44	45–64	65+
	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)
1	Falls 61.2 (222)	Complications of medical and surgical care 63.6 (335)	Complications of medical and surgical care 156.2 (620)	Falls 802.2 (1,488)
2	Complications of medical and surgical care 40.0 (145)	Falls 34.9 (184)	Falls 102.1 (405)	Complications of medical and surgical care 492.2 (913)
3	Exposure to inanimate and animate mechanical forces 29.5 (107)	Motor vehicle collisions 30.8 (162)	Exposure to inanimate and animate mechanical forces 23.9 (95)	Motor vehicle collisions 41.5 (77)
4	Motor vehicle collisions 9.7 (35)	Exposure to inanimate and animate mechanical forces 22.4 (118)	Motor vehicle collisions 16.9 (67)	Exposure to inanimate and animate mechanical forces 28.0 52)
5	Suicide 9.4 (34)	Suicide 21.6 (114)	Suicide 14.9 (59)	Suffocation including choking 27.0 (50)

Notes: Complications of medical and surgical care include sequelae.
Sources: Hospital In-Patient Discharges, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.3

Leading External Causes of Injury Resulting in Death by Sex, Peel, 2012

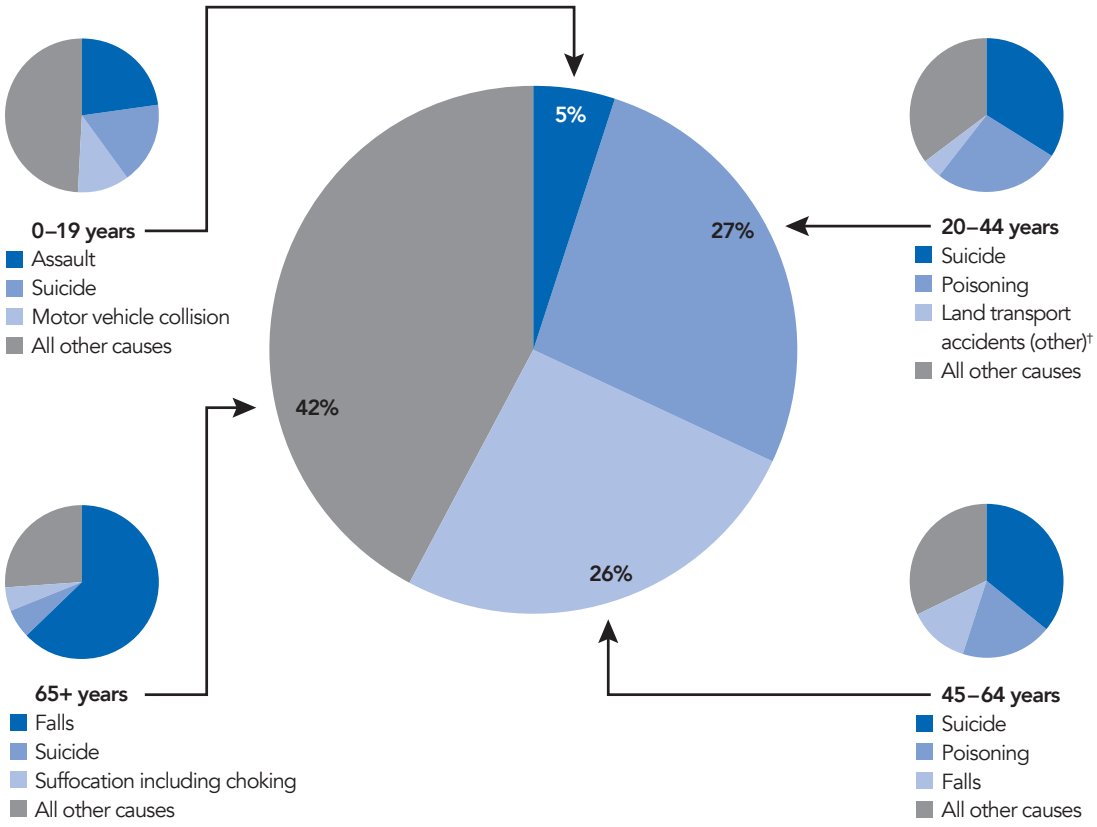


Note: External causes shown reflect the top five causes for males and females.
Source: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Falls are the leading cause of injury-related mortality among older adults in Peel. However, suicide or self-harm is the leading cause among Peel residents aged 20 to 64 years, and second-leading cause among those younger than 20 years of age and those aged 65 years and older (Figure 8.4).

Figure 8.4

Leading External Causes of Death from Injury by Age Group, Peel, 2008–2012 Combined

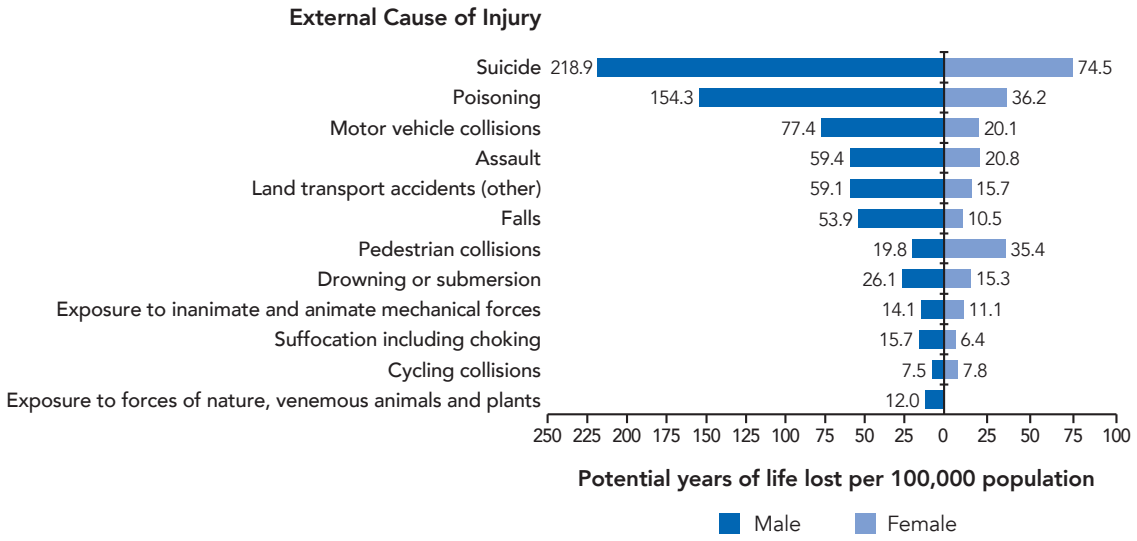


† Land transport accident (other) excludes motor vehicle colisions, cycling and pedestrian collisions.
Sources: Ontario Mortality Database, 2008-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In 2012 in Peel, suicide and all types of poisoning were the leading causes of injuries resulting in PYLL (Figure 8.5). Males have significantly higher PYLL rates in nearly all the outlined causes of injuries.

Figure 8.5

Potential Years of Life Lost for Selected Leading External Causes of Injury by Sex, Peel, 2012



Sources: Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Injuries due to Falls

Falls are numerous and heterogeneous in nature. In 2013/2014, approximately 46% of Peel residents (70,800 people) who reported having an injury serious enough to limit their normal activities, indicated that their injury was fall-related.[H2]

In Peel in 2016, there were 29,924 ED visits and 2,299 hospitalizations among Peel residents as a result of fall-related injuries.

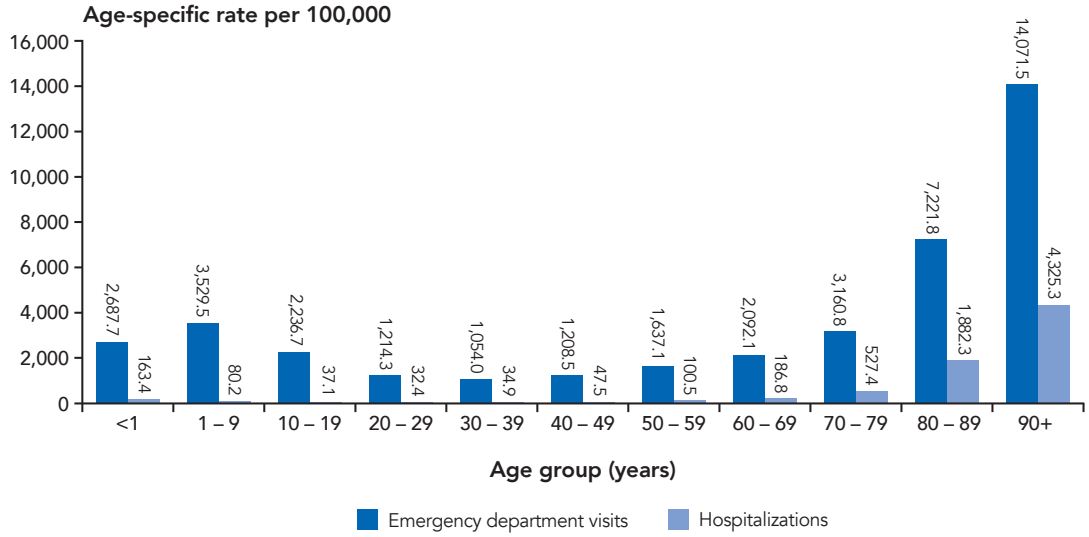
The highest rates of fall-related ED visits and hospitalizations in Peel are among older adults, followed by children under the age of 10 years (Figure 8.6).

In 2012, there were 102 deaths in Peel as a result of accidental falls. This represents 2% of all deaths in Peel and 30% of injury deaths. There have been fluctuations in Peel's mortality rates due to falls over the past 11 years, while Ontario's rates have continued to rise (Figure 8.7).

Death rates due to falls are highest in the older age groups, with the highest mortality rate observed among Peel residents aged 80 years and older. Although females have a higher number of falls, after age adjustment, males are 1.4 times more likely to die from a fall-related injury.[O]

Figure 8.6

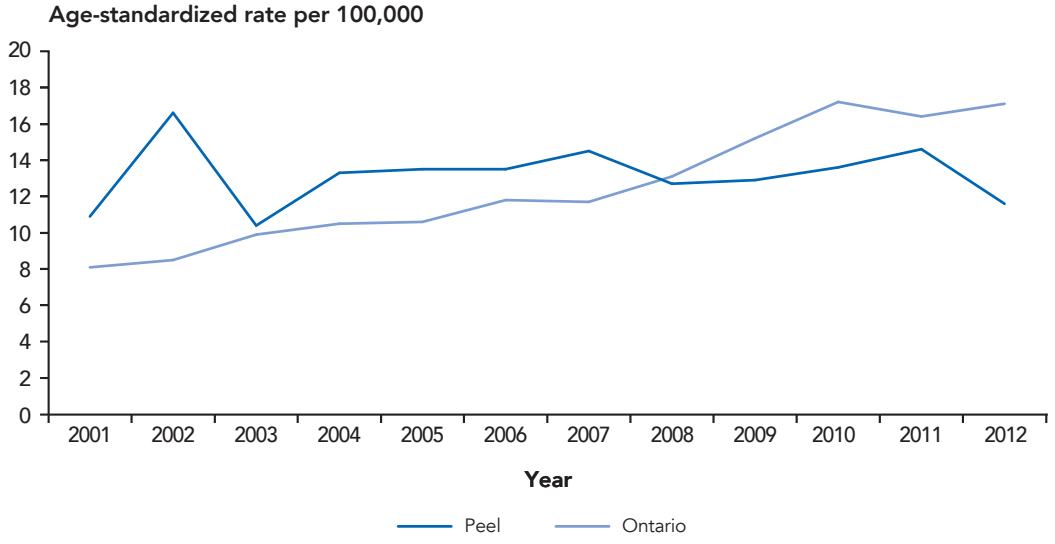
Emergency Department Visits and Hospitalizations due to Falls-related Injuries by Age Group, Peel, 2016



Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges Data, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.7

Deaths due to Falls-Related Injuries, Peel, 2001–2012



Note: Rates are age-standardized to the 2011 Canadian population
Sources: Ontario Mortality Database, 2001–2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2001–2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Transport-related Injuries

Transportation is an essential part of daily life. Within transport-related injuries, motor vehicle collisions have the largest rate of ED visits, hospitalizations, deaths and PYLL in Peel (Table 8.4).

Motor Vehicle Collisions

Data Gaps

The injury-related emergency department visits, hospitalization and mortality data for motor ***vehicle collisions (MVC)*** tell us about the injuries that Peel residents sustained in MVCs and do not necessarily mean that the MVC occurred within the geographic boundaries of Peel region.

In 2016 there were 6,083 ED visits and 341 hospitalizations due to MVC injuries among Peel residents.[M,N]

Peel Facts

In 2017, Peel Regional Police investigated a total of 26,471 motor vehicle collisions in which 25 involved fatalities.[276]

Over the past decade, ED visit rates due to MVCs in Peel have been stable (Figure 8.8). Hospitalization rates for both Peel and Ontario have decreased between 2003 and 2016 (data not shown).[N]

Table 8.4

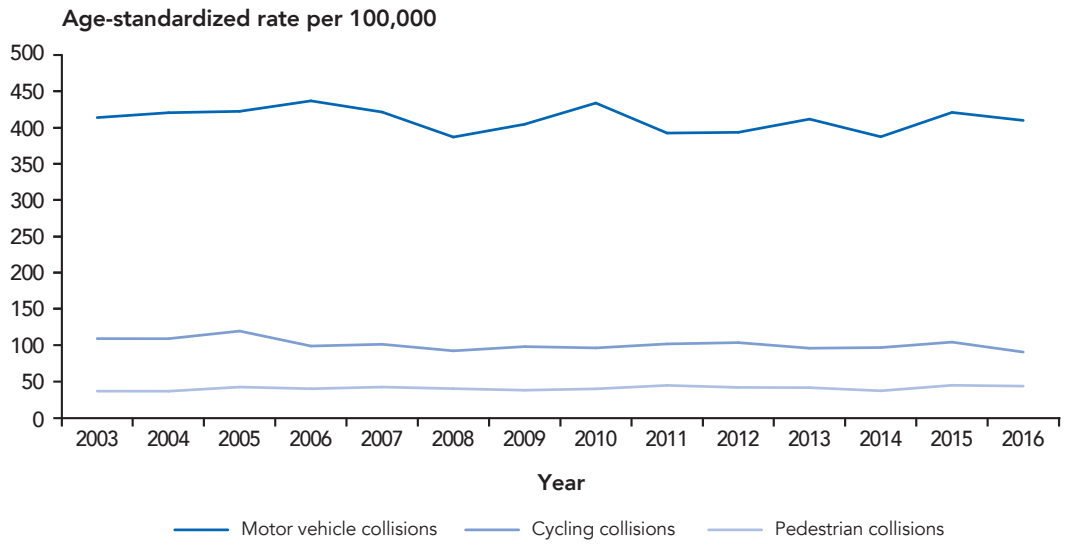
Burden of Selected Transport Injuries Peel, 2012, 2016

Leading Cause Diagnosis	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)		Potential Years of Life Lost (2012)	
	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number
Motor vehicle collisions	413.4	6,083	23.2	341	1.5	20	48.7	636
Land transport accidents (other)	42.6	627	1.1	16	1.1	15	37.4	488
Pedestrian collisions	44.1	649	7.2	106	1.0	14	27.6	361
Cycling collisions	94.3	1,387	5.2	77	0.3	4	7.7	100
Water transport accidents (excluding drowning)	3.5	52	0.5	8	0.2	3	0.0	0

Sources: National Ambulatory Care Reporting System 2016, and Hospital In-Patient Discharges 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Ontario Mortality Database 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.8

Emergency Department Visits due to Motor Vehicle, Pedestrian and Cycling Injuries by Mode of Transportation, Peel, 2003–2016



Note: Rates are age-standardized to the 2011 Canadian population.
Sources: National Ambulatory Care Reporting System, 2003–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In Peel and Ontario, ED visit rates due to MVC injuries are highest in the 20 to 29 year age group, followed by those aged 30 to 39 years (Figure 8.9).

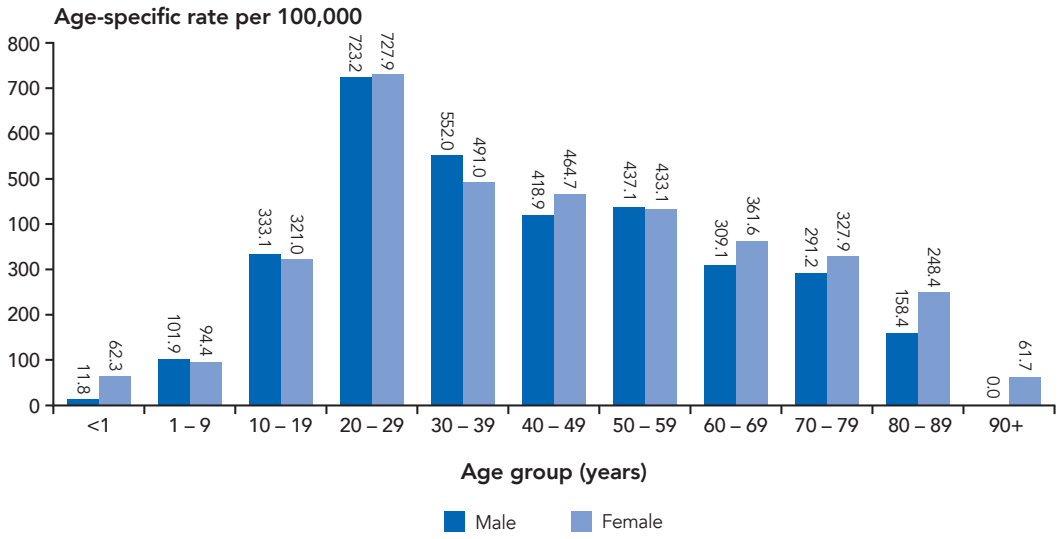
While not shown, hospitalization rates due to MVC injuries are highest among older adults in Peel and Ontario, particularly those aged 70 to 89 years (data not shown).[N]

Between 2003 and 2012 in Peel there was an average of 21 deaths per year due to injuries from MVCs.[O] Mortality rates due to MVCs have decreased between 2001 and 2012 in Peel and Ontario[O]; however, Peel's rates are lower than the province's.

In addition, the rate of death in a MVC is about three times higher among males than females (data not shown).[O] Between 2008 and 2012 combined, death rates from MVCs were highest among those aged 80 years and older.[O]

Figure 8.9

Emergency Department Visits due to Motor Vehicle Collision Injuries by Age Group and Sex, Peel, 2016



Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Cycling-related Injuries

In 2016, there were 1,387 ED visits and 77 hospitalizations from cycling-related injuries among Peel residents.[M,N] Over the past decade, cycling-related ED visit rates have fluctuated, while hospitalization rates have decreased slightly. Since 2003, Peel's ED visit and hospitalization rates have been lower than Ontario rates.[M,N]

ED visit and hospitalization rates are approximately three times higher among males than females (data not shown).

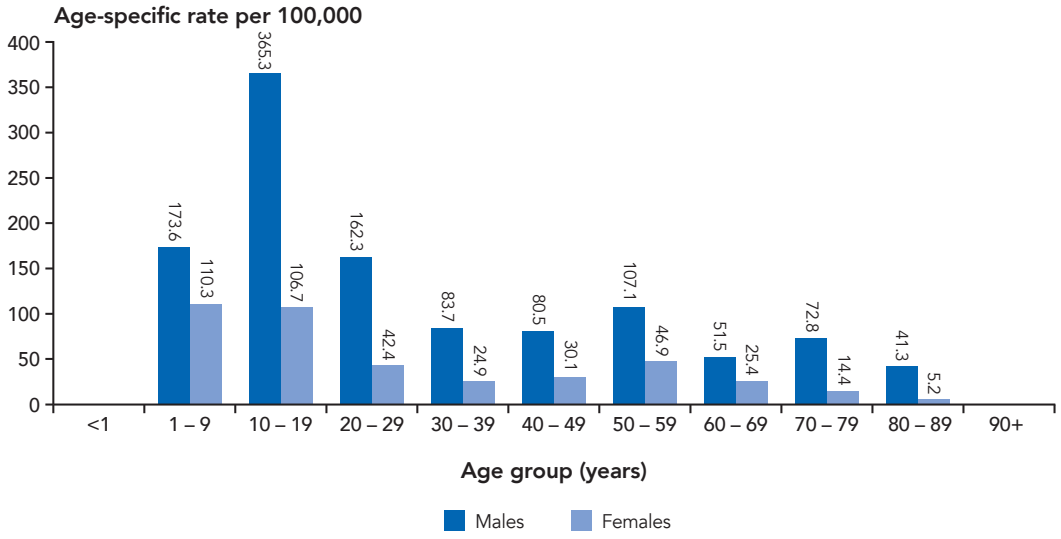
ED visit rates due to cycling accident-related injuries are highest among younger Peel and Ontario residents, particularly those in the 10 to 19 year age group (Figure 8.10). Peel's ED visit rates are lower than Ontario's rates in every age group (data not shown).

Hospitalization rates from cycling-related injuries are highest among those aged 10 to 19 years and 50 to 79 years in Peel and Ontario (data not shown).[N]

In Peel, between 2003 and 2012, there was an average of two deaths due to cycling injuries per year.[O] In Peel and Ontario, the rate of death due to cycling accidents was 0.3 per 100,000 in 2012.[O]

Figure 8.10

Emergency Department Visits due to Cycling Injuries by Age Group and Sex, Peel, 2016



Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Pedestrian-related Injuries

? *Did You Know*

Overall, pedestrians account for almost a quarter of traffic fatalities in Canada.[277]

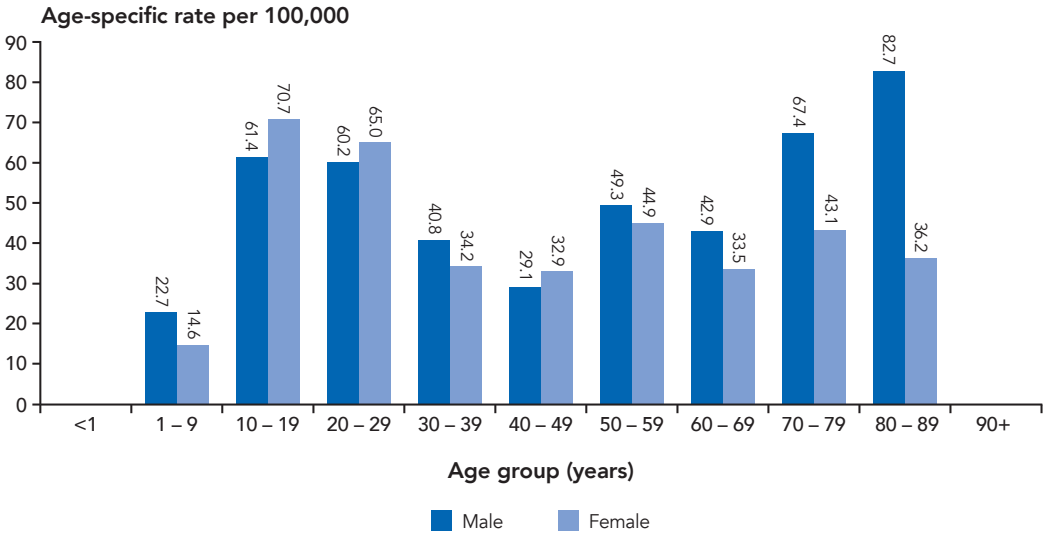
In 2016 in Peel, there were 649 ED visits and 106 hospitalizations from pedestrian-related injuries.[M,N] Rates of ED visits and hospitalizations due to pedestrian injuries are similar in Peel and Ontario.

Those affected the most are aged 10 to 29 years and 70 to 89 years for ED visits (Figure 8.11), and adults aged 70 years and over for hospitalization (data not shown).[N]

Between 2003 and 2012 in Peel, there was an average of 12 deaths per year from injury-related pedestrian collisions.[O] Mortality due to pedestrian injuries is highest among those aged 80 years. Mortality rates in Peel are higher than Ontario for those aged 80 years and older (Figure 8.12).

Figure 8.11

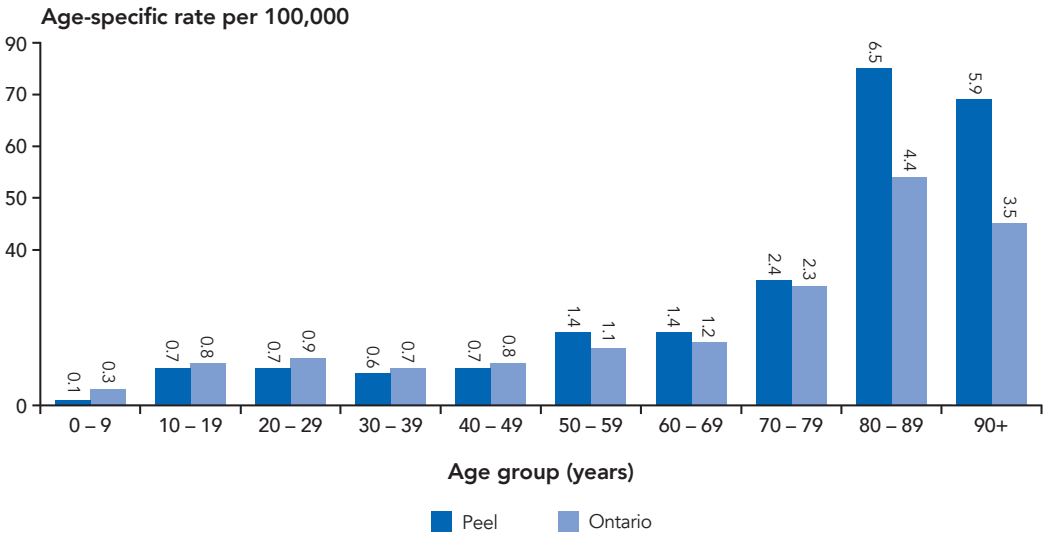
Emergency Department Visits due to Pedestrian Injuries by Age Group and Sex, Peel, 2016



Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.12

Death due to Pedestrian Injuries by Age Group, Peel and Ontario, 2003–2012 Combined



Note: Some rates are not releasable due to small numbers.
Sources: Ontario Mortality Database, 2003–2012, Ontario Registrar General, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003–2012, Statistics Canada, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Peel Facts

In Peel, in 2016, there were 1,095 ED visits and 46 hospitalizations from burns. Although burns do not rank high among the leading causes of injury-related deaths in Peel, they are among the fifth leading cause of injury-related ED visits and hospitalizations among infants under one year of age.[M,N]

Almost all burns were accidental in nature.[M,N]

Between 2003 and 2012, there was an average of two deaths per year in Peel from burns.[O]

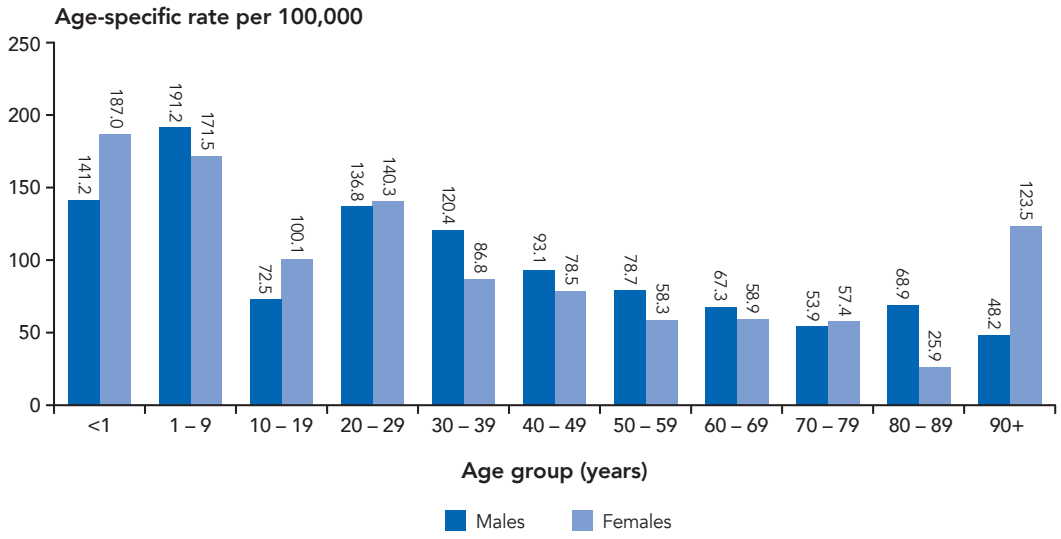
Injuries due to Poisoning

In 2016 in Peel, there were 1,466 ED visits and 173 hospitalizations due to poisoning.[M,N] Poisoning-related ED visit rates in Peel have declined slightly over the past decade and are lower than Ontario (data not shown).[M] Rates of ED visits due to poisoning are highest among Peel children under 10 years of age (Figure 8.13), while hospitalizations are highest among adults aged 70 to 79 years (data not shown).[N]

Mortality rates from poisoning are very low in Peel and are lower than that of Ontario (data not shown).[O] Between 2003 and 2012 there was an average of one poisoning death per year among Peel residents.[O]

Figure 8.13

Emergency Department Visits due to Poisoning by Age Group and Sex, Peel, 2016



Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Injuries due to Suffocation

In 2016, there were 42 ED visits and 84 hospitalizations from suffocation (including choking) among Peel residents.

Rates of ED visits due to suffocation are highest among infants less than one year as well as those 80 years and older (Figure 8.14). Hospitalization rates due to suffocation increase in older adulthood and are highest among those aged 80 years and older (data not shown).[N]

Between 2003 and 2012 in Peel, there was an average of 10 deaths per year due to suffocation (including choking).[O]

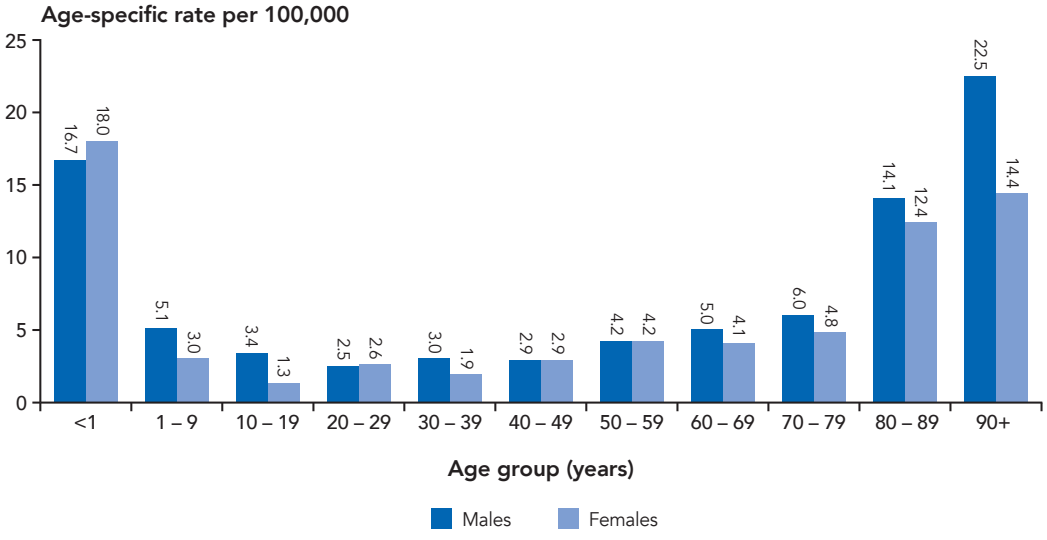
Injuries due to Exposure to Inanimate and Animate Mechanical Forces

In 2016 in Peel, there were 30,049 ED visits and 372 hospitalizations from exposure to inanimate and animate mechanical forces.[M,N] ED visit rates due to these types of injuries have been stable between 2003 and 2016 in both Peel and Ontario, while hospitalization rates have decreased. Peel's rates of ED visits are lower than Ontario's while its hospitalization rate is similar (data not shown).[M,N]

Peel males experience higher healthcare utilization rates due to injuries from inanimate and animate mechanical forces compared to females. For example, hospitalizations rates for males, are more than double than those for females (data not shown).[M,N]

Figure 8.14

Emergency Department Visits due to Suffocation (including Choking) by Age Group and Sex, Peel, 2012–2016



Sources: National Ambulatory Care Reporting System, 2012–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Table 8.5 outlines the leading types of exposure to mechanical forces resulting in injury-related ED visits and hospitalizations in Peel.

There are noticeable differences in the trend of ED visit and hospitalization rates due to mechanical force-related injuries, by age group, in Peel and Ontario. ED visit rates are highest among younger Peel residents one to 29 years of age (data not shown).

In contrast, hospitalization rates are highest among those aged 80 years and older (data not shown).[N]

Between 2003 and 2012, there was an average of four deaths per year from injuries related to exposure to inanimate and animate mechanical forces. Peel's mortality rates due to these types of injuries are lower than the province's, have been relatively stable over time, and are higher among males than females.[O]

Did You Know

In 2016, there were 2,217 ED visits and 64 hospitalizations involving concussions among Peel residents. Hospitalization rates have been relatively stable while ED visits have increased.[M,N]

Table 8.5

Leading Types of Exposure to Inanimate and Animate Mechanical Forces Resulting in Injury Emergency Department Visits and Hospitalizations, Peel, 2012, 2016

Type	Emergency Department Visits (2016)		Hospitalizations (2016)		Deaths (2012)	
	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number
Struck by or against object or person	761.5	11,206	6.5	95	0.1	2
Cut/pierced by object	340.1	5,005	1.6	23	–	–
Bitten, struck, stung by animal or insect	111.0	1,634	0.8	12	–	–
Occupational and machine-related injuries	76.8	1,130	3.3	49	0.2	2
Firearm (includes undetermined intent)	2.2	33	0.4	6	–	–
Explosion	1.4	21	0.5	7	–	–
All Causes of Exposure to Mechanical Force Injuries	**2,041.9**	**–**	**25.3**	**–**	**0.3**	**–**

Sources: National Ambulatory Care Reporting System, 2016, and Hospital In-Patient Discharges 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Injuries due to Drowning

In Peel, in 2016, there were 36 ED visits due to drowning or submersions (henceforth referred to as drowning). The rate of ED visits in Peel has fluctuated between 2003 and 2016 whereas Ontario's rate has increased. Peel's rate of ED visits due to drowning is lower than Ontario.[M]

Drowning rates are approximately twice as high for males compared to females. In Peel, in 2012 to 2016 combined, the rate of ED visits due to drowning was highest amongst children one to nine years old.[M]

In Peel, between 2008 and 2012, there was an average of eight deaths per year from drowning.[O] During this same time period, 39% of drowning deaths were reported to have occurred in or at home.

Work-related Injuries

In Peel, in 2016, there were 6,614 allowed lost-time injury claims. A lost-time claim, as defined by the Workplace Safety and Insurance Board (WSIB), occurs when a worker is entitled to benefits or services after they suffer a work-related injury or disease, which results in lost time from work, a loss of wages or earnings, or a permanent disability or impairment.[278] The injury events that accounted for the largest proportion of lost-time claims are bodily reaction and overexertion, contact with objects and equipment, and falls (Table 8.6). Sprains and strains were the most common lost-time injury (Table 8.7).

Table 8.6

Proportion of Allowed Lost-Time Claims by Injury Type, Peel, 2016

Injury Event	Allowed Lost-time Claims	
	Number	Per cent
Bodily reaction and overexertion	2,569	38.8
Contact with objects and equipment	1,818	27.5
Falls	1,385	20.9
Transportation accidents	316	4.8
Exposure to harmful substances or environments	281	4.2
Assaults, violent acts, harassment, and acts of war or terrorism	222	3.4
Other events or exposures unknown / unidentified	16	0.2
Fires and explosions	7	0.1
Total allowed lost-time claims	**6,614**	**100.0**

Note: Includes data for allowed lost-time claims only (for schedule 1 and 2 combined)
Source: WSIB Enterprise Information Warehouse, 2016, WSIB Open Data, WSIB Ontario

Table 8.7

Proportion of Allowed Lost-Time Claims by Injury Type, Peel, 2016

Injury Event	Allowed Lost-time Claims	
	Number	Per cent
Bodily reaction and overexertion	2,569	38.8
Contact with objects and equipment	1,818	27.5
Falls	1,385	20.9
Transportation accidents	316	4.8
Exposure to harmful substances or environments	281	4.2
Assaults, violent acts, harassment, and acts of war or terrorism	222	3.4
Other events or exposures unknown / unidentified	16	0.2
Fires and explosions	7	0.1
Total allowed lost-time claims	**6,614**	**100.0**

Note: Includes data for allowed lost-time claims only (for schedule 1 and 2 combined)
Source: WSIB Enterprise Information Warehouse, 2016, WSIB Open Data, WSIB Ontario

VIOLENCE

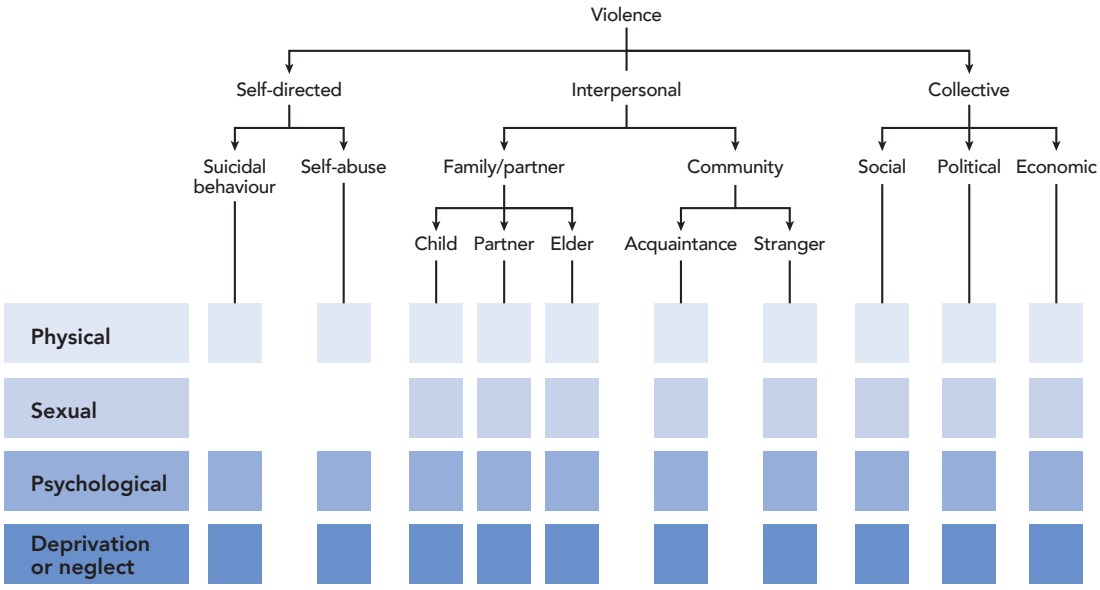
Violence is the intentional threat or use of physical force against oneself, another person, or a group or community that results in injury, death, psychological harm, maldevelopment or deprivation.[279] Victims of violence experience increased risk of chronic diseases (both mental and physical), substance abuse, economic vulnerability, social isolation and risk for further victimization.[280]

The World Health Organization (WHO) divides violence into three broad categories according to the characteristics of those committing the violent act (Figure 8.15), self-directed violence, interpersonal violence and collective violence.

The violence typology (Figure 8.15) defines four modes through which violence may be imposed: physically, sexually, psychologically, and through deprivation or neglect.

This section of the report will focus on interpersonal and family violence. Topics related to self-directed violence are captured in ***Chapter 6 – Mental Health***. Topics related to collective violence are not included in this report.

Figure 8.15
A Typology of Violence



Source: World Health Organization. World report on violence and health [Internet]. Geneva. 2002 [cited 2018 Aug 31]. Available from: http://www.who.int/violence_injury_prevention/violence/world_report/en/full_en.pdf?ua=1

Did You Know

There are four main data sources that document the issue of violence in Canada:

- mortality data (e.g., homicides)
- use of services (e.g., assault-related hospitalizations and emergency department visits, use of shelters due to intimate partner violence, child protection service investigations related to child abuse)
- crime data (e.g., police-reported crime data)
- survey data (e.g., self-reported victimization - intimate partner violence, sexual assault, elder abuse, child abuse, bullying)[275]

Our understanding of the problem of violence in Peel is evolving. Routine health status data about violence is limited to emergency department (ED) visits, hospitalizations and deaths from assault-related injuries and experiences of bullying among students. In addition, there are police-reported data on criminal violation incidents that occur within the community.

Self-reported data that describe experiences of violence among Peel residents are limited (Table 8.8). Table 8.9 shows selected types of police-reported criminal violence incidents. While police-reported data may capture a broader range of violence types, they capture only a fraction of the problem. Their use in understanding the magnitude of violence experienced by Peel residents is therefore limited.[280]

Table 8.8

Selected Types of Self-Reported Experiences of Violence and Associated Measurements, Peel and Ontario, 2012, 2017

Type of Violence or Affect from Violence		Measurement	Peel		Ontario	
			Number	Per cent	Number	Per cent
Physical	Childhood physical abuse	Population aged 15 years and older who report being physically abused during childhood	–	–	–	–
	Physical violence in dating relationships	Those who dated in the past five years and had experienced physical violence by a dating partner	–	–	–	–
	Physical abuse of older adults	NA	–	–	–	–
Sexual	Childhood sexual abuse	Population aged 15 years and older who report being sexually abused during childhood	–	–	–	–
	Sexual assault	Population aged 15 years and older who report that they experienced sexual assault in the past 12 months	–	–	–	–
	Sexual violence in dating relationships	Those who dated in the past five years and had experienced sexual violence by a dating partner	–	–	–	–
Psychological	Witnessing violence during childhood	Population aged 15 years and older who report witnessing violence during childhood	–	–	–	–
	Emotional violence in dating relationships	Those who dated in the past five years and experienced emotional violence by a dating partner	–	–	–	–
	Bullying at school	Peel students who reported being a victim of bullying at school at least once during the school year	19,900	17.0	219,400	21.0
		Grade 7 to 12 students who report being bullied at least once during the school year - most often by verbal attack	18,300	15.8	181,200	17.4
		Grade 7 to 12 students who report being bullied at least once during the school year - most often by physical attack	NR	NR	17,400	1.7
		Grade 7 to 12 students who report being bullied at least once during the school year - most often by having property stolen or damaged	NR	NR	20,600	2.0

Table 8.8 continues...

Table 8.8 continued

Type of Violence or Affect from Violence		Measurement	Peel		Ontario	
			Number	Per cent	Number	Per cent
Psychological	**Cyberbullying**	Grade 7 to 12 students who report experiencing cyberbullying in the last 12 months	24,900	21.5	212,900	20.5
	Bullying in the Workplace	NA	–	–	–	–
Deprivation or neglect	**Child maltreatment**	Adults experiencing childhood maltreatment before the age of 16 years	415,028	36.5	3,333,647	32.1
	Maltreatment of older adults	NA	–	–	–	–

NA - Measure not available.
NR - Not releasable due to small numbers.
– Data not available
Sources: Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health.
Canadian Community Health Survey Share File, Mental Health Module, 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Conroy C and Cotter, A. Canadian Centre for Justice Statistics. Self-reported sexual assault in Canada, 2014. Available from: https://www150.statcan.gc.ca/n1/pub/85-002-x/2017001/article/14842-eng.htm

Table 8.9

Selected Types of Police-Reported Criminal Violence Incidents and Associated Measurements, Peel and Ontario, 2016

Type of Violence or Affect from Violence		Measurement	Peel		Ontario	
			Number of Incidents†	Crude Rate per 100,000	Number of Incidents†	Crude Rate per 100,000
Physical	Homicide	Homicide incidents	11	0.7	206	1.5
	Attempted murder	Attempted murder incidents	36	2.4	260	1.9
	Assault	Assault incidents (including Level 1 - common assault, Level 2- with weapon or causing bodily harm, and Level 3 - aggravated assault)	4,067	276.4	58,878	421.1
Sexual	Sexual assault	Sexual assault incidents	454	30.9	7,465	53.4
	Sexual violence against children	Sexual violence against children incidents	119	8.1	1,947	13.9
Psychological	Criminal harassment	Police-reported criminal harassment incidents	247	16.8	7,688	55.0
	Indecent/harrassing communications	Police-reported indecent/ harassing communications	70	4.8	3,049	21.8
	Utter threats to person	Police-reported incidents involving uttering threat to person	1,005	68.3	14,551	104.1
Deprivation or neglect	NA	NA	–	–	–	–
Multiple or Overlapping Types of Violence	NA	Police-reported family violence‡	–	–	20,211	150.0

NA - Measure not available
– Data not available.
† Incident refers to the occurrence of one (or more) criminal offence(s) during one single, distinct event, regardless of the number of victims. If there are multiple victims or multiple accused persons, the offences must occur at the same location and at the same time if they are to be included within the same incident.
‡ Family violence refers to violence comitted by spouses, parents, children, siblings and other extended family members. Victims are those aged 89 years or younger.
Notes: excludes "other assaults" and "other violent violations"
Sources: Uniform Crime Reporting Survey, 2016, Police Services. Canadian Centre for Justice Statistics, Statistics Canada. Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario. Minister of Health and Long-Term Care.

Did You Know

Many types of violence are commonly underreported to police. Results from the General Social Survey 2014 estimates the magnitude of underreporting of incidents of violence to the police by Canadians who report being victimized in the past. For example:

- 38% of incidents of physical assault[281]
- 83% of sexual assault incidents[282]
- 70% of victims of spousal violence[280]

In addition, the vast majority (93%) of Canadians, aged 15 years and older, who experienced physical and/or sexual violence in childhood (i.e., younger than 15 years) report that they did not speak to police or child protection services about their experience.[280]

Data Gaps

Peel has limited local data providing quality estimates to describe the various types of violence experienced by Peel's population across the lifespan, such as child maltreatment, intimate partner violence, and mistreatment of adults. Similarly, there are data gaps related to experiences of violence in the workplace, and bullying among younger children and adults in Peel.

Assault

An assault occurs when a person applies force intentionally towards another person without the consent of that person.[283] In 2013/2014, 1% of Ontario residents aged 12 years and older reported sustaining an injury serious enough to limit their normal activity that was caused by a physical assault.[H2] Peel data are not available due to small numbers.

Police-reported Assault Incidents

In Peel, in 2016, there were a total of 4,067 police-reported assault incidents.[Y] Peel's rate of police-reported assault incidents is lower than that of Ontario and has decreased between 1998 and 2016 (Figure 8.16).

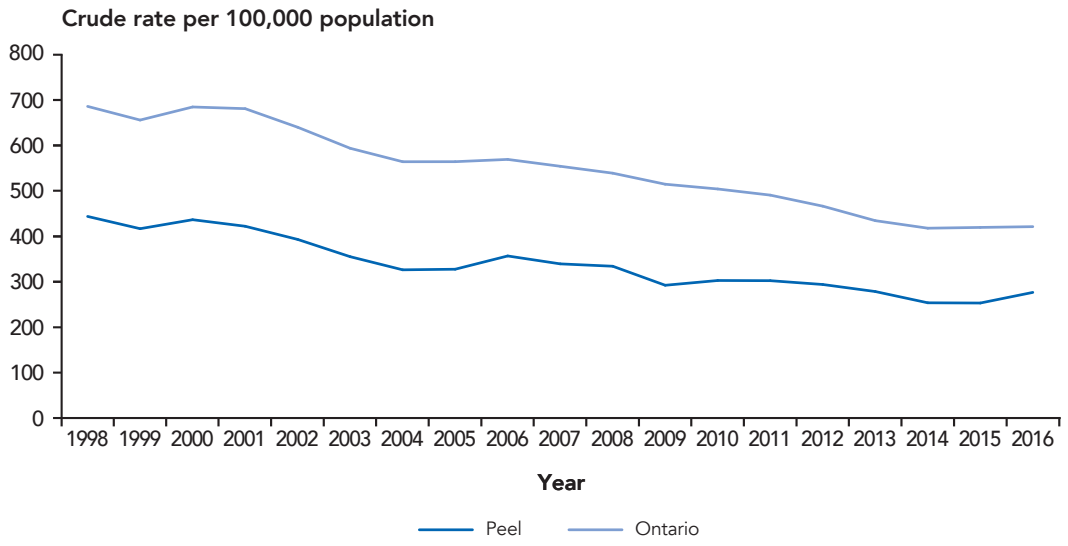
Emergency Department Visits and Hospitalizations due to Assault

In Peel, in 2016, there were 1,814 ED visits and 130 hospitalizations from assault-related injuries. Peel's rate of ED visits and hospitalizations from assault are lower than that of Ontario (data not shown).[M,N]

Although rates of assault-related ED visits are higher for Peel males than females, the gap between the sexes has narrowed over the past decade from 3.4 times higher in 2006 to 2.6 times higher in 2016 (Figure 8.17). Rates of emergency department visits due to assault-related injuries are highest among 20 to 29 year-olds (Figure 8.18).

Figure 8.16

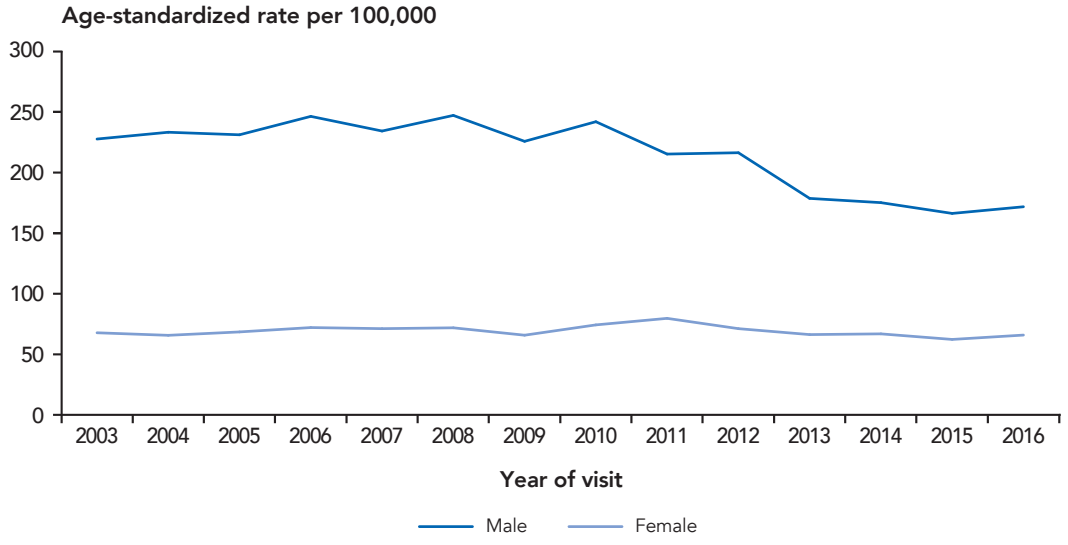
Police-Reported Assault Incidents†, Peel and Ontario, 1998–2016



† Incident refers to the occurrence of one (or more) criminal offence(s) during one single, distinct event, regardless of the number of victims. If there are multiple victims or multiple accused persons, the offences must occur at the same location and at the same time if they are to be included within the same incident.
Sources: Uniform Crime Reporting Survey, 1998-2016, Police Services. Canadian Centre for Justice Statistics, Statistics Canada. Population Estimates, 1998–2016, Statistics Canada. IntelliHEALTH Ontario. Ministry of Health and Long-Term Care.

Figure 8.17

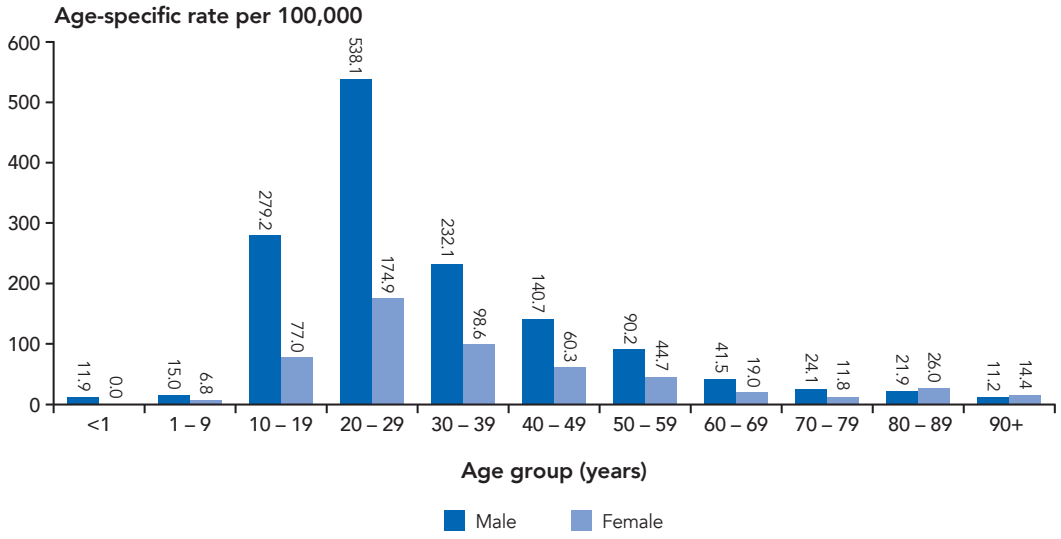
Emergency Department Visits due to Assault-Related Injuries by Sex, Peel, 2003–2016



Note: Rates are age-standardized to the 2011 Canadian population
Sources: National Ambulatory Care Reporting System, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.18

Emergency Department Visits due to Assault by Age Group and Sex, Peel, 2012–2016 Combined



Sources: National Ambulatory Care Reporting System, 2012–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care
Population Estimates, 2012–2016, Statistics Canada, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Mortality due to Assault

In Peel, between 2003 and 2012, an average of 17 residents died each year from assault. Peel's mortality rates from assault are similar to Ontario's and have fluctuated over time. Males in Peel are two times more likely to die from assault than females.[O] Between 2008 and 2012 combined, mortality rates from assault were highest among those aged 15 to 24 years (data not shown).[O]

In addition, in Peel in 2012, assault was the fourth-leading cause of injury resulting in premature death as measured by potential years of life lost (PYLL) (Table 8.1). In Peel, PYLL due to assault was nearly three times higher for males than females (data not shown).[O]

Between 2012 and 2016, there was an average of 13 police-reported incidents per year involving homicide and 20 involving attempted murder in Peel.[Y] The rate of homicide incidents has fluctuated over time in Peel and has been generally lower than that of Ontario since 1998.[Y] In addition, the rate of attempted murder incidents has also fluctuated over time and was lower than that of Ontario until 2016 when it exceeded Ontario for the first time.[Y]

Did You Know

- In 2016, 37 Peel residents visited an emergency department and 19 were hospitalized due to assaults involving a firearm. These are the highest numbers on record. While Peel's rates of ED visits and hospitalizations from assaults with firearms have remained low since 2003, the rates more than doubled between 2014 and 2016.[M,N]
- In Peel, between 2003 and 2012, an average of eight Peel residents died each year from an assault with a firearm. Firearm injuries account for approximately 46% of assault-related deaths.[O]

Sexual Assault

Definition

Sexual assault is classified into three categories:

- ***Level 1*** is sexual assault causing minor physical injuries or no injuries to the victim.
- ***Level 2*** is sexual assault involving the use of a weapon, threats to a third party or causing bodily harm to the victim.
- ***Level 3*** is sexual assault that results in wounding, maiming, disfiguring or endangering the life of the victim.[283]

In Canada, there is a higher risk of sexual assault among those who are women, young, Indigenous, homosexual or bisexual, and those who experience mental health issues. In addition, individuals exposed to certain conditions, such as childhood abuse and homelessness, also have a higher risk of sexual assault. Perpetrators are most often a friend, acquaintance or neighbour, as opposed to a stranger.[282]

Police-reported Sexual Assault Incidents in Peel

In Peel in 2016, there were a total of 454 police-reported sexual assault incidents.[Y] Peel's rate of police-reported assault incidents is lower than that of Ontario and has declined over the past 15 years (Figure 8.19).

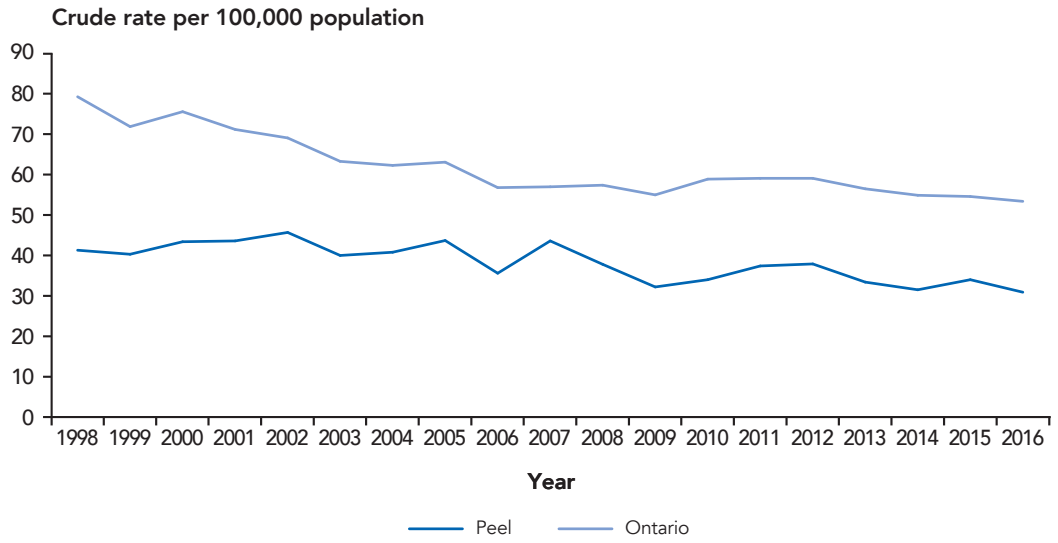
Emergency Department Visits and Hospitalizations due to Sexual Assault

In Peel, in 2016, there were 19 ED visits from injuries related to sexual assault and this rate has declined over time (Figure 8.20). Peel's rate of ED visits due to sexual assault injuries is lower than that of Ontario (data not shown).[M]

Sexual assault ED visits are more than five times higher for females than males (data not shown) and peak among those aged 15 to 24 years (Figure 8.21). Hospitalizations from sexual assault are low (data not shown).[N]

Figure 8.19

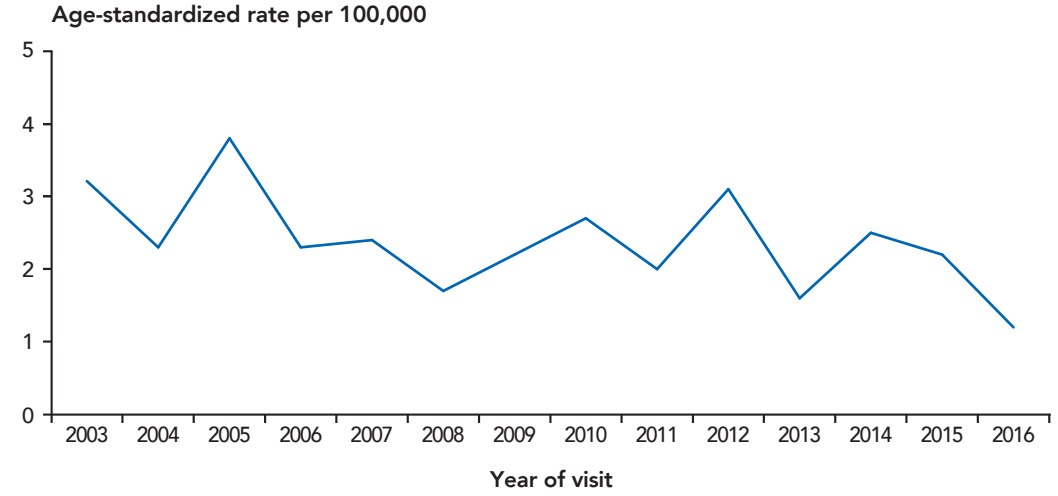
Police-Reported Sexual Assault Incidents†, Peel and Ontario, 1998–2016



† Incident refers to the occurrence of one (or more) criminal offence(s) during one single, distinct event, regardless of the number of victims. If there are multiple victims or multiple accused persons, the offences must occur at the same location and at the same time if they are to be included within the same incident.
Sources: Uniform Crime Reporting Survey, 1998-2016, Police Services. Canadian Centre for Justice Statistics, Statistics Canada. Population Estimates, 1998–2016, Statistics Canada. IntelliHEALTH Ontario. Minister of Health and Long-Term Care.

Figure 8.20

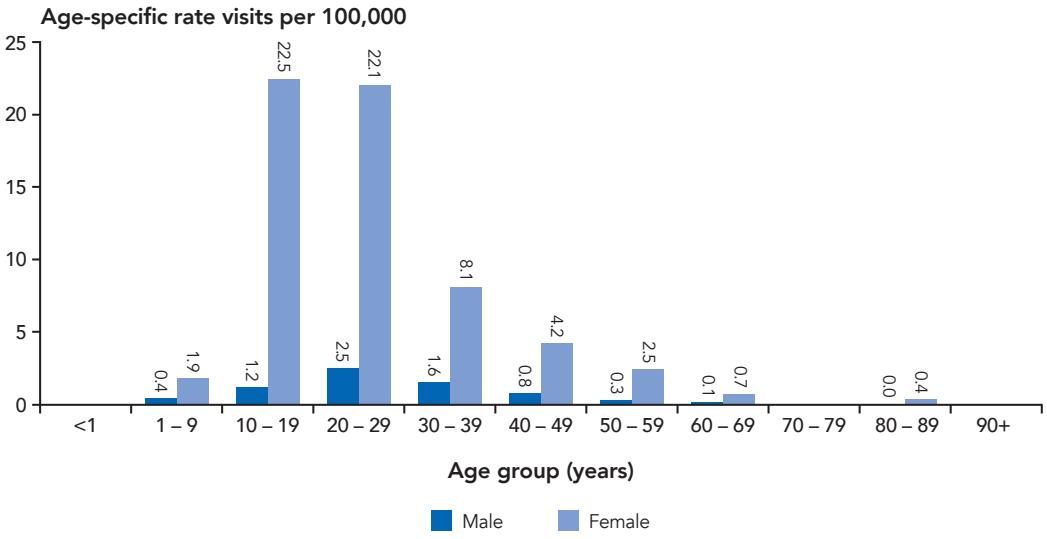
Emergency Department Visits due to Sexual Assault, Peel, 2003–2016



Note: Rates are age-standardized to the 2011 Canadian population
Sources: National Ambulatory Care Reporting System, 2003–2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 8.21

Emergency Department Visits due to Sexual Assault Injuries by Age Group and Sex, Ontario, 2016



Sources: National Ambulatory Care Reporting System, 2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Family Violence

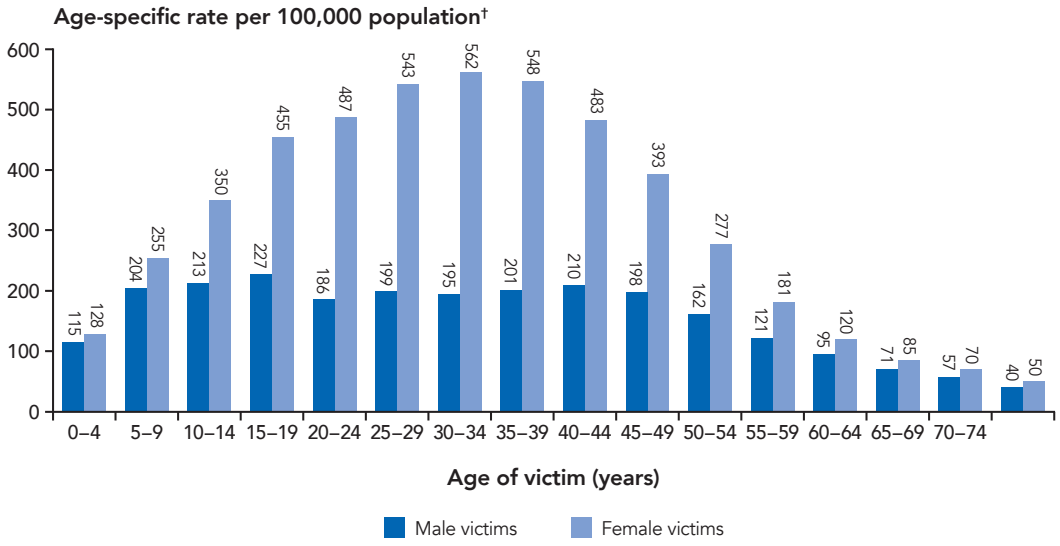
Family violence includes any violence, abuse, unhealthy conflict or neglect by a family member towards another family member that has the potential to lead to poor health.[9] Incidents of family violence that are reported to the police are likely to significantly underestimate the actual extent of family violence in Canada. For example, self-reported data from the 2014 General Social Survey on Canadians' Safety show that 70% of victims of spousal violence and 93% of victims of childhood physical and/or sexual abuse never spoke to authorities about their experiences.[280]

In Canada, an average of 172 homicides are committed every year by a family member. This represents nearly one in every three homicides. In 2016, there were 86,405 victims of police-reported family violence in Canada. The victimization rates increase with age and peak among those in their early 30s (379 victims per 100,000 population). Females are victimized by a family member at a higher rate than males (Figure 8.22). In Ontario, there were 20,231 victims of police-reported family violence (148 victims per 100,000 population) This is lower than the Candian rate (data not shown).[280]

In Canada, physical assault was the most common type of offence in police-reported family violence incidents. While male victims experience higher rates of physical assault and uttering threats, females experience higher rates of sexual offences and criminal harassment (Figure 8.23).

Figure 8.22

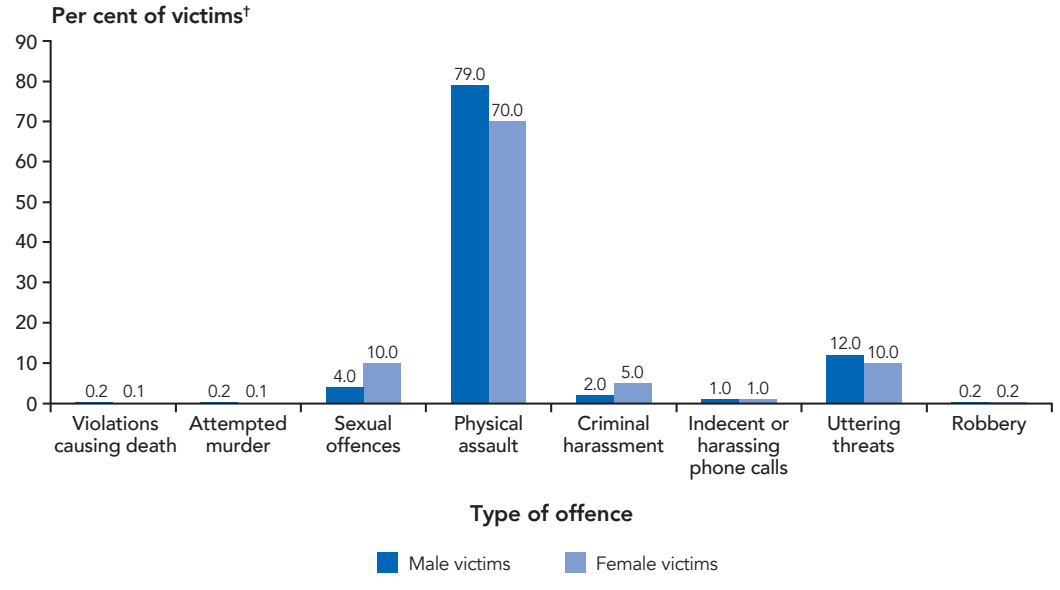
Victims of Police-Reported Family Violence by Sex and Age Group of Victim, Canada, 2016



† Includes victims aged 89 years and younger
Sources: Statisitcs Canada. Family violence in Canada: A statisitcal profile, 2016
Uniform Crime Reporting Survey, 2016, Police Services. Canadian Centre for Justice Statistics, Statistics Canada.

Figure 8.23

Victims of Police-Reported Family Violence and Type of Offence, by Sex of Victim, Canada, 2016

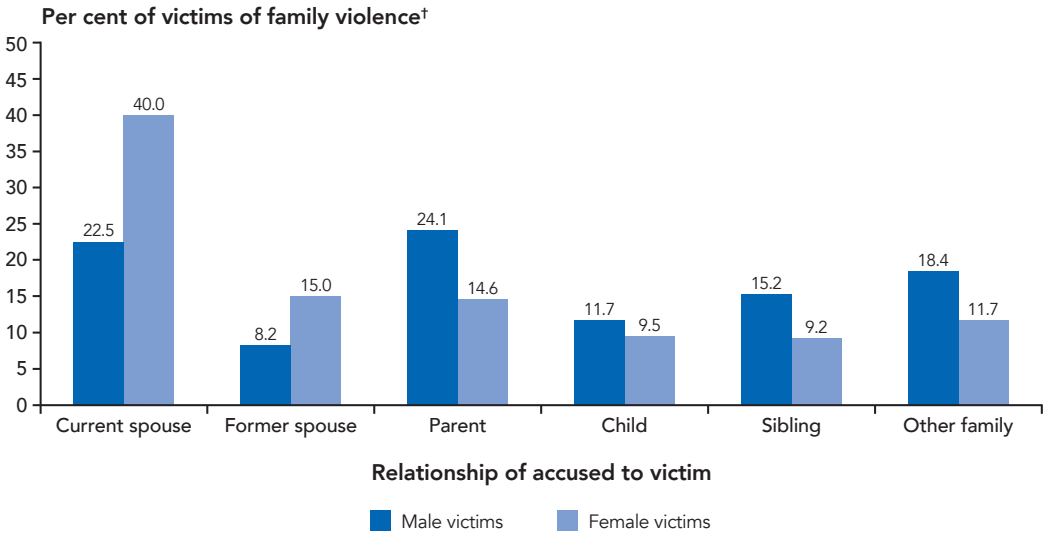


† Includes victims aged 89 years and younger
Source: Statistics Canada, 2016, Family Violence in Canada: A statisitcal profiles, 2016.
Uniform Crime Reporting Survey, 2016, Police Services. Canadian Centre for Justice Statistics, Statistics Canada.

In Canada in 2016, victims of family violence crimes most commonly were victimized by a current spouse (34%), parent (17%) or extended family member (14%).[282] The relationship between the accused and victims in families varies by sex as shown in Figure 8.24. A higher proportion of female victims are victimized by a current- or ex-spouse (55%) than male victims (28%), while a larger proportion of male victims are victimized by a parent, extended family member or sibling.

Figure 8.24

Victims of Police-Reported Family Violent Crime by Sex of Victim and Relationship of Accused to Victim, Canada, 2016



† Includes victims aged 89 years and younger
Note: denominator includes total victims of family violence
Source: Statistics Canada, 2016, Family Violence in Canada: A statisitcal profiles, 2016.
Uniform Crime Reporting Survey, 2016, Police Services. Canadian Centre for Justice Statistics, Statistics Canada.

Child Maltreatment

Definition

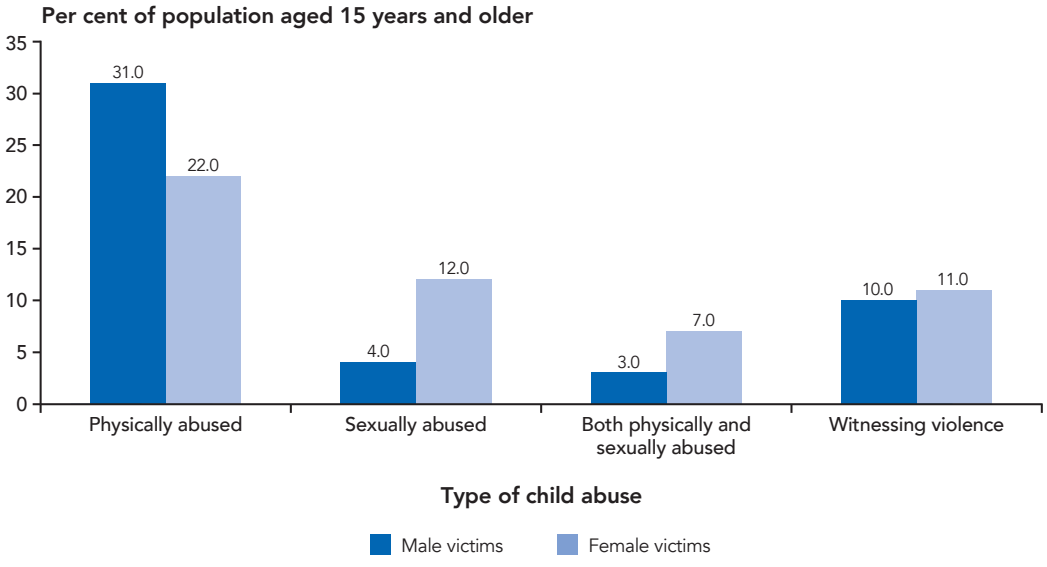
Childhood maltreatment, as defined in the General Social Survey, refers to physical or sexual abuse by an adult or witnessing violence by a parent or guardian against another adult in the home before the age of 15.[282]

In 2014, an estimated one-third of Canadians aged 15 years and older reported having experienced some form of child maltreatment prior to the age of 15 years.[284] Physical abuse during childhood (26%) was the most common form of childhood maltreatment reported, while 8% experienced sexual abuse.

Males are more likely to report having been physically abused during childhood (31%) than females (22%). Females are more likely to report having been sexually abused (12%) or both physically and sexually abused (7%) than their male counterparts (4%) (Figure 8.25).

In addition, approximately one in 10 Canadians aged 15 years and older reported having witnessed violence in their home before they were 15 years old. This includes having seen or heard their parents, step-parents or guardian hit each other or another adult.[284] Peel-specific data are not available.

Figure 8.25
Self-Reported Childhood Maltreatment by Sex of Victim, Canada, 2014



Note: Data for respondents who answered "don't know" or refuse" are not shown, but are included in per cent calculations.
Sources: Statistics Canada, 2015. Family violence in Canada: A statistical profile, 2015.
General Social Survey, 2014, Statistics Canada.

Did You Know

In 2017, approximately one in five Peel Students (17%) was a victim of bullying at school at least once in the previous 12 months. Among Peel students who were bullied, 29%* (*use estimate with caution) reported that they were bullied daily or almost daily or weekly since the start of the school year. Verbal attack was the most common type of bullying experienced by Peel students (16%).[U1] Additionally, 22% of Peel students in grades 7 to 12 were bullied electronically or through the internet. There was no variation by sex or grade in any of the bullying categories.[U1]

Elder Abuse

Definition

Elder abuse is defined in Ontario as a single or repeated act, or lack of appropriate action, occurring within any relationship where there is an expectation of trust that causes harm or distress to an older person. Elder abuse includes physical, sexual, psychological, emotional, financial and material abuse; abandonment; neglect; and serious loss of dignity and respect.[287]

In Canada, in 2015, there were more than 9,900 older adults (aged 65 years and over) who were victims of police-reported violent crime. A total of one-third of senior victims of violent crime were victimized by a family member, while the remainder were victimized by friends, acquaintances, strangers or others. Most older adult victims of police-reported family violence were victimized with physical force such as pushing or hitting (61%) or threats (21%) and 40% sustained injuries. Most (57%) older adult victims of this type of injury were female.[284]

The relationship of the accused to senior victims of family violence varies by sex as shown in Figure 8.26. A higher proportion of senior male victims are victimized by a grown child, while a larger proportion of female victims are victimized by their spouse.

Figure 8.26

Senior Victims of Police-Reported Family Violent Crime by Sex of Victim and Relationship of Accused to Victim, Canada, 2015

† Includes victims aged 65–89 years of age
Note: Denominator includes total senior victims of family violence. Excludes victims where the sex or the age was unknown.
Source: Statistics Canada. Family violence in Canada: A statistical profiles, 2015
Uniform Crime Reporting Survey, 2015, Police Services. Canadian Centre for Justice Statistics, Statistics Canada.

Chapter 9

Infectious Diseases

Key Messages

- Influenza is ranked as one of the top five reportable diseases among all age groups in Peel and is associated with the highest number of emergency department visits and hospitalizations.
- Some cancers are caused by infectious pathogens such as human papillomavirus (HPV), hepatitis B and hepatitis C. Over the past decade approximately 1,200 new cancers in Peel were due to these cancer-causing infections.
- Enteric outbreaks present a high burden in Peel institutions and often affect already vulnerable populations. Between 2007 and 2016 enteric disease outbreaks affected more than 10,000 residents in Peel, of which 70% occurred in institutions. Norovirus was responsible for the majority of these outbreaks.
- There are residents in Peel who travel to visit friends and relatives (VFRs) in disease endemic countries that can put them at increased risk for certain communicable diseases. VFRs typically have longer lengths of stay and increased risk of exposure to endemic diseases, such as typhoid fever and hepatitis A.

Public health measures such as improvements in hygiene and sanitation, the introduction of vaccines and antibiotics to prevent and treat illness, advancement in diagnostic tools, and improved surveillance have greatly advanced the prevention and control of infectious diseases. Despite these successes, infectious diseases continue to occur due to the complex interactions between agent, host, and environmental factors. Understanding this epidemiologic triad provides insight into factors that render some individuals vulnerable to illness, and the environmental conditions that enable infectious diseases to thrive in certain populations.

Ongoing threats such as climate change, drug resistance, and changing demographics and behaviours continue to challenge public health efforts to reduce disease transmission.

CHARACTERIZING THE BURDEN OF INFECTIOUS DISEASES

Understanding the overall burden of infectious diseases is an important factor for determining public health priorities and guiding resource allocation. Different methods have been used in the literature to estimate population-level disease burden.[286-290] The 2010 Ontario Burden of Infectious Disease Study (ONBOIDS) used health-adjusted life years (HALYs) to measure infectious disease burden in Ontario.

The ONBOIDS study found that nearly half of the total burden of infectious diseases was attributable to five pathogens (Figure 9.1):

- hepatitis C virus
- *Streptococcus pneumoniae*
- human papillomavirus (HPV)
- hepatitis B virus
- *Escherichia coli* (*E. coli*)

The overall burden of infectious diseases was largely due to years of life lost (YLL) as a result of premature mortality. Reduced functioning or poor health from the disease and its consequences (YERF) had less impact on overall burden.[286]

Definition

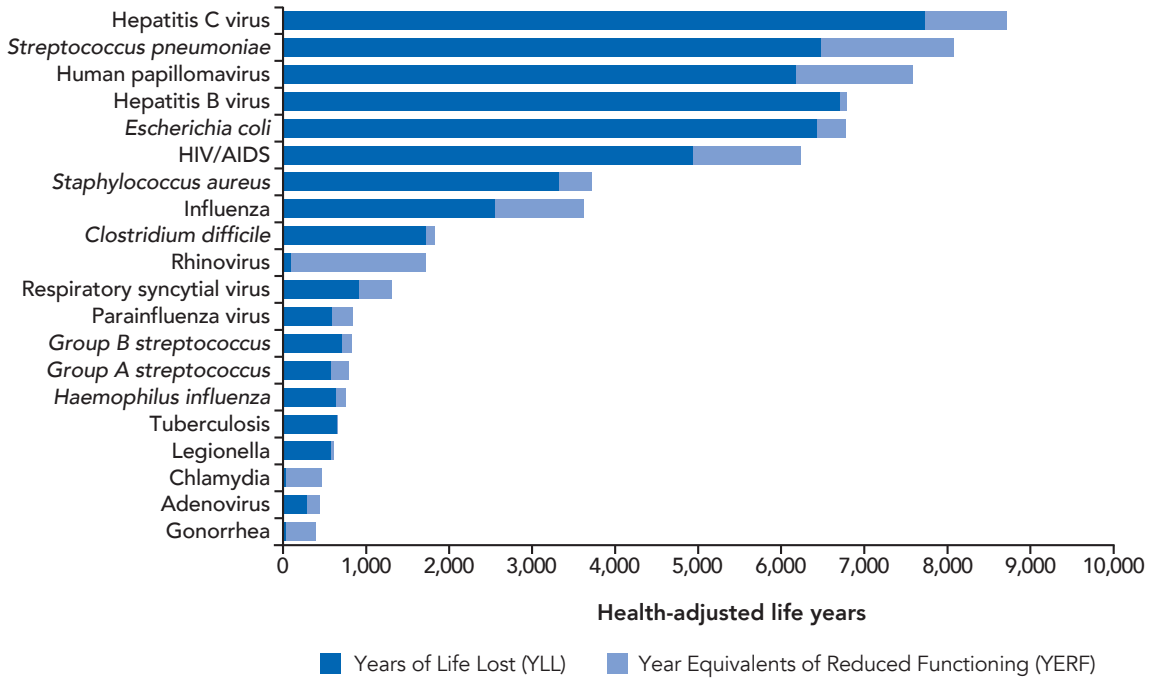
Health-adjusted Life Years (HALYs) is a measure of population health used to estimate the burden of disease. HALYs are used to measure the combined effect of mortality and morbidity in populations. In this composite measure, mortality is measured as years of life lost (YLL); morbidity is measured as the year-equivalents of reduced functioning due to disease. The higher the number of HALYs, the greater the disease burden.

Definition

The ONBOIDS study found that a large proportion of illness from infectious diseases can be prevented through existing public health interventions such as hand hygiene, improved vaccine uptake, promotion of safer sex and safer drug using practices.[286]

Figure 9.1

The Top 20 Pathogens in Ontario Ranked by Health-Adjusted Life Years



Source: Kwong JC, Crowcroft, NS, Campitelli MA, Ratnasingham, S, Daneman N, Deeks SL, Manual DG. Ontario Burden of Infectious Disease Study (ONBOIDS):
An OAHPP/ICES Report. Toronto: Ontario Agency for Health Protection and Promotion. Institute for Clinical Evaluative Sciences; 2010.

Pathogens with the ability to cause cancer including hepatitis C, hepatitis B, and HPV had the highest HALYs. Also included in the list are health-care associated pathogens (e.g., *C. difficile, S. aureus*) and diseases that are preventable by vaccines (e.g., HPV, hepatitis B, *S. pneumoniae*, influenza). Pathogens casuing diseases that have been prevented through routine childhood vaccinations (e.g., measles) were not included in the top 20 pathogens in Ontario (Figure 9.1), a testament to the success of such interventions.

Table 9.1 summarizes infectious diseases data through laboratory-confirmed case counts, emergency department visits, hospitalizations and deaths in Peel using an overall ranking of the most commonly reported laboratory-confirmed cases. The five most common laboratory-confirmed infectious diseases include: chlamydia, latent and active tuberculosis, influenza, gonorrhea, and campylobacteriosis. Among them, influenza was associated with the highest number of emergency department visits and hospitalizations. Hepatitis C was the leading cause of death in Peel, which is in keeping with Ontario findings from the ONBOIDS study.

Table 9.1

Top Reportable Diseases Ranked by Laboratory-Confirmed Cases, Peel

Disease	Laboratory-Confirmed Cases (2012–2016 combined)		Emergency Department Visits (2012–2016 combined)		Hospitalizations (2012–2016 combined)		Mortality (2012)	
	Number	Average Crude Rate per 100,000	Number	Average Crude Rate per 100,000	Number	Average Crude Rate per 100,000	Number	Average Crude Rate per 100,000
Chlamydia	17,292	244.0	94	1.3	11	0.2	0	0.0
Latent tuberculosis infection	5,834	82.5	–	–	–	–	–	–
Active tuberculosis infection	666	9.4	159	2.3	264	3.7	9	0.7
Influenza	5,775	81.0	6,632	93.2	1,412	19.8	7	0.5
Gonorrhea	2,837	39.9	37	0.5	10	0.1	0	0.0
Campylobacteriosis	1,687	23.9	61	0.9	83	1.2	0	0.0
Salmonellosis	1,596	22.6	117	1.7	203	2.9	0	0.0
Hepatitis C	1,510	21.3	42	0.6	13	0.2	13	1.0
Hepatitis B chronic	1,212	17.2	25†	0.4†	29†	0.4†	5†	0.4†
Hepatitis B acute	23	0.3						
Infectious syphilis	245	3.4	23	0.3	9	0.1	0	0.0
Non-infectious syphilis	456	6.4						
Giardiasis	649	9.2	11	0.2	7	0.1	0	0.0
Invasive pneumococcal disease (IPD)	396	5.6	471	6.6	665	9.4	6	0.4
Human immunodeficiency virus (HIV)	238	3.4	50	0.7	111	1.6	4	0.3
Acquired immunodeficiency syndrome (AIDS)	25	0.4						
Varicella (chickenpox)‡	219	3.1	3,649	51.5	208	2.9	1	0.1
Malaria	201	2.9	187	2.6	108	1.5	0	0.0
Group A streptococcal disease, invasive	194	2.8	82	1.2	280	3.9	3	0.2

† includes counts for all hepatitis B virus visits and deaths and is not specific to carriers
‡ Includes lab confirmed cases, but excludes school-reported cases.
– Data not available
Sources: Integrated Public Health Information System (iPHIS), 2012-2016, Region of Peel - Public Health.
Hospital In-Patient Discharges, 2012–2016, Canadian Institute for Health Information (CIHI).National Ambulatory Care Reporting System, 2012-2016, Canadian Institute for Health Information (CIHI).
Ontario Mortality Database, 2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Influenza is one of the top five reportable diseases among all age groups in Peel (Table 9.2). Infants and young children experience higher rates of enteric illnesses such as salmonellosis, campylobacteriosis and giardiasis. Young adults have the highest rates of sexually transmitted infections such as gonorrhea and chlamydia, while hepatitis B and C are highest among adults and seniors in Peel.

Table 9.2

Top Five Reportable Diseases by Age Group, Peel, 2012–2016 Combined

	Age Group (years)								
	<1	1–4	5–9	10–14	15–24	25–39	40–59	60–74	75+
Rank	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)	Crude Rate per 100,000 (Number)
1	Influenza 446.7 (360)	Influenza 315.3 (1,032)	Influenza 144.9 (629)	Influenza 39.5 (179)	Chlamydia 898.9 (9,277)	Chlamydia 428.0 (6,395)	Chlamydia 73.3 (1517)	Influenza 89.9 (794)	Influenza 391.1 (1,307)
2	Salmonella 81.9 (66)	Salmonella 81.3 (264)	Salmonella 43.6 (190)	Salmonella 23.1 (104)	Gonorrhoea 128.2 (1,324)	Gonorrhoea 76.2 (1,144)	Influenza 36.9 (766)	Hepatitis C 35.3 (305)	Tuberculosis 39.9 (132)
3	Neonatal Group B Strep 43.5 (35)	Campylo-bacter 33.3 (108)	Campylo-bacter 23.9 (104)	Campylo-bacter 15.5 (70)	Campylo-bacter 26.3 (271)	Influenza 34.2 (513)	Hepatitis C 32.4 (670)	Campylo-bacter 29.4 (256)	Invasive Pneumo Disease 26.2 (84)
4	Encephalitis/ Meningitis 29.8 (24)	Giardiasis 29.2 (95)	Giardiasis 12.2 (53)	Varicella 8.5 (38)	Salmonella 20.0 (207)	Hepatitis B 29.0 (446)	Hepatitis B 22.0 (454)	Hepatitis B 23.3 (200)	Campylo-bacter 25.2 (83)
5	Pertussis 28.7 (23)	Invasive Pneumo Disease 12.6 (41)	Shigella 6.6 (29)	Giardiasis 6.4 (29)	Influenza 18.6 (193)	Hepatitis C 25.5 (382)	Campylo-bacter 21.9 (452)	Salmonella 18.1 (155)	Hepatitis C 22.6 (74)

Notes: Counts include laboratory-confirmed cases, hepatitis B counts include confirmed and carriers, Syphilis counts include infectious and non-infectious cases, TB cases include respiratory and non-respiratory, HIV (carriers) and AIDS (confirmed) counts are combined, Adverse Events Following Immunizations and Latent TB Infections were excluded from the ranking.
Crude incidence is reported per 100,000 population, total case count is in brackets ().
Sources: Integrated Public Health Information System (iPHIS), 2012–2016, Region of Peel - Public Health.
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

VACCINE PREVENTABLE DISEASES

Vaccines are one of the greatest public health achievements that have led to the prevention, control, and in some cases, elimination of diseases that were once widespread in Canada.[291] Since the introduction of vaccines, the incidence of several infectious diseases has decreased. Notable successes include the global eradication of smallpox and the elimination of previously common childhood diseases such as measles and polio in Canada.[291]

Despite these successes, vaccine preventable diseases (VPD) still present a considerable burden to population health. In some cases, infection can cause serious complications, particularly among those who are at increased risk (such as those with chronic medical conditions). The risk of importation and possible resurgence of any of the VPDs that have been eliminated in Canada exists as long as these diseases continue to occur in other countries.

> ? *Did You Know*
>
> When nearly all individuals in a community are immunized, disease protection may be extended to individuals who are not immunized. This concept is known as "**population immunity**" or "**herd immunity**." The proportion of the population that must be immune to achieve a population immunity threshold varies by disease.

In Peel, most VPD rates have declined or remained stable over the last 10 years (Table 9.3). This trend is due in part to the high immunization coverage rates among Peel students. There continues to be local transmission of some VPDs such as influenza and invasive pneumococcal disease, whereas others, like measles and rubella, are imported into Peel from endemic countries.

One example of the effect of vaccines on disease incidence is shown in Figure 9.2. Following three province-wide measles outbreaks in Ontario in the early 1990s, a two-dose measles vaccine schedule was implemented in 1996. In Peel, a sharp decline in measles was observed soon after the schedule change, with an average of one case reported per year between 1996 and 2016. Previously, the average was 155 cases per year. Since 1991, the incidence of mumps in Peel has declined, with cyclical peaks occurring every three to five years. Rubella remains rare in Peel with one imported case reported over the past 10 years.

Table 9.3

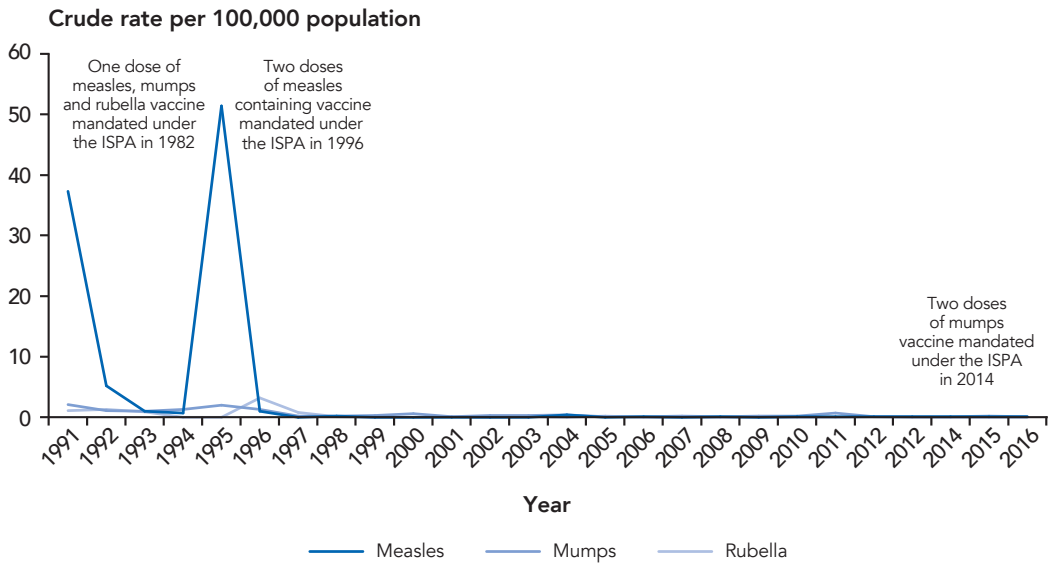
Total Laboratory-confirmed Cases and Incidence Rate of Vaccine Preventable Diseases, Peel, 2007–2016 Combined

Disease	Total Number of Laboratory Confirmed Cases	Median Cases per Year (10-year Range)	Average Yearly Crude Incidence Rate (per 100,000)	Age-standardized Incidence Rate Compared to Ontario
Influenza	8,964	813 (226–1830)	65.2	Higher
Hepatitis B	2,913	282 (224–405)	21.8	Higher
Invasive pneumococcal disease (IPD)	834	79 (69–103)	6.2	Lower
Varicella (chickenpox)†	371	35 (20–56)	2.7	Similar
Pertussis (whooping cough)	217	14 (5–76)	1.7	Lower
Hepatitis A	187	21 (9–23)	1.4	Higher
Invasive meningococcal disease	29	3 (1–6)	0.2	Similar
Mumps	21	2 (0–7)	0.2	Similar
Measles	10	1 (0–2)	0.1	Similar
Haemophilus influenzae B disease (HiB)	5	1 (0–1)	0.0	Similar
Rubella	1	1 (0–1)	0.0	Similar
Congenital rubella syndrome	0	0	0.0	NA
Tetanus	0	0	0.0	NA
Polio	0	0	0.0	NA
Diphtheria	0	0	0.0	NA
Yellow fever	0	0	0.0	NA
Human papillomavirus (HPV)	–	–	–	NA

* Includes acute and chronic hepatitis B cases
† Does not include aggregate counts of chicken pox.
– Data not available
NA - Not applicable.
Sources: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel - Public Health
Population Estimates, 2007–2016, Statistics Canada. IntelliHealth Ontario, Ministry of Health and Long-Term Care.

Figure 9.2

Incidence of Measles, Mumps and Rubella Cases, Peel, 1991–2016



Source: Integrated Public Health Information System (iPHIS) 1991–2016, Region of Peel - Public Health. Population Estimates, 1991–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Immunization Coverage

There is no immunization registry that captures everyone in the population. Instead, the number of students immunized in Peel is used to estimate vaccine protection in the general community. The coverage rates presented in Figure 9.3 are for students attending school in Peel during the 2015/2016 school year. Coverage estimates are compared to Canada's national coverage goals for the number of recommended doses received by a specific age.[292]

Did You Know

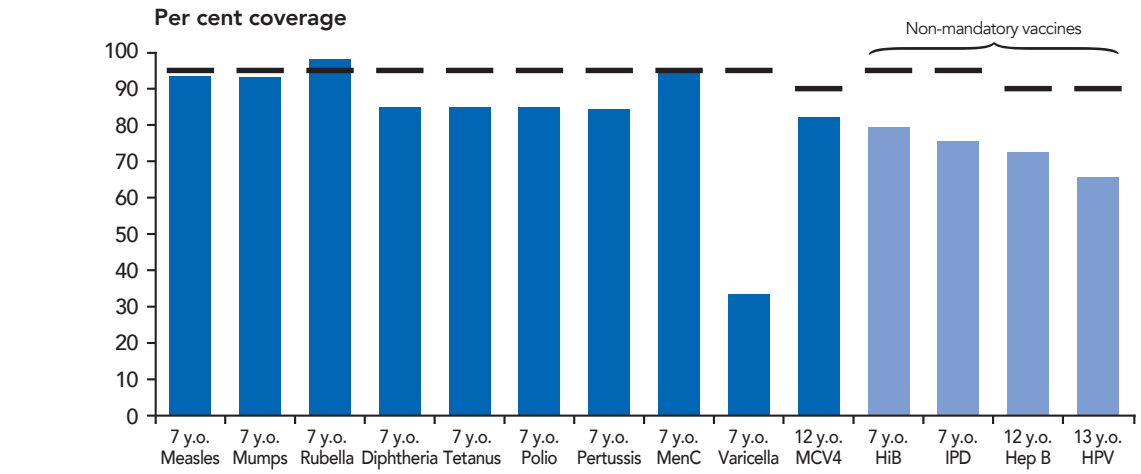
There are currently nine vaccine agents that are mandatory under the Immunization of School Pupils Act (ISPA) which include: diphtheria, tetanus, polio, measles, mumps, rubella, meningococcal disease, pertussis (whooping cough), and varicella (chicken pox). Uptake of these mandatory vaccines is higher than voluntary vaccines. Non-compliance with mandatory vaccines results in student suspensions.

Definition

Up-to-date coverage includes the proportion of a population that has received the recommended number of doses of a specific vaccine by a certain age. Children who are not up-to-date have often received some, but not all, recommended doses in a vaccine series.

Figure 9.3

Per Cent of Children With Up-to-Date Immunization Coverage, Peel, 2015/2016 School Year



	7 y.o. Measles	7 y.o. Mumps	7 y.o. Rubella	7 y.o. Diphtheria	7 y.o. Tetanus	7 y.o. Polio	7 y.o. Pertussis	7 y.o. MenC	7 y.o. Varicella	12 y.o. MCV4	7 y.o. HiB	7 y.o. IPD	12 y.o. Hep B	13 y.o. HPV
Peel	93.4	93.2	98.1	84.9	84.8	85.0	84.4	95.3	33.4	82.1	79.4	75.5	72.6	65.6
Goal	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	90.0	95.0	95.0	90.0	90.0

Notes: Hib=invasive haemophilus influenzae type B, IPD=invasive pneumococcal disease, MenC=meningococcal disease type C, MCV4=quadrivalent meningococcal (types A, C, Y, W-135), Hep B=hepatitis B, HPV=human papillomavirus
†HPV includes 13 year old females
y.o.=year old
Varicella vaccine is mandated under the Immunization of School Pupils Act (ISPA) only for students born in or after 2010. The varicella, pertussis, IMD (MenC and MCV4), and two doses of mumps containing vaccine became mandated under the ISPA in 2014 and Peel began screening for these vaccines in the 2014–2015 school year. The following vaccines are not mandated under the ISPA: Hib, IPD, Hep B and HPV.
Sources: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Immunization coverage report for school pupils: 2013–14, 2014–15 and 2015–16 school years. Toronto, ON: Queen's Printer for Ontario; 2017.
Public Health Agency of Canada. (2018). Vaccination Coverage Goals and Vaccine Preventable Disease Targets by 2025, Ottawa, Ontario: Public Health Agency of Canada.

Immunization coverage rates for childhood vaccines in Peel for the 2015/16 school year were similar to Ontario. With the exception of rubella and meningococcal C vaccine, coverage estimates in both Peel and Ontario are still below national coverage goals. Generally, antigens that require fewer doses for up-to-date coverage had higher coverage rates.

Varicella vaccine coverage in seven year olds was low (33%) in 2015/16 because immunization was only mandated under the Immunization for School Pupils Act (ISPA) for students born in or after 2010. Coverage rates for school-based immunization programs (i.e., hepatitis B, HPV, meningococcal) among 12-and 13-year olds were slightly higher in Peel compared to Ontario.[293]

A small minority of parents in Peel choose not to immunize their children for medical, religious or philosophical reasons. The overall exemption rate for vaccines was less than 2% in Peel for the 2016/17 school year. This exemption rate has remained similar to previous rates and is similar to Ontario.[AA]

The remainder of the vaccine-preventable diseases section will present two VPDs, invasive pneumococcal disease and influenza, where there continues to be significant transmission in Peel.

Invasive Pneumococcal Disease (IPD)

Streptococcus pneumoniae is a bacterium that colonizes the nasopharynx of between 5% and 10% of adults, and 20% to 40% of children.[286] *S. pneumoniae* can cause infections of the ears, sinus or lungs. In more invasive cases, it can cause infections of the blood or brain, resulting in brain damage or hearing loss. This type of infection is called invasive pneumococcal disease (IPD) and is the number one bacterial cause of pneumonia and meningitis.

IPD cases are reportable in Ontario, with the majority occurring in children under the age of five and adults over the age of 65. IPD was identified as the second most burdensome infectious disease in Ontario.[286] In Canada, the serotype distribution of cases has changed over time with an increase in the incidence of non-vaccine preventable serotypes.[294] IPD vaccination is not mandatory under the Immunization of School Pupils Act.

Between 2012 and 2016, there were 396 cases of IPD reported in Peel, 59 of which were fatal (15%). Incidence rates of IPD in Peel have steadily declined and are lower compared to Ontario. The highest age-specific incidence rates were reported among those over the age of 65, particularly males. The 65 and older age group accounted for 42% of all cases reported during this time period. Among all IPD cases in Peel, 48 (12%) were reported in children younger than five years of age. Overall, 67% of Peel cases were infected with a vaccine preventable serotype.[BB]

Influenza

Influenza was identified as the eighth-most burdensome infectious disease in Ontario and is the third-most frequently reported infectious disease in Peel (Table 9.1).[286] Pregnant women, individuals with certain chronic health conditions, children under five years, adults over the age of 65, residents of chronic-care facilities, and Indigenous peoples are most vulnerable to influenza-related complications.[295] The influenza vaccine is the most effective intervention to prevent illness and negative outcomes.

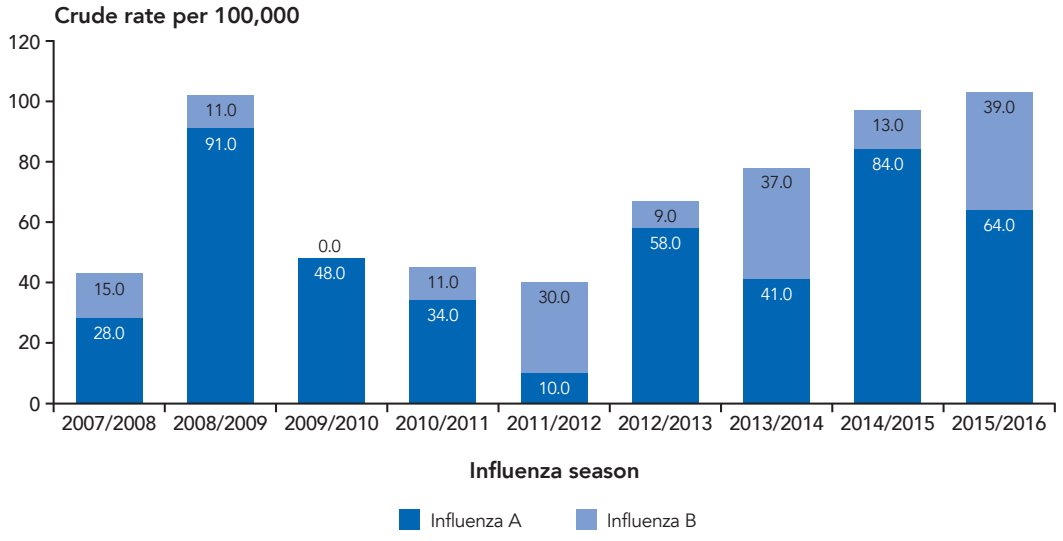
Did You Know

Not all infected people will seek medical care for influenza. As a result, cases reported to public health departments are likely an underestimate of the true number of influenza cases. In addition, provincial policy restricts the number of specimens submitted for laboratory testing.

Between the 2011/2012 and 2016/2017 influenza seasons, there were 6,846 laboratory-confirmed cases reported in Peel. The annual incidence of influenza (measured by lab-confirmed cases) has increased since the 2011/2012 season (Figure 9.4). Influenza A was the dominant subtype circulating in all but two seasons (2011/2012 and 2013/2014).

Figure 9.4

Incidence of Laboratory-Confirmed Influenza by Subtype and Season, Peel, 2007/2008 to 2016/2017 Season



Sources: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel - Public Health. Population Estimates, 2007–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Between 2012 and 2016, there were a total of 6,632 emergency department visits (ED) for influenza and 1,412 hospitalizations.[M,N] Those aged 65 and older have the highest risk of complications due to influenza and mortality rates were highest in this age group.[O]

Did You Know

Vaccines against the influenza virus first became available in Canada in 1981. In 1989, a publicly funded vaccine was made eligible for high-risk groups in Ontario. This was later expanded to all Ontario residents in the year 2000.

Because influenza viruses are constantly changing, the formulation of the vaccine is reviewed each year in order to match to circulating strains. The number of cases of influenza and the number of outbreaks observed from season-to-season is influenced by levels of vaccine uptake, susceptibility of the population, the types of strains circulating in the community, and the similarity or "match" between these strains and the vaccine. For example, during the 2014/2015 influenza season, overall vaccine effectiveness was low in Canada, which may have been a significant contributing factor to the high number of outbreaks and associated cases of influenza reported in Peel during this season (Table 9.4).

Table 9.4

Influenza Cases, Peel, 2011/2012 to 2016/2017 Season

Influenza Season	Number of Confirmed Outbreaks in Institutions	Number of Laboratory-confirmed Cases	Number of Outbreak-associated Cases in Institutions†	Number of Deaths among Outbreak-associated Cases in Institutions†	Median Duration of Outbreaks (in Days)	Dominant Subtype(s) (Canada)
2011/2012	5	547	74	3	14	B
2012/2013	21	914	397	18	15	A/H3N2
2013/2014	23	1,084	378	3	17	A/H1N1 and B
2014/2015	57	1,378	1,163	31	17	A/H3N2
2015/2016	12	1,488	240	5	16	A/H1N1 and B
2016/2017	37	1,435	737	22	17	A/H3N2

† Includes residents, patients, and staff. Some cases may also be included in the total for laboratory-confirmed cases.
Note: The term "institutions" is defined as long-term care, retirement homes and acute care settings.
Sources: Integrated Public Health Information System (iPHIS), 2011–2017, Ontario Ministry of Health and Long-Term Care. Public Health Agency of Canada, FluWatch. Ottawa, ON: Minister of Health; 2011–2017.

Influenza Vaccine Uptake

Similar to Ontario, influenza vaccine uptake has remained relatively stable in Peel (Table 9.5). During the 2013/2014 influenza season, 27% of Peel residents received the influenza vaccine. The proportion of Peel's population who received a flu shot in the 2013/2014 influenza season was significantly higher among those aged 65 years and older (63%) compared to all other age groups. The majority of people who were not vaccinated in the 12 months prior to the survey felt it was unnecessary (73%) or they "didn't get around to it" (16%). In general, Peel influenza immunization rates have been lower than Ontario rates.[H2] The reason for this is not known.

OTHER RESPIRATORY INFECTIONS

Tuberculosis

Tuberculosis (TB), while preventable and curable, remains a significant disease of public health interest globally. TB is the ninth-leading cause of death worldwide, with 10.4 million incident cases and 1.3 million deaths in 2016.[296] Although the incidence rate of active TB disease in Canada has been decreasing over time and is among the lowest in the world, high rates persist among Indigenous peoples and foreign-born individuals.[297]

Latent Tuberculosis

Latent tuberculosis infection (LTBI) is the second-most frequently reported infection in Peel (Table 9.1). While incidence rates for LTBI have declined over time in Peel and Ontario, an average of 1,235 LTBI infections are reported annually in Peel. LTBI incidence rates are consistently higher in Peel compared to Ontario. This is likely due to the high number of residents in Peel who are from TB-endemic countries.[BB]

Active Tuberculosis

Over the past decade, Peel's active TB disease rate has been twice the rate of Ontario (Figure 9.5). On average, there are 130 active TB cases reported in Peel each year. Incidence rates of active TB are highest amongst those aged 65 years and older and for individuals born outside Canada. Among Peel cases of active TB disease, 93% reported having lived in a TB endemic country. The three most commonly reported countries in these cases were India (44%), Philippines (15%), and Pakistan (9%). These countries are also the top three countries of birth for immigrants in

Table 9.5

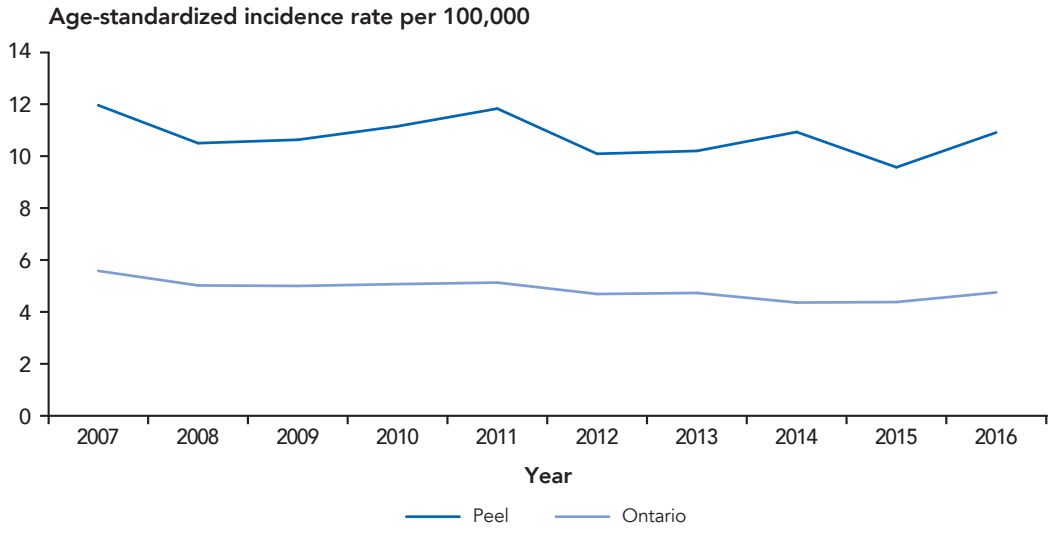
Per cent of the Total Population Who Had a Flu Shot Within the Past Year, Peel and Ontario, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014

	2000/2001 Per cent (95% CI)	2003 Per cent (95% CI)	2005 Per cent (95% CI)	2007/2008 Per cent (95% CI)	2009/2010 Per cent (95% CI)	2011/2012 Per cent (95% CI)	2013/2014 Per cent (95% CI)
Peel	32.7 (30.2–35.2)	30.6 (28.3–33.1)	35.5 (32.9–38.1)	33.7 (30.8–36.6)	26.7 (24.3–29.3)	26.3 (23.8–29.0)	27.3 (24.5–30.2)
Ontario	34.7 (34.0–35.4)	35.1 (34.4–35.9)	42.5 (41.8–43.3)	36.8 (36.0–37.6)	31.3 (30.5–32.1)	32.0 (31.1–32.8)	33.5 (32.6–34.3)

Note: 95% CI reflects the 95% confidence interval of the estimated per cent.
Source: Canadian Community Health Survey Share File, 2000/2001, 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Figure 9.5

Age-Standardized Incidence of Active Tuberculosis by Year, Peel and Ontario, 2007–2016



Note: Rates are age-standardized to 2011 Canadian population.
Sources: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel – Public Health.
Public Health Ontario. Query: Peel Public Health: Counts by age and gender. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2017 October 25 [cited 2017 October 25].
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Query/Pages/default.aspx
Population Estimates, 2007–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

While active TB most frequently manifests clinically as pulmonary TB, the disease can affect other parts of the body such as bones, kidneys and lymph nodes. Unlike TB in the lungs and airways, TB in other parts of the body is not infectious. In 2016, 97 pulmonary TB cases represented 65% of all active TB cases.

Risk factor data are available for 60% of active TB cases in Peel. The most common risk factors reported include: diabetes (24%), known contact with a confirmed case (16%), and underlying chronic illness (13%).[BB] It is unknown whether these were independent risk factors.

Drug-resistant Tuberculosis

Between 2007 and 2016, there were 15 cases of multidrug-resistant (MDR) TB in Peel (1% of all TB cases). Although drug-resistant TB is not presently a problem in Peel, the risk to Peel residents is present because they are more likely to travel to countries with high TB rates and TB that has associated drug resistance. One case of extensively drug-resistant (XDR) TB was identified in Peel in 2011.

ENTERIC ILLNESS

Enteric illnesses are infections of the digestive system. Although symptoms are typically mild and self-limiting, hospitalizations and deaths can occur.

Data Gaps

Enteric diseases are largely under-reported. Many people let their symptoms "run their course" without seeking medical care, and physicians may not order the collection of diagnostic samples when seeing patients with enteric symptoms. It has been estimated that only one out of every 313 cases of enteric illness are reported to a health unit.[298]

Campylobacteriosis, non-typhoidal salmonellosis, and giardiasis were the most commonly reported enteric diseases in Peel between 2007 and 2016. Combined, these three diseases accounted for 78% of all reportable enteric diseases (Table 9.6). Age-standardized incidence rates were higher in Peel than Ontario for amebiasis, typhoid fever, shigellosis, hepatitis A and paratyphoid fever. For these five common diseases, a high proportion of cases were linked to recent travel. Children under five are a vulnerable population for enteric illness. Salmonellosis, campylobacteriosis and giardiasis were the most commonly reported infectious diseases among this age group (Table 9.2).

Between 2007 and 2016, there were 380 confirmed or suspect enteric disease outbreaks affecting more than 10,000 residents in Peel. Seventy per cent of these occurred in institutions (e.g., long-term care, retirement home, hospital) and were responsible for 45 deaths in Peel (Table 9.7). For outbreaks in which a pathogen was isolated, norovirus had the highest number (5,416) of associated cases.

Table 9.6

Enteric Illness Summary, Peel, 2007–2016

Illness	Total Number of Laboratory-confirmed Cases	Average Annual Crude Incidence Rate per 100,000‡	Age-standardized Incidence Rate Compared to Ontario	Total Outbreak-associated Cases††	Per cent of Cases that are Travel-associated	Most Common Country of Travel
Campylobacteriosis	3,348	24.8	Lower	15	35.6	India
Non-typhoidal salmonellosis	2,900	21.4	Similar	276	37.0	Cuba
Giardiasis	1,503	11.4	Similar	0	48.9	India
Amebiasis*	1,105	2.1	Higher	50	58.1	India
Typhoid fever	368	2.7	Higher	0	94.4	India
Shigellosis	320	2.4	Higher	1	69.9	India
Yersiniosis	252	1.9	Similar	0	41.3	Cuba
Cryptosporidiosis	225	1.7	Lower	1	60.8	India
Hepatitis A	187	1.4	Higher	3	86.5	Pakistan
Paratyphoid fever	191	1.4	Higher	0	89.0	India
Verotoxin producing *E. coli* O157	135	1.0	Lower	18	15.4	Cuba
Food poisoning	57	0.4	–	489	–	–
Cyclosporiasis	157	1.1	Similar	34	60.4	Mexico
Listeriosis	55	0.4	Similar	11	6.7	Mexico
Brucellosis	10	0.1	–	0	–	–
Botulism	6	0	–	3	–	–
Norovirus	**–**	**–**	**–**	**5,416**	**–**	**–**
Clostridium difficile†	–	–	–	388	–	–
Rotavirus	–	–	–	110	–	–
Clostridium perfringens	–	–	–	22	–	–
Gastroenteritis	–	–	–	2,807	–	–
Unknown/unconfirmed aetiologic agent	–	–	–	1,439	–	–

† Only reportable in the setting of gastroenteritis outbreaks (all causes) in public hospitals or institutions or in public hospitals for C. difficile outbreaks.
‡ Crude incidence rate includes laboratory-confirmed cases
†† Includes community and institutional confirmed and suspect outbreaks where an aetiologic agent was identified (cases may or may not be lab-confirmed). Relates to both local and provincial outbreaks in which Peel had associated cases.
* Amebiasis counts include confirmed and probable cases
– Data not available.
Sources: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel – Public Health
Population Estimates, 2007–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Older adults (aged 65 years and older) suffer disproportionately from severe outcomes of norovirus infection. The estimated case-fatality ratio in this age group is approximately 20 times higher than those aged 18 to 64 years.[299,300] Although older adults in the community do not appear to have an overall higher risk for infection, those living in health-care facilities are at greater risk of being affected during outbreaks.[301]

Between 2007 and 2016, there were 5,416 cases of Norovirus as a result of 35 community outbreaks and 120 institutional outbreaks in Peel. These outbreaks were associated with 38 This is likely an underestimation of the true burden of norovirus in Peel.

Table 9.7

Enteric Outbreak Setting and Associated Cases, Peel, 2007–2016

Outbreak Setting	Number of Outbreaks (%)	Total Number of Outbreak Cases	Total Number of Outbreak-related Deaths
Long-term care home (i.e., nursing home)	144 (39.8)	5,296	36
Retirement home	76 (21.0)	2,200	1
Hospital	33 (9.1)	847	8
Child-care centre	32 (8.8)	592	0
Restaurant	23 (6.4)	208	0
Private home	16 (4.4)	113	0
School	14 (3.9)	631	0
Banquet hall	10 (2.8)	237	0
Other	14 (3.9)	235	0

Notes: Confirmed (n=333) and suspect (n=29) outbreaks are included.
'Other' includes shelter (4), workplace (3), camp (2), grocery (2), club/organization (2), and correctional facility (1).
Source: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel – Public Health.

TRAVEL-RELATED DISEASES AND RISKS

Many infectious diseases that are uncommon in Canada can be acquired through travel to endemic countries or imported through immigration.[302]

Between 2012 and 2016, Peel's age-standardized incidence rates of hepatitis A, malaria, paratyphoid fever and typhoid fever were considerably higher than Ontario.[BB] Table 9.8 presents data related to these four infections. Most cases were among individuals travelling to their countries of origin to visit friends and relatives (VFR travellers) as the primary purpose of their visit. Such travellers are often at higher risk for infectious diseases than other international travellers as they tend to stay in local homes, travel for longer durations, and may not take precautions such as immunizations to reduce the health risks inherent to travelling to their country of origin.[302-305]

The majority of common travel illness cases reported staying in home accommodations (89%) for an average duration of stay between 33 and 49 days. Very few reported a pre-travel consultation with a medical professional before departure, and few reported taking preventive medical measures (i.e., vaccination, prophylaxis).

Table 9.8

Characteristics of Travel-associated Illness
Peel, 2012–2015 Combined

	Disease			
	Hepatitis A (n=56)	**Malaria (n=114)**	**Paratyphoid Fever (n=52)**	**Typhoid Fever (n=117)**
Top travel countries	Pakistan India Afghanistan Egypt	Nigeria Ghana India	India Pakistan Bangladesh Sri Lanka	India Pakistan Bangladesh Mexico
Completed a pre-travel consultation Number (%)	2 (4.7)	19 (21.6)	5 (10.2)	10 (8.9)
Visiting friends/relatives Number (%)	32 (84.2)	65 (81.3)	43 (95.6)	94 (95.0)
Duration of travel (days): median range	49 5 – 380	36 3 – 1,110	33 10 – 185	38 7 – 343

Sources: Integrated Public Health Information System (iPHIS), 2012–2015, Region of Peel – Public Health.
Peel Enhanced Risk Factor Surveillance Data, 2012–2015, Region of Peel – Public Health.

SEXUALLY TRANSMITTED INFECTIONS

Sexually transmitted infections (STIs) are preventable but continue to be a significant public health concern. Since 1997, there has been an increase in the rates of chlamydia, gonorrhea and infectious syphilis in Canada.[100] It is unclear if increasing STI rates are a result of a true rise in STI incidence, or because of changes in reporting or improved screening and detection.[306] STIs can have negative long-term health outcomes. Untreated syphilis may cause damage to the heart, brain, liver, bones and eyes. If left untreated, chlamydia and gonorrhea in females can lead to pelvic inflammatory disease, which can increase the risk of ectopic pregnancies and infertility.[306, 307] In addition, STI infections such as gonorrhea, syphilis and chlamydia can increase the risk of acquiring and transmitting HIV.[306, 307]

Definition

Sexually transmitted infections (STIs) are transmitted from one person to another through sexual contact. Some infections such as HIV and syphilis can also be transmitted vertically from mother to child during pregnancy and birth.

Chlamydia

Chlamydia has the highest incidence rate of all reportable diseases and incidence has been increasing over time in both Peel and Ontario (data not shown).[BB] A number of factors may account for this trend, one of which includes more sensitive testing methods that allow for more reliable case detection. However, the possibility of a true increase in incidence cannot be ruled out. Many infected individuals are often asymptomatic and unaware that they may be transmitting the disease.[306]

In Peel, chlamydia affects more females than males (Table 9.9) and the incidence rates are highest among females between 15 to 24 years, and males aged 20 to 29 years (data not shown). This may be due in part to routine testing for chlamydia and gonorrhea at the time of PAP testing that allows for greater detection of infection.

Gonorrhea

Gonorrhea is the second-most commonly reported STI in Peel. In Peel, the age-standardized incidence rates of gonorrhea have been increasing since 2012 and are highest among males aged 20 to 29 years and females aged 15 to 24 years.[BB] While gonorrhea is usually curable with antibiotics, global resistance to treatment is on the rise.

Similar to Ontario, males in Peel have higher rates of gonorrhea than females (Table 9.9). Gonorrhea tends to be symptomatic more often in males than in females, resulting in a higher number of male cases seeking testing and treatment.[308] In Peel, unprotected oral sex was the most commonly reported risk factor for gonorrhea (78%) between 2014 and 2016.[CC] In 2016, 26% of male gonorrhea cases were among men who have sex with men (MSM), a percentage which has increased from 15% in 2014 and 19% in 2015.

Table 9.9

Reported Cases and Incidence Rates of Gonorrhea and Chlamydia by Sex, Peel, 2016

Sex	Gonorrhea		Chlamydia	
	Number of Cases	Crude Incidence Rate per 100,000	Number of Cases	Crude Incidence Rate per 100,000
Males	439	29.8	1,576	107.1
Females	255	17.3	2,302	156.4
Total	**694**	**47.2**	**3,878**	**263.5**

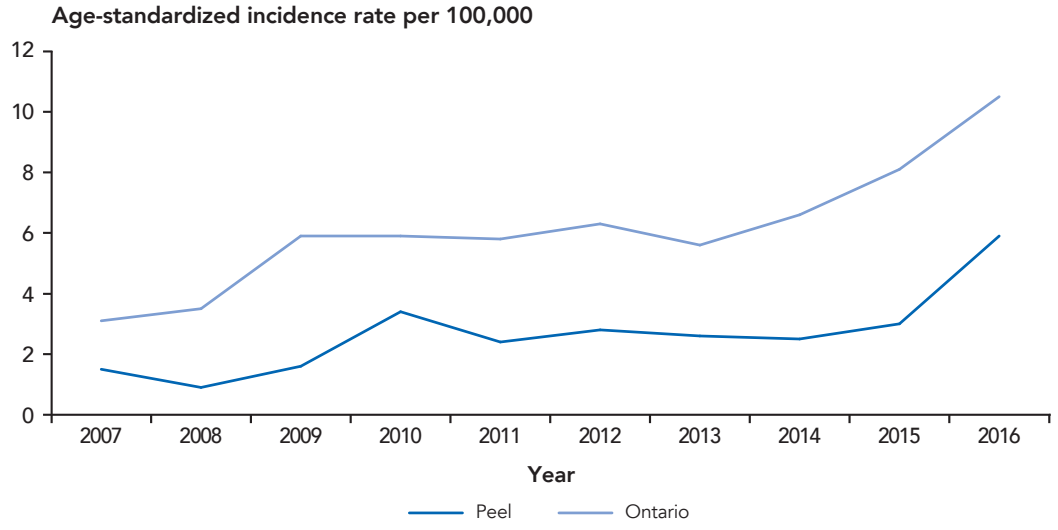
Source: Integrated Public Health Information System (iPHIS), 2016, Region of Peel – Public Health.
Population Estimates, 2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Infectious Syphilis

Peel's age-standardized incidence rate of infectious syphilis is considerably lower than Ontario's, but it has increased over time (Figure 9.6). Prior to 2002, the incidence of infectious syphilis in Ontario was approximately equal among males and females. Since then, infectious syphilis has been higher in males both in Peel and provincially (data not shown).[BB] Outbreaks of infectious syphilis, predominantly among MSM populations, have contributed to significant rate increases and sustained transmission of the disease in many Ontario jurisdictions, including Toronto, Ottawa and other provinces in Canada.[309]

Figure 9.6

Incidence of Infectious Syphillis, Peel and Ontario, 2007–2016



Note: Rates are age-standardized to the 2011 Canadian population.
Sources: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel – Public Health.
Public Health Ontario. Query: Peel Public Health: Counts by age and gender. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2017 October 25 [cited 2017 October 25].
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Query/Pages/default.aspx
Population Estimates, 2007–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Did You Know

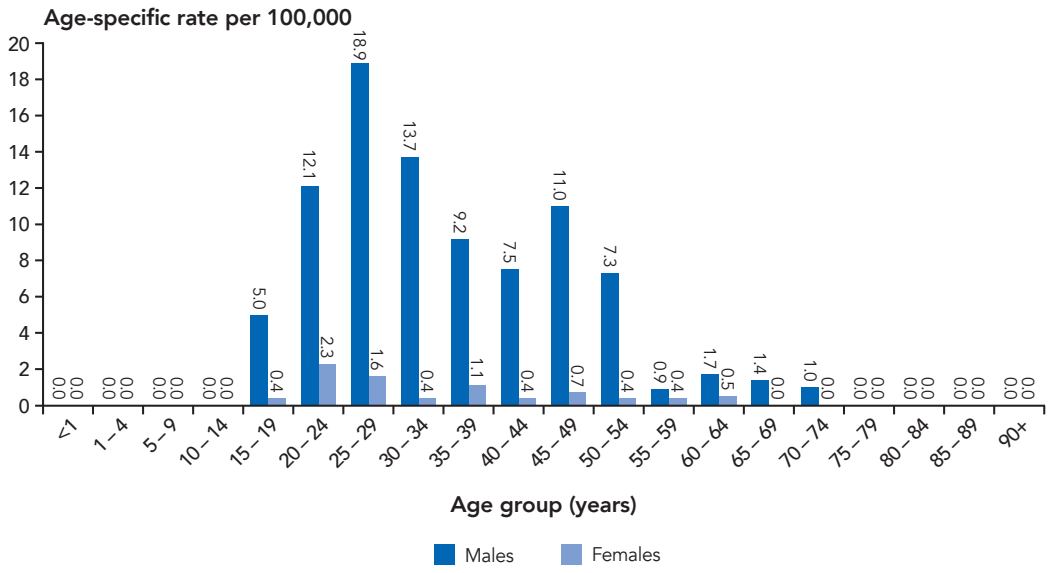
Untreated gonorrhea or infectious syphilis can increase a person's risk of acquiring or transmitting HIV.[310] This risk is especially pronounced among infectious syphilis cases where there is an estimated two to fivefold increased risk of acquiring HIV if exposed.[307] Among Peel infectious syphilis cases reported between 1991 and 2014, 70 individuals (23%) were diagnosed with HIV before or within one year after their syphilis diagnosis.

Between 2012 and 2016, Peel had a total of 246 cases of infectious syphilis, of which 91% were male. The incidence rate of infectious syphilis was highest among males aged 25 to 29 years (Figure 9.7).

While infectious syphilis cases in Peel report multiple risk factors, condomless oral sex (98%) was the most frequently reported risk factor among MSM populations, whereas condomless vaginal sex (80%) was most frequently reported among non-MSM populations (Figure 9.8).

Figure 9.7

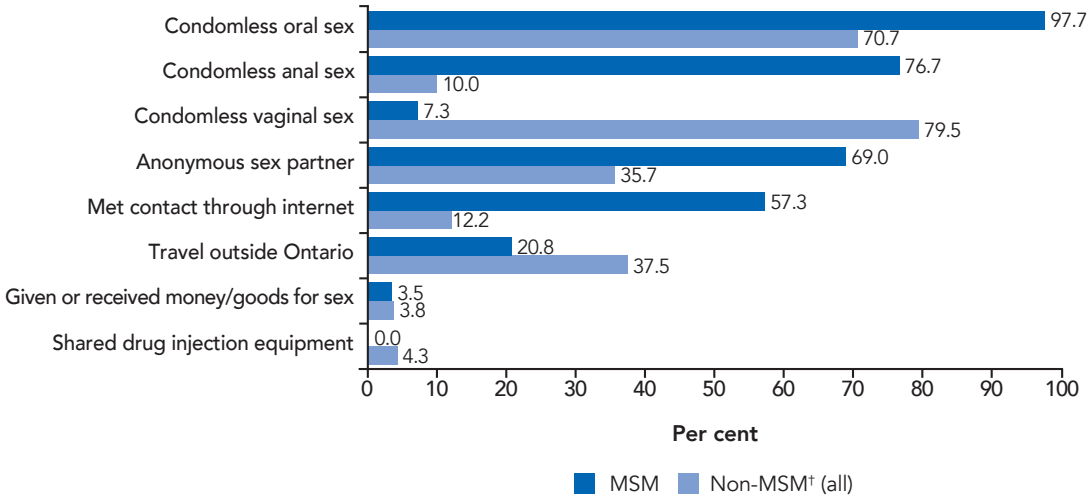
Incidence of Infectious Syphilis by Age Group and Sex, Peel, 2012–2016 Combined



Sources: Integrated Public Health Information System (iPHIS), 2012-2016, Region of Peel - Public Health. Population Estimates, 2012-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 9.8

Risk Factors for Infectious Syphillis, Peel, 2012–2016 Combined



† includes non-MSM males and females
Notes: MSM=men who have sex with men.
Clients may select more than one risk factor.
Source: Enhanced STI Risk Factor Surveillance (Program Database), June 2017. Region of Peel - Public Health.

Human Immunodeficiency Virus (HIV)

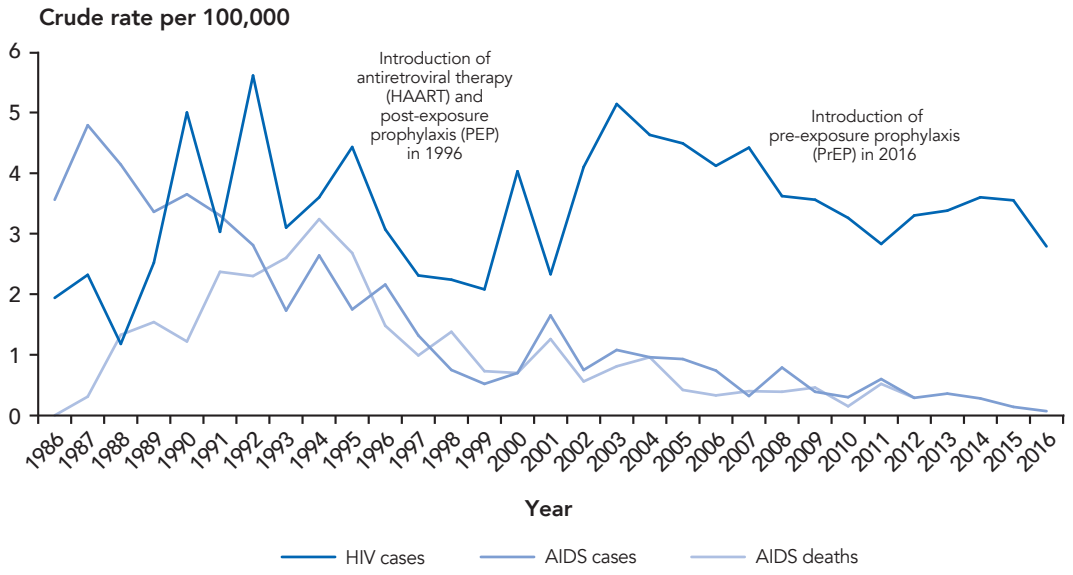
Between 2012 and 2016, a total of 238 HIV cases and 25 AIDS cases were reported in Peel. Age-standardized incidence rates for Peel have been consistently lower compared to Ontario. In Peel, HIV incidence is higher among males and has decreased over time, whereas the HIV incidence rate among females has remained stable.[BB]

The number of AIDS cases and deaths have been declining since the 1980s. This decline was most marked in 1996 following the introduction of newer combination antiviral medications that were more effective than the drugs previously available for HIV treatment (Figure 9.9).[311]

Between 2012 and 2016, the incidence rate for HIV was higher among males compared to females, especially among males aged 20 to 49 years (Figure 9.10). During this same time period, there was one case of HIV in an infant acquired through vertical transmission in Peel. Due to routine prenatal screening introduced in Ontario in 1999, vertical transmission of HIV in Peel has been low.

Figure 9.9

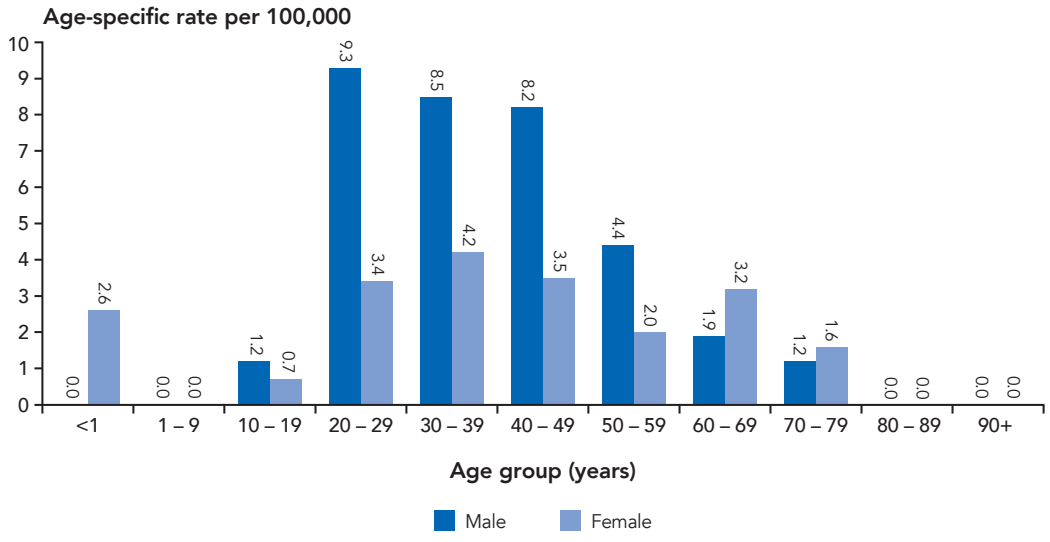
Incidence of HIV and AIDS Cases and AIDS Deaths
Peel, 1986–2016



Sources: Integrated Public Health Information System (iPHIS), 1986–2016, Region of Peel - Public Health.
Population Estimates, 1986–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Mortality Database 1986–2012. Office of the Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 9.10

Incidence of Human Immunodeficiency Virus (HIV) by Age Group and Sex,
Peel, 2012–2016 Combined



Sources: Integrated Public Health Information System (iPHIS), 2012–2016, Region of Peel – Public Health.
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Similar to infectious syphilis, the most common risk factors among non-MSM HIV cases in Peel were behavioural, such as condomless vaginal sex (83%) and condomless oral sex (39%); and exposure risk factors, such as travel outside of Ontario (39%). Among cases identified as MSM, the most common risk factors were condomless anal sex (100%), condomless oral sex (93%) and anonymous sex partner (66%).

BLOOD-BORNE INFECTIONS

Definition

Blood-borne infections (BBIs) are transmitted through contact with contaminated blood. Potential modes of transmission include: the sharing of contaminated needles or other infected materials; blood transfusion; tissue or organ transplant; and transmission before, during, and after birth from a mother to her infant. Some infections (e.g., HIV, hepatitis B) may be transmitted through both sexual and blood-borne transmission routes.

Hepatitis C

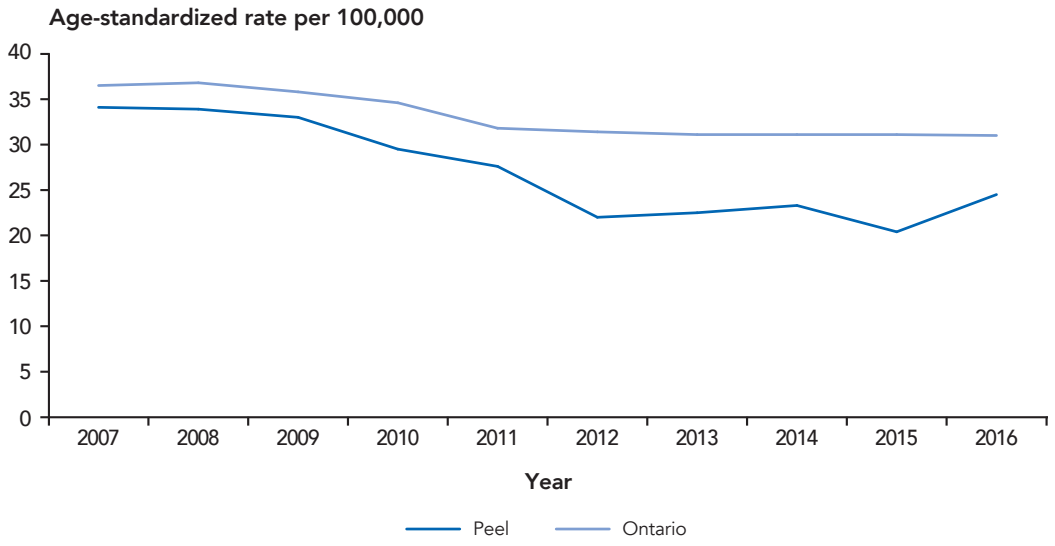
Hepatitis C has been identified as the most burdensome disease in Ontario with the highest number of potential years of life lost.[286] Most infections in Canada relate to exposures in countries where hepatitis C is endemic (e.g., through unsterile medical procedures, injection drug use, receipt of unscreened blood products).[312,313] Transmission during sexual activity can occur, but it is rare. In recent years, significant advances have occurred in the treatment of hepatitis C. Direct-acting antiviral treatments, which can cure over 95% of cases, are available as oral medications with shorter duration and reduced side effects.[314]

Most infections (75%) are asymptomatic and many individuals remain unaware that they are infected. Between 2012 and 2016, there were 1,510 hepatitis C cases reported in Peel. Incidence rates have decreased in Peel since 2007 and are lower than Ontario (Figure 9.11). Males in Peel had a higher incidence rate compared to females, and the rate was highest in those aged 50 to 69 years. There were two cases of vertical transmission of hepatitis C in Peel (Figure 9.12).

Among hepatitis C cases in Peel, the most frequently reported risk factors were having lived in or travelled to an endemic country (48%), and being born in an endemic country (44%).

Figure 9.11

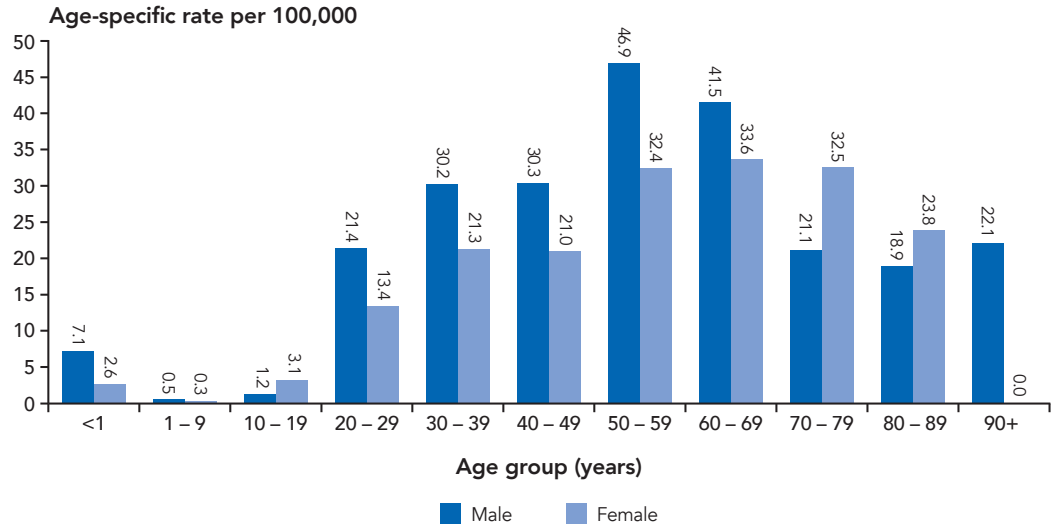
Incidence† of Hepatitis C
Peel and Ontario, 2007–2016



† Data represent newly reported cases, which may include both incident cases and carriers.
Note: Rates are age-standardized to the 2011 Canadian population.
Sources: Integrated Public Health Information System (iPHIS), 2007–2016, Region of Peel – Public Health.
Public Health Ontario. Query: Peel Public Health: Counts by age and gender. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2017 May 10 [cited 2017 May 12].
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Query/Pages/default.aspx
Population Estimates, 2007–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 9.12

Incidence† of Hepatitis C by Age Group and Sex,
Peel, 2012–2016 Combined



† Data represent newly reported cases, which may include both incident cases and carriers.
Sources: Integrated Public Health Information System (iPHIS), 2012–2016, Region of Peel – Public Health.
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Hepatitis B

Hepatitis B is a blood-borne infection that is more infectious than hepatitis C or HIV. Initial infection is often asymptomatic, with half of adults and up to 90% of children demonstrating no symptoms. About 95% of adults recover within six months of becoming infected (i.e., acute hepatitis B), resulting in lifelong protection. The remaining 5% are unable to clear the virus and will progress to chronic hepatitis B infection.[315] Infection at a young age increases the likelihood that an individual becomes a chronic hepatitis B carrier.[316] The majority of infected infants, between 80% to 90%, go on to develop chronic hepatitis.[286]

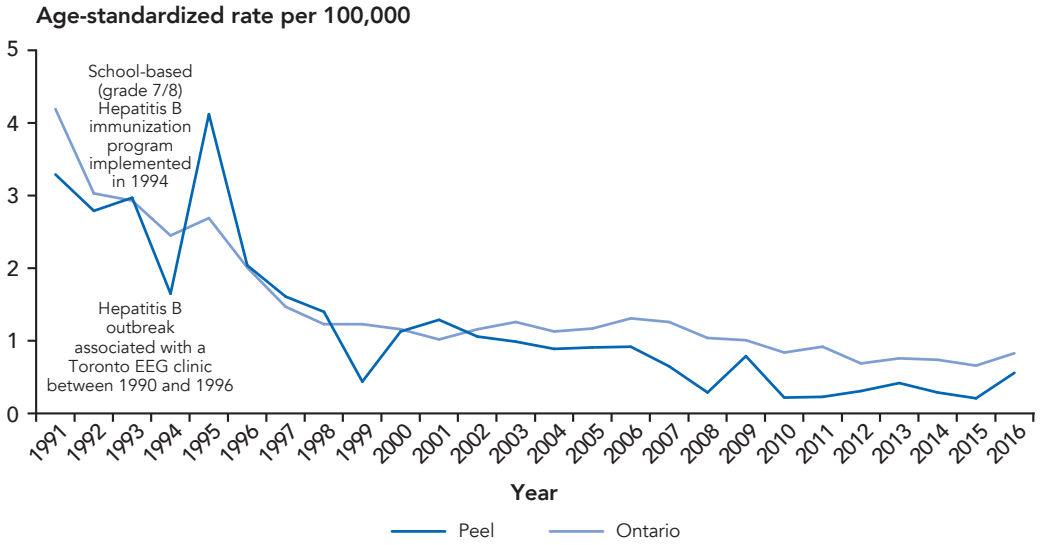
Hepatitis B has been identified as the fourth-most burdensome infectious disease in Ontario.[286] The potential complications from chronic hepatitis B infection, particularly cirrhosis and liver cancer, can be severe, long-lasting, and lead to high healthcare costs.[286] While there is a very effective vaccine that can prevent hepatitis B, there is currently no cure for it.

Peel Facts

In 1994, the hepatitis B vaccine became publicly funded for students in Grade 7; however it is not mandatory under the Immunization of School Pupil's Act. In the 2015/16 school year, the coverage rate for hepatitis B immunization among 12-year olds in Peel was 73% compared to 70% in Ontario.[293] Canada's national immunization coverage goal for hepatitis B is 95%.

Figure 9.13

Incidence of Acute Hepatitis B
Peel, 1991–2016



Note: Rates are age-standardized standardized to the 2011 Canadian population.
Sources: Integrated Public Health Information System (iPHIS), 1991–2016, Region of Peel - Public Health.
Public Health Ontario. Query: Peel Public Health: Counts by age and gender. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2017 May 10 [cited 2017 May 12].
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Query/Pages/default.aspx
Population Estimates, 1991–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

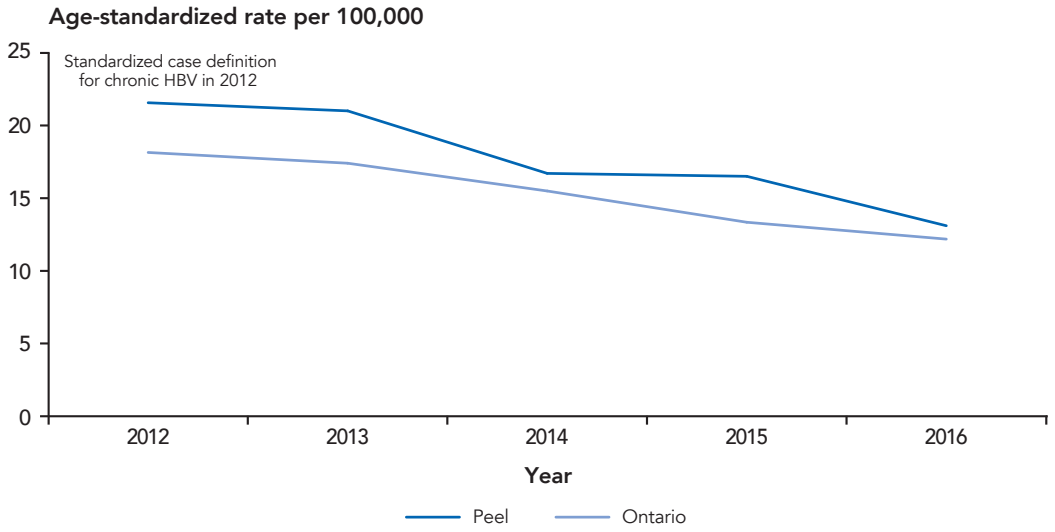
Incidence rates for both acute and chronic hepatitis B in Peel have declined over time (Figures 9.13 and 9.14). Overall, acute hepatitis B incidence in Peel has been similar to Ontario; however the region's chronic hepatitis B incidence rate is higher.

Between 2012 and 2016, 64% of acute hepatitis B cases and 72% of chronic hepatitis B cases in Peel reported travel to or having lived in a country where hepatitis B is endemic. There were a total of 23 acute hepatitis B cases and 1,212 chronic hepatitis B cases reported in Peel during this same time period. Acute hepatitis B was highest among males between the ages of 50 to 59 years in Peel while chronic hepatitis B was highest among males aged 30 to 44 years.[BB]

Between 2012 and 2016, 20 chronic hepatitis B cases (2%) were reported in those younger than 19 years (Figure 9.15). Of these cases, 70% were born to a mother who had the infection or was a carrier.

Figure 9.14

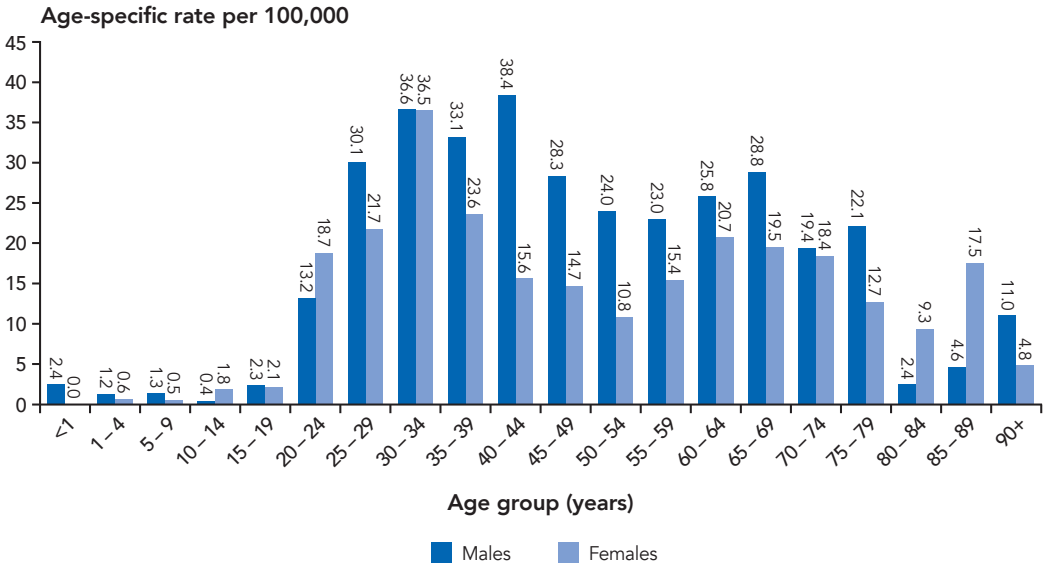
Incidence of Chronic Hepatitis B, Peel, 2012–2016



Note: Rates are age-standardized to the 2011 Canadian population.
Sources: Integrated Public Health Information System (iPHIS), 2012–2016, Region of Peel - Publc Health.
Public Health Ontario. Query: Peel Public Health: Counts by age and gender. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2017 May 10 [cited 2017 May 12].
Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Query/Pages/default.aspx
Population Estimates, 2012–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Figure 9.15

Incidence of Chronic Hepatitis B by Age Group and Sex, Peel, 2012–2016 Combined



Sources: Integrated Public Health Information System (iPHIS), 2012-2016, Region of Peel – Public Health. Population Estimates, 2012-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

INFECTIOUS DISEASES LINKED TO CANCER

It is well established that some cancers are caused by infectious pathogens.[317,318] To date, the International Agency for Research on Cancer has classified 11 infectious agents as carcinogenic to humans. This includes human papillomavirus, hepatitis C, and hepatitis B[319], which cause a number of cancers.

Between 2003 and 2012, approximately 1,200 new cancer diagnoses in Peel are estimated to have resulted from these cancer-causing infections (Figure 9.16). HPV infection accounted for the greatest proportion of these cases (n=919) during this time period.

Definition

The ***population-attributable fraction (PAF)*** describes the proportion of all cases of disease that are attributable to a particular exposure (e.g., human papillomavirus (HPV)). It is a way of describing the proportion of the disease that could be prevented if the exposure was removed. For example, the population attributable fraction for oropharyngeal cancers and HPV infection is 53%.[320] In other words, 53% of oropharyngeal cancers are caused by HPV, and all of these cases would be eliminated if they were not infected with HPV.

The Link between HPV and Cancer

Persistent infection with HPV causes cervical cancer.[321] HPV is also an established cause of cancer of the penis, anus, vulva, vagina, oropharynx, oral cavity and tonsil, and possibly, larynx.[319]

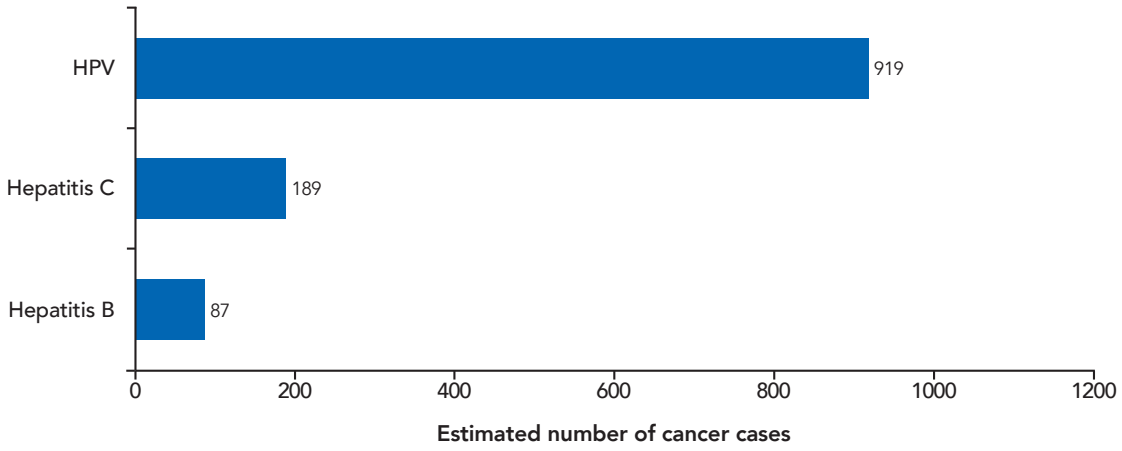
Table 9.10 describes the incidence of HPV-associated cancers in Peel between 2003 and 2012. Between 2003 and 2012, a total of 1,857 HPV-related cancers were reported in Peel, with an estimated 919 of these cases attributed to HPV infection.

This means that approximately half of these cancers could be prevented if HPV infection were eliminated.

Cervical cancer and oropharyngeal cancers represent the highest incidence of HPV-associated cancers in Peel. The incidence of cervical cancer has declined in Peel and Ontario since 1986, but has remained stable since the early 2000s (Figure 9.17)

Figure 9.16

Estimated Number of Cancer Cases Attributable to Human Papillomavirus (HPV), Hepatitis B and Hepatitis C, Peel, 2003–2012



Sources: Ontario Cancer Incidence Database, 2003–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).

Did You Know

HPV is one of the most common sexually transmitted infection (STIs) in Canada with more than 70% of sexually active men and women in Canada being infected at some point in time. Without vaccination, most sexually active adults will acquire an HPV infection.[319] With the introduction of the HPV vaccine and Ontario's school-based funded HPV immunization program, a reduction in the number of new HPV infections is likely to occur in the foreseeable future. A decreasing trend has been observed in regions where longer-standing HPV immunization programs have been offered.[322-324] HPV immunization is not mandatory in Ontario.

Table 9.10

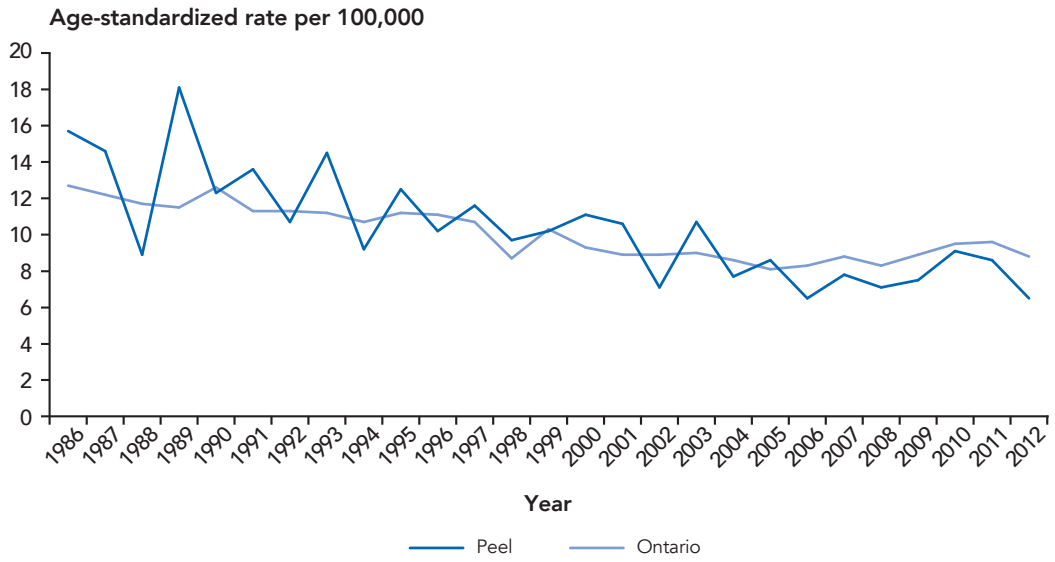
Estimated Disease Burden Due to Human Papillomavirus-Related Cancers, Peel, 2003–2012

Cancer Types	Number of New Cancer Cases	Estimated Per cent of Cancer Cases Attributable to HPV (Range)	Estimated Number of Attributable Cancers (Range)
Cervix	460	100†	460
Vulva	99	48 (43–53)†	48 (43–52)
Vagina	9	78 (70–86)†	7 (6–8)
Anus	177	92 (83–100)†	163 (147–177)
Penis	13	53 (48–58)†	7 (6–8)
Oropharynx	382	53 (48–58)†	202 (183–222)
Oral	464	4 (4–5)†	19 (19–23)
Larynx	253	5 (4–5)†	13 (10–13)
All cancer types associated with HPV	**1,857**	**45 (42–48)†**	**919 (874–962)**

Note: For details on how estimates were calculated, please see Chapter 14 – Data Methods.
Sources: Ontario Cancer Incidence with PHU 2003–2012, Cancer Care Ontario. SEER*Stat Package Release 10 – OCR (August 2015).
† Cancer Care Ontario. Burden of Cancer Caused by Infections in Ontario. Toronto: Queens' Printer for Ontario; 2018

Figure 9.17

Incidence of Cervical Cancer, Peel and Ontario, 1986–2012



Note: Rates are age-standardized to the 2011 Canadian population.
Sources: Ontario Cancer Incidence Database, 1986–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
Population Estimates, 1986–2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

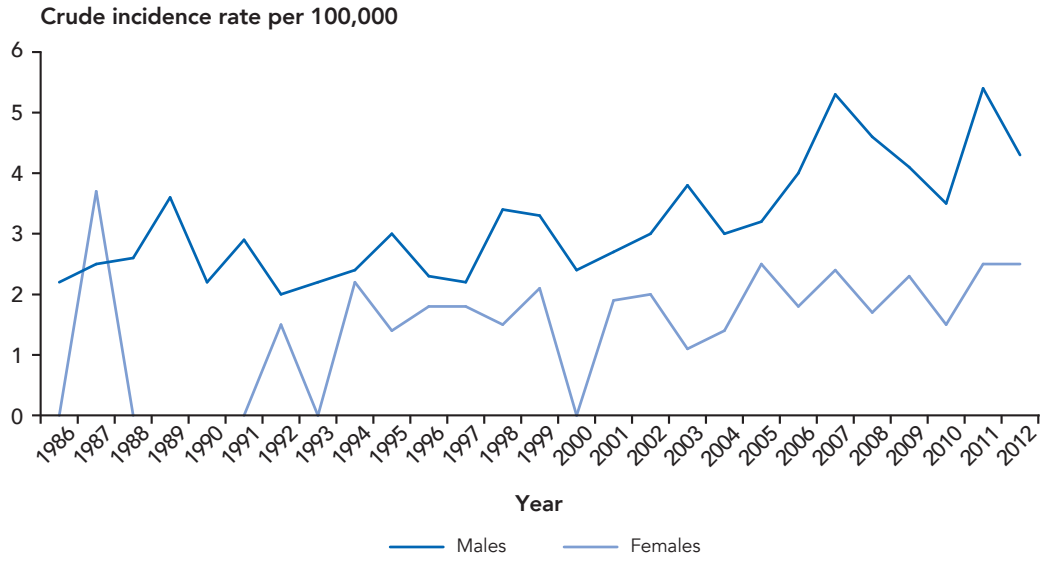
Did You Know

Based on the first cohort in Ontario who were eligible to receive the HPV vaccine, the earliest year to observe a decline in HPV-associated cancers is estimated as 2035 (i.e., when females will be 40 years old).

There has been a steady increase in oropharyngeal cancer in Ontario since 2002.[325] In Peel, oropharyngeal cancer incidence is higher in males than females (Figure 9.18).This has also been observed in Canada overall, the United States and in Europe, and may be due to more persistent HPV infection among males.[325]

Figure 9.18

Incidence of Oropharyngeal Cancer by Sex, Peel, 1986–2012



Source: Ontario Cancer Incidence Database, 1986–2012, Cancer Care Ontario. SEER*Stat Package Release 10 – OCR (August 2015).
Population Estimates, 1986–2012, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The Link between Hepatitis C and Cancer

Chronic hepatitis C infection is a known cause of liver cancer (hepatocellular carcinoma) and non-Hodgkin lymphoma.[319] Those infected with chronic hepatitis C are 24 times more likely to develop liver cancer than those not infected.[326]

Between 2003 and 2012, an estimated 150 new cases of liver cancer and 39 cases of non-Hodgkin lymphoma were attributed to hepatitis C infection in Peel (Table 9.11). This accounts for roughly 24% of all liver cancer cases and 2% of all non-Hodgkin lymphoma cases during this time period.

Similar to Ontario, the incidence of liver cancer has been increasing in Peel, especially in males.[Y1]

Table 9.11

Estimated Disease Burden Due to Hepatitis C-related Cancers, Peel, 2003–2012

Cancer Types	Number of New Cancer Cases	Estimated Per cent of Cancer Cases Attributable to Hepatitis C (Range)	Estimated Number of Attributable Cancers (Range)
Liver	623	24 (10–37)†	150 (62–231)
Non-Hodgkin lymphoma	1,949	2 (0.4–2)†	39 (8–39)
Total	**2,572**	**NA**	**189 (70-269)**

Note: For details on how estimates were calculated, please see data and methods section at end of report.
NA – Not applicable
Sources: Ontario Cancer Incidence with PHU 2003–2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
† Cancer Care Ontario. Burden of Cancer Caused by Infections in Ontario. Toronto: Queens' Printer for Ontario; 2018.

The Link between Hepatitis B Virus and Cancer

There is sufficient evidence that chronic hepatitis B infection causes liver cancer (i.e., hepatocellular carcinoma).[325] Those with chronic forms of the infection are 20 times more at risk of developing liver cancer than those who are not infected.[326] While co-infection with hepatitis B and C is possible, they are independent risk factors for liver cancer.[326]

Chronic infection with hepatitis B accounts for an estimated 14% of all liver cancer cases in Peel, equivalent to 87 cases (Table 9.12).

Table 9.12

Estimated Disease Burden Due to Hepatitis B-related Cancers, Peel, 2003–2012

Cancer Types	Number of New Cancer Cases	Estimated Per cent of Cancer Cases Attributable to Hepatitis B (Range)	Estimated Number of Attributable Cancers (Range)
Liver	623	14 (7–22)†	87 (44–137)

Note: For details on how estimates were calculated, please see Chapter 14 – Data Methods.
Sources: Ontario Cancer Incidence with PHU, 2003-2012, Cancer Care Ontario. SEER*Stat Package Release 10 - OCR (August 2015).
† Cancer Care Ontario. Burden of Cancer Caused by Infections in Ontario. Toronto: Queens' Printer for Ontario; 2018.

ZOONOTIC AND VECTOR-BORNE DISEASES

The complex ecology of zoonotic and vector-borne diseases (VBDs) poses both challenges and opportunities for surveillance and control. The emergence and transmission of these diseases is driven by a number of factors including importation of vectors and pathogens through international travel and trade, industrial and residential encroachment into animal habitats, and human behaviour. Rising temperatures and increasing rainfall associated with climate change can also make previously inhospitable regions more suitable habitats for disease vectors. Elimination and control of vectors, as well as public education on strategies to reduce potential exposures, are essential to controlling the spread of vector-borne and zoonotic diseases.

Definition

Zoonotic diseases (also known as zoonoses) are infections that occur in animals that can be transmitted to humans (e.g., rabies).

Vector-borne diseases are transmitted to people through the bite of an infected insect such as a mosquito (e.g., West Nile virus) or a tick (e.g., Lyme disease).

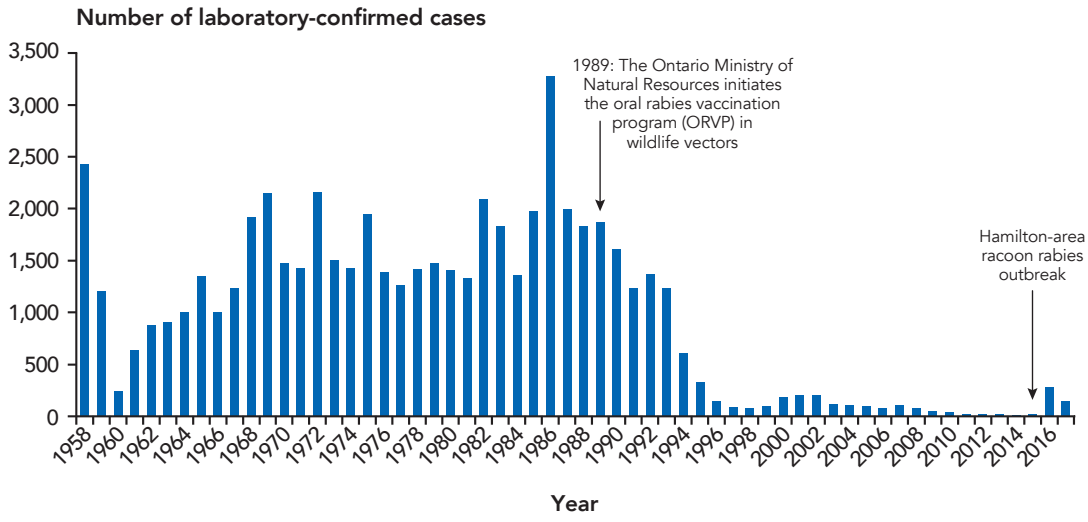
Rabies

Rabies is a viral infection that is usually spread from animal to animal but it can also be spread from an infected animal to a human through a bite or contact through broken skin or mucous membrane with an infected animal's saliva. While rare, untreated human infections are almost always fatal. Ontario's last domestic case of human rabies was reported in 1967. A more recent case associated with out-of-country travel was reported in 2012. Post-exposure prophylaxis (i.e., rabies vaccine and rabies immune globulin) given before the onset of symptoms is highly effective in preventing disease.

Wildlife vaccination programs (e.g., vaccine baiting) and compulsory vaccination of pets against rabies have led to dramatic reductions in rabies cases over time among terrestrial mammal populations.[327-329] In 2014 and 2015, there were fewer than 30 detected animal rabies cases in Ontario. This is significantly lower than the average of 1,500 animal cases per year, which was reported between 1958 and 1988 before provincial prevention and control programs were implemented (Figure 9.19). Ontario's first animal rabies outbreak in over a decade was detected in 2016, with most cases occurring in and around the Hamilton area. Between December 2015 and June 2017, 338 animals, mostly raccoons, tested positive for rabies. Though incidence appears to be declining, several years will likely be required to successfully eliminate rabies in the Hamilton area.[330]

Figure 9.19

Laboratory-Confirmed Animal Rabies, Ontario, 1958–2017



Sources: Data for 1958–2000: Nunan et al. Post-exposure treatment and Animal Rabies, Ontario, 1958–2000. Emerging Infectious Diseases, 8(2), 2002.
Data for 2001–2012: Middleton et al. Human Rabies Post-Exposure Prophylaxis and Animal Rabies in Ontario, Canada, 2001–2012. Zoonoses and Public Health, 2015.
Data for 2013–2017: The Public Health Agency of Canada [Internet]. Canada; The Canadian Food Inspection Agency; c2018. Archived - Rabies in Canada; 1998–2017 [cited 2018 July 25]. Available from: http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/rabies/rabies-in-canada/eng/1519159995664/1519159996478

Did You Know

Translocation of animals, both wild and domesticated, can change an area's local rabies risk. In December 2015, the public health department in Hamilton, Ontario was notified that a locally trapped racoon had tested positive for rabies. Genetic analysis of the virus demonstrated that cross-border spread was not the source of the ensuing outbreak.[331] Rather, it is believed that a rabid raccoon was introduced after a long-distance translocation from the State of Vermont either by water (shipping) or by land (transport trucking).[330]

Post-exposure prophylaxis is given to people following exposure to a potentially rabid animal. In Peel, approximately 1,000 animal incidents are investigated each year resulting in approximately 6% (270) of exposed individuals treated (Table 9.13).

Table 9.13

Number of Animal Rabies Incidents Investigated and Clients Placed on Post-exposure Prophylaxis, Peel, 2012 to 2016

Year	Number of Animal Incidents† Investigated	Number of Clients Placed on Post-exposure Prophylaxis (%)
2012	920	62 (6.7%)
2013	1,027	56 (5.5%)
2014	977	71 (7.3%)
2015	1,009	45 (4.5%)
2016	1,057	38 (3.6%)
Total	**4,990**	**272 (5.5%)**

† Includes contact with an animal; such as a bite, scratch, and/or handling of the animal
Sources: Peel Health Integrated Business Information System, 2012–2016, Region of Peel - Public Health. Integrated Public Health Information System (iPHIS), 2012–2016, Region of Peel – Public Health.

West Nile Virus

West Nile virus (WNV) is a mosquito-borne viral disease that primarily circulates between birds and bird-biting mosquitoes. Human infection is most often the result of bites from infected mosquitoes. Most human WNV cases are asymptomatic. However, in rare circumstances (less than 1%) those infected with WNV will develop severe or fatal neurological disease (e.g., meningitis, encephalitis). Persons over 50 years of age and those who are immunocompromised have the highest risk of severe disease.[332,333]

WNV became reportable in Ontario in 2003. Since then, activity of the virus in the province has varied from year to year as it is closely related to temperature and precipitation. Higher temperatures accelerate the mosquito life cycle and increases the rate at which the virus multiplies. Warmer winter temperatures also increase the number of mosquitoes who survive from year to year.[334] In addition, increased precipitation results in more standing water which creates more breeding locations for mosquitoes.

Peel Facts

Rates of human WNV are low in Peel. Between 2012 and 2016, there were 31 confirmed cases of which 63% were locally acquired.[BB]

Lyme Disease

Lyme disease is caused by the bacterium *Borrelia burgdorferi*, which is transmitted to humans by the bite of an infected blacklegged tick (*Ixodes scapularis*). In 2009, Lyme disease became notifiable in Canada, with provincial and territorial departments reporting physician-diagnosed cases to the Public Health Agency of Canada. The number of Lyme disease cases in Canada has increased more than six-fold, from 144 in 2009 to 917 in 2015, of which 323 were in Ontario.[335]

Ticks require wooded and brushy areas to establish themselves. In the early 1990s, Long Point Provincial Park was the only known risk area for Lyme disease in Ontario.[336] Since then, Ontario has seen an increase in the expansion of blacklegged tick populations, particularly in eastern Ontario, including part of Mississauga (Map 9.1).[335,337-339]

? *Did You Know*

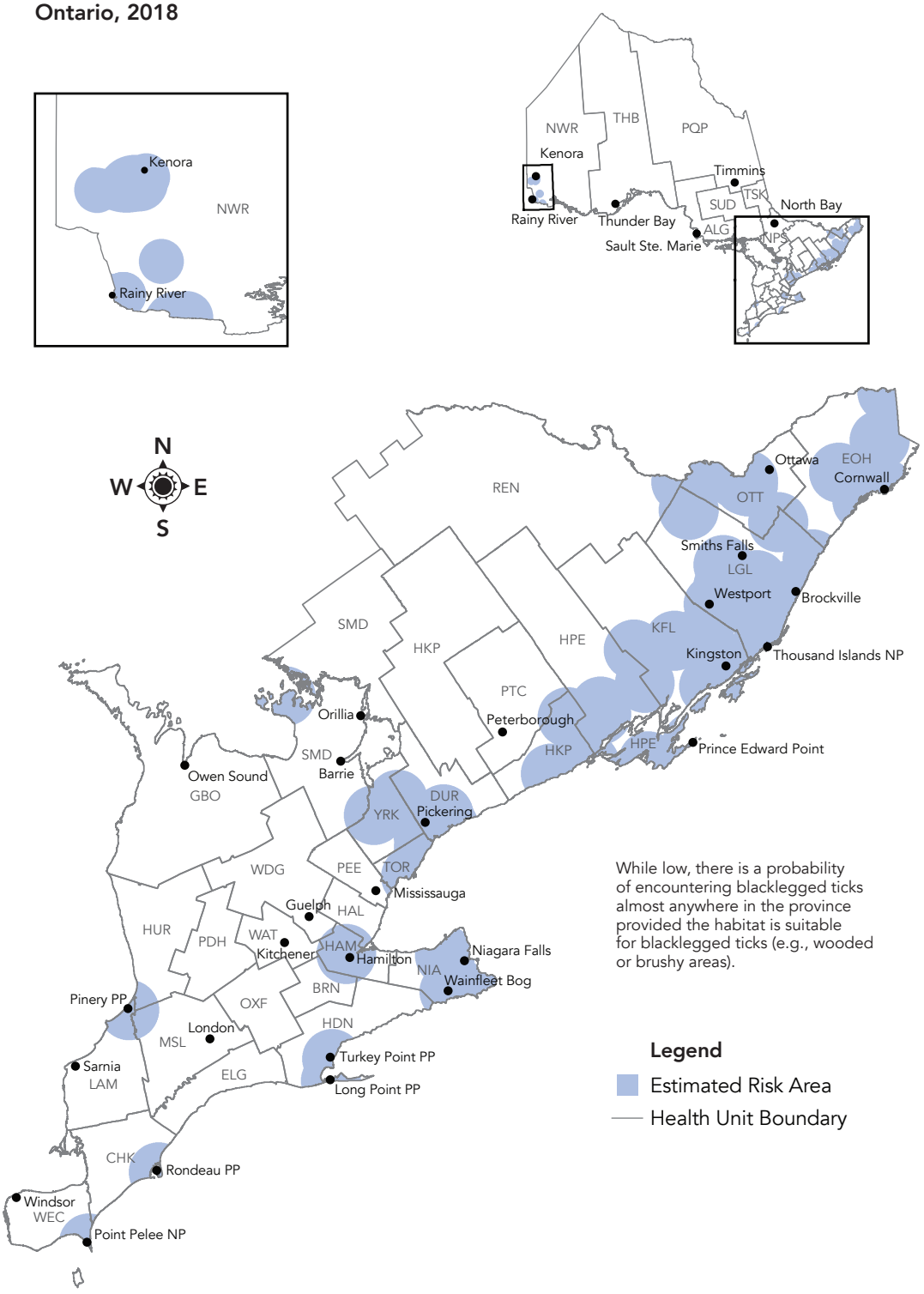
Estimate Risk Areas are locations where blacklegged ticks have been identified or are known to occur, and where humans have the potential to come into contact with infected ticks.

Where blacklegged ticks reside, Lyme disease soon follows. It is estimated that *Borrelia burgdorferi* will enter the tick population in three to five years once blacklegged ticks are established in a given area.[338] Ticks can also be carried by migratory birds, creating the potential for new populations of ticks to be spread across the province.

Rates of Lyme disease are lower in Peel than in Ontario. Over the past 10 years, between 2007 and 2016, there were 42 Lyme disease cases reported in Peel. Among these cases, 62% reported travel outside of Ontario, most often to countries in Europe where Lyme disease is present. During this time period, one confirmed Lyme disease case was locally acquired in Peel.[BB]

Map 9.1

Estimated Risk Areas of Lyme Disease, Ontario, 2018



Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario Lyme disease map 2018: estimated risk areas. Toronto, ON: Queen's Printer for Ontario; 2018

Other Vector-borne Diseases

Climate change may also affect the geographic range of other vector-borne diseases. For example, the Asian tiger mosquito (*Aedes albopictus*), a vector for dengue, Zika, yellow fever and chikungunya viruses, is currently found in parts of northeastern United States.[340] Changes in temperature, precipitation and humidity could lead to the northward expansion of this species into Canada.

The importation of vector-borne diseases in Canada from global trade and travel is also of concern. Studies have suggested that temperature increases in Southern Canada may become increasingly suitable for mosquitoes capable of transmitting Rift Valley Fever and malaria.[342,343] In 2016 and 2017 *Aedes albopictus* and *Aedes aegypti* mosquitoes (both are species that can transmit Zika virus) were discovered through mosquito trapping in Windsor, Ontario. This could indicate that these mosquitoes are moving northward as temperatures rise. None of these mosquitoes have tested positive for Zika virus. The risk of transmission of Zika in Peel remains low.

Did You Know

Malaria is a disease that was once endemic to Canada. During the 18th and 19th centuries, several malaria epidemics occurred in Ontario, Quebec and the prairies, including a severe outbreak that halted the construction of Ottawa's Rideau Canal in 1830.[341,343-345] Several species of Anopheles mosquitoes were, and still are, carriers of the disease. It is believed that malaria was introduced each spring by waves of infected immigrants arriving from Europe where the disease was rampant.[346]

During the construction of the Rideau Canal, a temperate form of malaria (*P. vivax*) was present. This variety of malaria had the ability to hibernate in the liver of those infected allowing the parasite to survive the harsh Canadian winter.[347] Groupings of people, such as in the canal construction camps, helped spread the disease, allowing mosquitoes to easily transmit malaria from one worker to another.

Malaria was eradicated in North America in the 1950s.[348] Control of the disease is attributed to a number of efforts including: draining of swamps in highly populated areas, the use of glass (and later screens) in windows to prevent the entry of mosquitoes at night, and more readily available and affordable drug treatment.[344,349] Malaria now occurs in Canada only when imported from other parts of the world, particularly from central Africa and Southeast Asia, where the disease continues to be endemic.

Chapter 10

Environment and Health

Key Messages

- The health risk from environmental exposures in Peel is currently low due to good infrastructure and regulatory frameworks.
- While air quality is improving in Peel, transportation-related air pollution remains a significant source of exposure for Peel residents, especially for those living near major roads and travelling in cars.
- Peel's temperature and precipitation patterns are changing. These changes pose a potential risk for other health impacts. Measures to mitigate and adapt to our changing climate are required.

A healthy environment is an important part of a healthy community. Access to fresh air and clean water, as well as soil and food that are free of contamination are important to overall health.

This chapter provides an overview of environmental sources that may impact the health of Peel residents. Trends and health effects related to air quality, weather, land use, spills, drinking and recreational water, and food safety are discussed.

AIR QUALITY

Air quality is a significant issue that can impact health. Air pollutants that can directly affect health are typically divided into "common" and "hazardous" air pollutants.

Health Effects from Air Pollution

Air pollution affects everyone. Those at higher risk include people with heart disease, asthma, chronic obstructive pulmonary disease and other respiratory illnesses, obesity, diabetes, young children, the elderly, pregnant women, those who work or exercise vigorously outdoors, and who live or work in close proximity to a significant pollution source.[350-352]

Potential acute and chronic health effects associated with air pollutants are summarized in Table 10.1.

Definition

Common air pollutants, also known as criteria air contaminants, are gases or particles largely related to the burning of fossil fuels. The six common air pollutants include fine particulate matter ($PM_{2.5}$), ground-level ozone (O_3), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), and total reduced sulphur (TRS) compounds. These pollutants cause smog and acid rain and are associated with health effects in both general and vulnerable populations. Ozone is not emitted directly, but formed by chemical reactions in the environment. Fine particulate matter can be emitted directly or formed in the environment. Some common air pollutants are also greenhouse gases (GHGs) – pollutants that trap the radiant energy of the sun and cause climate change.

Hazardous air pollutants, or air toxins, include a variety of chemicals in the air that are known or suspected of causing cancer and other serious diseases. Examples include many volatile organic compounds (VOCs) such as benzene, acrolein, acrylonitrile, ammonia, and toluene.

Table 10.1

Summary of Potential Acute and Chronic Health Effects from Outdoor Air Pollution

Pollutant	Health Effects	
	Acute	Chronic
Ground-level ozone (O_3)	• Reduction in lung function in healthy people during exercise • Coughing, breathing difficulties, reduced lung function • Inflammation	• All-cause mortality • Asthma • Lung tissue damage
Fine particulate matter ($PM_{2.5}$)	• Irritation of the eyes, nose and throat • Coughing, breathing difficulties, reduced lung function • Inflammation • Decreased lung function	• Cancer • Ischaemic heart disease • Mortality (all-cause, cardiovascular, respiratory) • Low birth weight
Sulfur dioxide (SO_2)	• Irritation of the eyes, nose, throat, and airways to cause coughing, wheezing, shortness of breath • Respiratory problems in people with asthma, but at relatively high levels of exposure	• Marginally associated with all-cause and cardiopulmonary mortality
Nitrogen oxides (NOx)	• Irritation of the respiratory system/triggers asthma • Impaired lung function	• Chronic effects on the cardiovascular system
Carbon monoxide (CO)	• Low-level, short term exposure: - Decreased athletic performance - Aggravated cardiac symptoms • Acute exposures in the range of 70-800 ppm can cause headache, dizziness, disorientation • Reduced ability to transport oxygen • Premature death (above 800 ppm)	• Not Applicable
Volatile organic compounds (VOC)	• Depends on the VOC	• Some VOCs can cause cancer over long-term exposures (e.g. formaldehyde and benzene)

Sources: Ontario Ministry of Environment. Air Quality in Ontario 2002 Report. Ontario: Ontario Ministry of Environment Environmental Monitoring and Reporting Branch; 2003.
U.S. Environmental Protection Agency. America's Children and the Environment. 3rd ed. Washington D.C.: Environmental Protection Agency; January 2013.

Sources of Air Pollution in Peel

Transportation

Transportation is an important source of air pollution. People living near major roads and travelling in cars are exposed to higher levels of air pollution. Exposure to air pollutants from traffic emissions generally occurs within 300 to 500 metres from a highway or major road. The highest exposure occurs closest to the road and it decreases with increasing distance from the road.[353]

Did You Know

Traffic-related emissions in the Greater Toronto-Hamilton area are estimated to be responsible for up to 1,000 premature deaths and 4,000 hospitalizations each year.[354]

Peel Facts

Every day, approximately 68,000 vehicles transport goods over Peel's roads and almost 45% of jobs in the region rely on goods movement activities.[355]

Fifty-three per cent of Peel's population lives within 300 metres of a high-volume traffic road or highway (>25,000 vehicles per day).[355] Table 10.2 highlights the number of sites in Peel where vulnerable populations are exposed to air pollution from high-traffic roads based on 2011 Census data.

Did You Know

A recently completed Air Quality and Human Health Risk Assessment for Toronto Pearson International Airport found that the traffic on major highways around the airport contributes more to poor air quality than the airport itself.[356]

Table 10.2

Population and Sites Located within 300 Metres of High Traffic Volume on Roads, Peel, 2012

Population or Site	Total Number	Number Within 300 Metres of High Traffic Volume Roads	Per Cent Within 300 Metres of High Traffic Volume Roads
Population, all ages	1,296,815	690,960	53.3
All recreational centres	1,541	439	28.5
Outdoor sports fields	1,439	403	28.0
Licensed daycares	544	175	32.2
Parks and playgrounds	643	163	25.3
Schools	391	103	26.3
Long-term care facilities	26	18	69.2

Sources: Block Population data from Esri Business Analyst v10.0.
Census, 2011, Statistics Canada.
Average Annual Daily Traffic data 2012. Cities of Brampton and Mississauga Transportation Departments, and Region of Peel Public Works.
GIS data shapefiles, 2013. Corporate Services Integrated Planning.

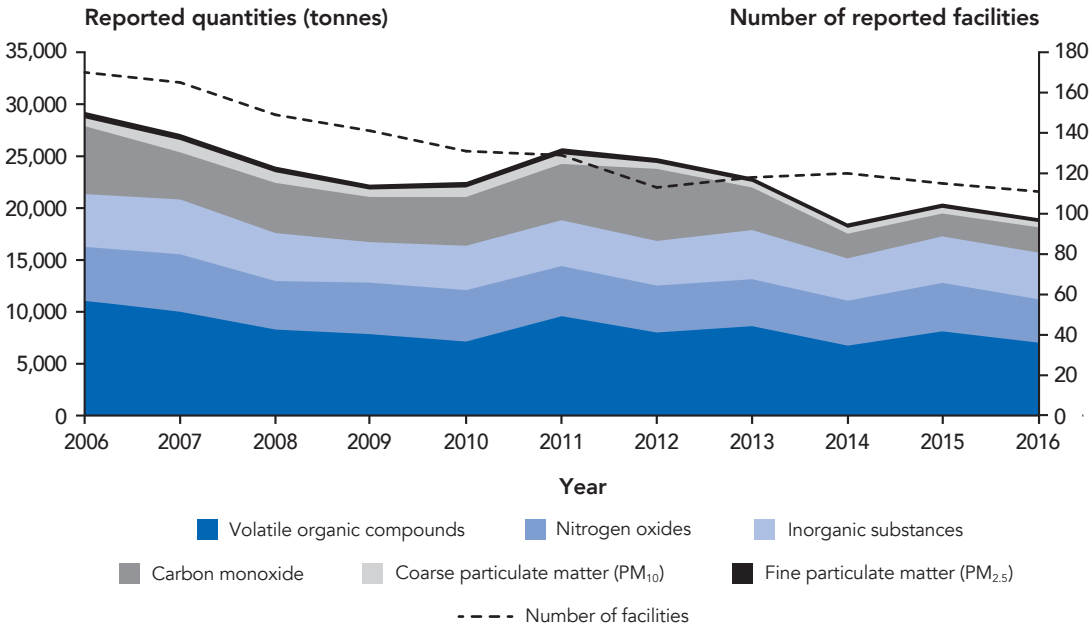
Industry

Industrial emissions, also known as stationary or point-source emissions, are another major source of air pollution and are responsible for the majority of sulphur dioxide emitted in Peel.

In Peel, 111 industries reported releases to air to the National Pollutant Release Inventory (NPRI) in 2016. A total of 19,075 tonnes of pollutants were released into the air in 2016, covering 12 different groups of substances. Between 2006 and 2016, the number of reporting facilities and the reported releases to air in Peel decreased (Figure 10.1). In 2016, volatile organic compounds (VOCs) were released most frequently into the air in Peel (7,050 tonnes), followed by inorganic substances (4,442 tonnes). In 2016, the "cement, lime and other non-metallic minerals" industry had the highest reported quantity of releases to air, followed by "other manufacturing" (Figure 10.2).

Figure 10.1

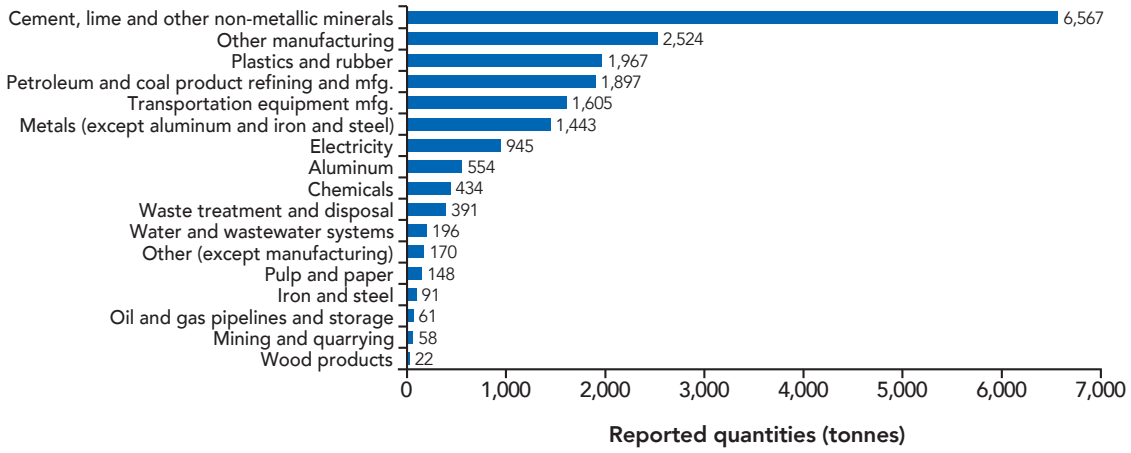
Total Quantities of Air Pollutant Releases by Substance Group and Number of Facilities Reporting Releases to the National Pollutant Release Inventory, Peel, 2006–2016



Notes: Caution should be taken when comparing quantities across years as there have been changes in reporting requirements and reporting facilities from year to year.
Quantities reported in gTEQ(ET) were removed from the analysis.
Sources: National Pollutant Release Inventory (NPRI) - Pollutant Release and Transfer Data Reported by Facilities, 2006-2016, Environment and Climate Change Canada, Government of Canada.
Toxic Substances Portal, 2008, Agency for Toxic Substances and Disease Registry. U.S. Department of Health & Human Services.

Figure 10.2

Sources of Industrial Air Pollutants Reported to the National Pollutant Release Inventory, Peel, 2016



Notes: "Other manufacturing" includes: fabricated metal product, miscellaneous, food, clothing, printing and related support activities, machinery, paper, textile product mills, beverage and tobacco product, textile mills, leather and allied product, computer and electronic product, electrical equipment, appliance, and component, furniture and related product. "Other (except manufacturing)" includes: agriculture, forestry, fishing and hunting, utilities, construction, wholesale trade, mining, quarrying and oil and gas extraction, retail trade, transportation and warehousing, wholesale trade, professional, scientific and technical services, educational services, administrative and support, waste management and remediation services, arts, entertainment and recreation, healthcare and social assistance, real estate and rental and leasing, information and cultural industries, finance and insurance, accommodation and food services, other services (except public administration), management of companies and enterprises, accommodation and food services, public administration.
Quantities reported in gTEQ(ET) were removed from the analysis.
Source: National Pollutant Release Inventory (NPRI) - Pollutant Release and Transfer Data Reported by Facilities, 2016, Environment and Climate Change Canada, Government of Canada.

How is Air Quality Measured in Peel?

Peel is home to two Ministry of Environment, Conservation and Parks/ National Air Pollution Surveillance air monitoring stations, located in Mississauga and Brampton which monitor six air pollutants.[357] Air quality in Caledon is estimated based on monitoring data from the Brampton and Newmarket stations.

Did You Know

Ontario Ambient Air Quality Criteria (AAQC)

To assess and manage regional air quality, the Ministry of Environment, Conservation and Parks (MOECP) established Ambient Air Quality Criteria. AAQCs refer to a desirable concentration of air pollutants not to be exceeded over defined averaging times – generally over one-hour, eight-hours, 24-hours and/or annually, based on human health and environmental effects. The averaging times are designed to protect against both acute and chronic health effects.[357,358]

Air Quality in Peel and Ontario

Air quality in Ontario and Peel is improving due to decreased emissions of nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and particulate matter ($PM_{2.5}$) from closing coal-fired generating stations, improved fuel and vehicle emissions standards, and tighter industrial emissions standards.[357]

There were no exceedances of AAQCs recorded in Peel stations for 2016, the most recent year for which data are available. The station in Newmarket (representative of Caledon) recorded seven hours above the one-hour ozone AAQC in 2016.[357]

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is a reddish-brown gas with a strong odour. NO_2 plays a large role in the reactions involved in the generation of ozone and secondary particulate matter, the major components of smog.[359]

All combustion in air produces nitrogen oxides (NO_X), of which NO_2 is a component. In Ontario, the major sources of NO_X emissions come from the transportation sector, industrial processes and utilities. Large urbanized centres in Ontario recorded the highest NO_2 levels.[357]

Between 2007 and 2016, the NO_2 annual mean concentrations for Ontario decreased by 30% (Figure 10.3). Annual NO_2 mean concentrations decreased in Brampton, Mississauga and Newmarket by 32%, 33% and 21% respectively. However, Peel's annual NO_2 means are above the provincial average, likely due to emissions from transportation.[357]

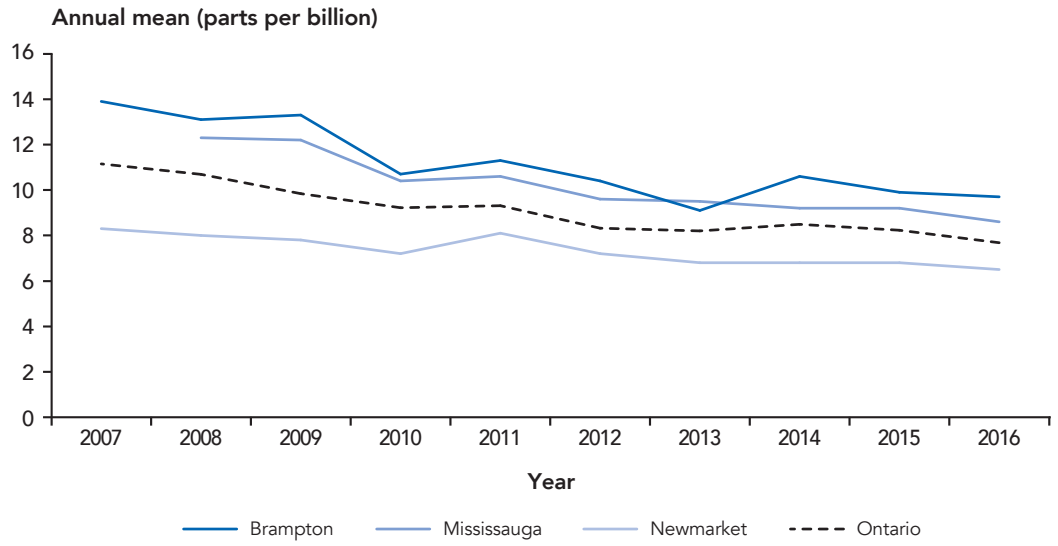
It is estimated that 0.9% (95% CI: 0.3%-1.5%) of non-accidental mortality in Peel can be attributed to acute exposure to NO_2 emissions. This represents 45 deaths per year.[360]

Measurement

Health Canada has estimated the number of deaths attributable to ambient levels of fine particulate matter ($PM_{2.5}$), ozone (O_3) and nitrogen dioxide (NO_2) using the Air Quality Benefits Assessment Tool (AQBAT). The AQBAT model produces estimates of the number of premature deaths and other health outcomes attributable to air pollutants, using concentration response functions (CRFs) and estimates of background concentrations of pollutants.[361]

Figure 10.3

Mean Annual Level of Nitrogen Dioxide, Brampton, Mississauga, Newmarket and Ontario, 2007–2016



Notes: Data not available for Mississauga station in 2017.
Ontario trend is a composite mean based on data from 31 monitoring sites.
Source: Ministry of Environment and Climate Change. Air Quality in Ontario 2016 Report. 2018.

Ground-level Ozone

Ground-level ozone (ozone) is a colourless, odourless gas that is harmful to human health. It is a major component of smog. Ozone is not emitted directly – it is formed in the atmosphere by chemical reactions between NOx, volatile organic carbons (VOCs) and sunlight. It is also transported from distant sources. Ozone levels typically increase during the day, decrease at night and are higher in the summer due to the longer days of sunlight.[357]

The largest source of precursors of ozone, NOx and VOCs are emissions from transportation and general solvent uses.[357] Between 2007 and 2016, monitoring data for ozone annual means in Ontario show the trend to be slowly increasing. Ozone annual means have increased by 1% in Brampton and 8% in Mississauga, but have remained below Ontario levels (Figure 10.4). In Newmarket, levels have decreased by 8% over the past 10 years.

Between 2007 and 2016, ozone summer means have decreased by 3% and ozone winter means have increased by 4% in Ontario (data not shown).

The one-hour Ambient Air Quality Criteria (AAQC) for ozone is 80 ppb. In 2016, there were no exceedances of this level for Brampton and Mississauga. The Newmarket station (representative for Caledon) exceeded the one-hour AAQC for ozone on seven occasions during summer months. While winter ozone levels have increased in Ontario, there were no exceedances of the one-hour AAQCs in the winter.[357]

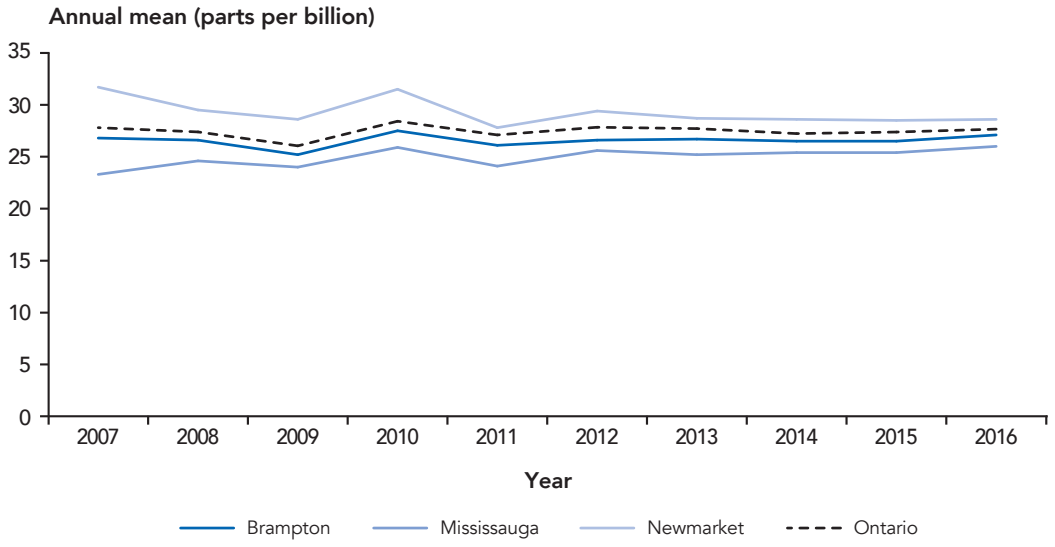
Acute exposure to ozone in Peel between 2007 and 2009 was associated with 1.3% (95% CI: 0.9%–1.7%) of non-accidental mortality (60 deaths per year). Chronic exposure to ozone in Peel was linked to 8.1% of respiratory-related mortality (95% CI: 2.8%–13.1%) which is equivalent to 31 respiratory deaths per year.[360]

Fine Particulate Matter

Particulate matter is classified by size and includes aerosols, smoke, fumes, dust, fly ash and pollen. Fine particulate matter ($PM_{2.5}$) may be emitted directly into the atmosphere as a by-product of fuel combustion or it may be formed indirectly in the atmosphere through a series of complex chemical reactions. Fine particulate matter is typically responsible for the majority of air pollution-related health effects and is commonly used as an indicator of "respirable" particles because these particles can deposit in the lower portion of the respiratory tract. Coarse particulate matter (PM_{10}) is commonly referred to as "inhalable" particles, because particles of this size are normally deposited in the upper portion of the respiratory tract.[357]

Figure 10.4

Mean Annual Level of Ozone, Brampton, Mississauga, Newmarket, and Ontario, 2007–2016



Notes: Ontario trend is a composite mean based on data from 39 monitoring sites.
Source: Air Quality in Ontario 2016 Report. Ministry of Environment and Climate Change 2018.

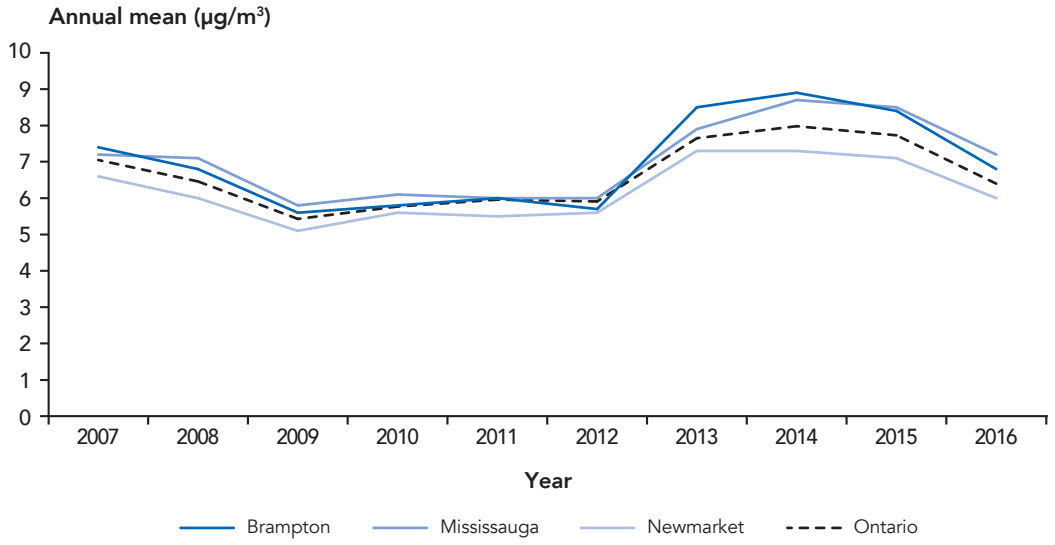
The largest sources of $PM_{2.5}$ emissions in Ontario are from residential heating and cooling (e.g., wood stoves and fireplaces), industry, and transportation.[357]

Ten-year trends for $PM_{2.5}$ are not available from the MOECP due to changes in the measurement method that occurred in 2013. However, the MOECP applied an approximate correction factor to the data to approximate the 10-year trends. Figure 10.5 describes mean annual levels of $PM_{2.5}$. $PM_{2.5}$ emissions from electric utilities and industrial processes decreased by approximately 33% in Ontario.[357] Emissions from the transportation sector decreased by 48% due to the phase-in of new vehicles/ engines with stricter emission standards.[362]

It is estimated that there are between 290 and 900 new cancer cases in Ontario annually from exposure to $PM_{2.5}$ in outdoor air.[363] The estimated number of lung cancer cases attributable to diesel particulate matter exposure is 100 per year (range between 20 and 280). This represents a subset of the estimated annual number of cancer cases attributable to $PM_{2.5}$ exposure (refer to ***Chapter 7 – Chronic Diseases*** for more information about cancer).

Figure 10.5

Mean Annual Level of Fine Particulate Matter ($PM_{2.5}$), Brampton, Mississauga, Newmarket and Ontario, 2007–2016



Notes: Ontario trend is a composite mean based on data from 39 monitoring sites.
A correction factor was applied to PM2.5 concentrations measured by TOEM (2007-2012) to approximate SHARP-like measurements. PM2.5 concentrations measured by SHARP are reflected from 2013 and onward.
Source: Ministry of Environment and Climate Change, Air Quality in Ontario 2016 Report. 2018.

In Peel, there was a 2.7 µg/m^3 decrease in $PM_{2.5}$ between 2000 and 2011, representing a 24% decrease in $PM_{2.5}$ emissions. This decrease was associated with a gain in life expectancy of 0.22 years and a reduction in the number of people experiencing health impacts related to air pollution, such as respiratory and cardiac hospital admissions.[360] Table 10.3 highlights the reduction in selected health impacts as a result of this decrease in $PM_{2.5}$, based on modelled estimates.

Sulphur Dioxide

Sulphur dioxide (SO_2) is a colourless gas that smells like burnt matches. SO_2 reacts to form sulphuric acid which contributes to acid rain and sulphates, and are a major component of secondary $PM_{2.5}$. The most significant sources of SO_2 emissions in Ontario are from smelters and other industrial sources.[357]

SO_2 is measured at a subset of the monitoring stations across Ontario and in Peel data are available from the Mississauga monitor. Monitoring data between 2008 and 2015 indicate that SO_2 levels have decreased by 39% in Mississauga (Figure 10.6).[364]

According to the MOECP, there were no exceedances of the provincial one-hour, 24-hour and annual AAQC for SO_2 in Ontario in 2016. The closure of coal-fired power plants, low-sulphur content in fuel, stricter controls for smelters, the acid rain program, Ontario emissions trading regulations, and other actions have all contributed to SO_2 reductions.[357]

Table 10.3

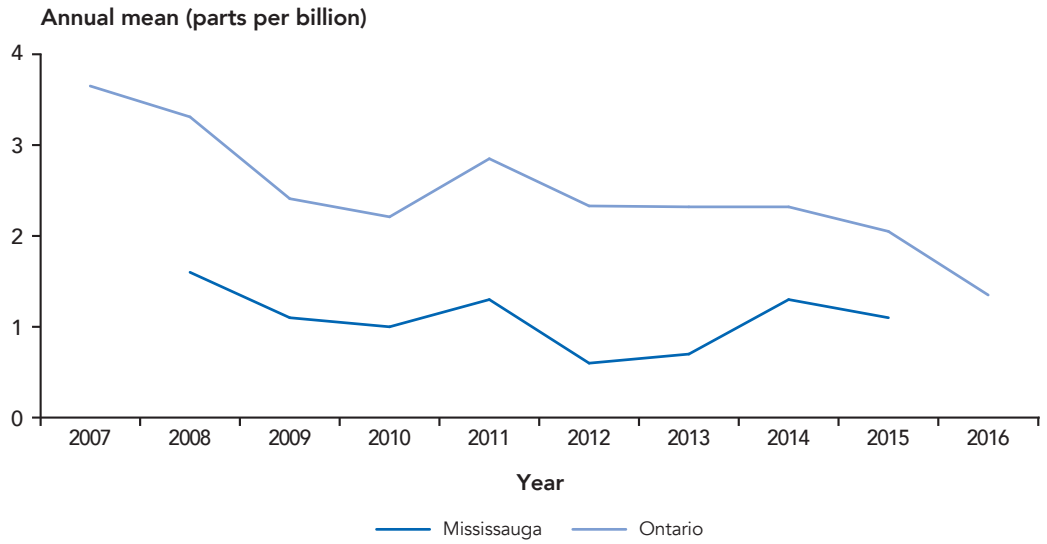
Estimated Changes in Health Impacts Associated with a 24.2% Decrease in $PM_{2.5}$ Concentrations, Peel, 2000–2011

Health Impact	Average Reduction in Number of People Experiencing Health Impacts Attributed to Decrease in $PM_{2.5}$ (95% CI)	Average Per Cent Reduction of Health Impacts Attributed to Decrease in $PM_{2.5}$ (95% CI)
Mortality	120 (63–180)	2.5 (1.3–3.7)
Respiratory emergency department visits	38 (25–52)	0.2 (0.1–0.3)
Cardiac emergency department visits	16 (8–23)	0.2 (0.1–0.3)
Cardiac hospital admissions	12 (6–18)	0.2 (0.1–0.3)
Respiratory hospital admissions	8 (5–10)	0.2 (0.1–0.3)

Source: Stieb, D., Judek, S., Donkelaar, A., Martin, R., Brand, K., Shin, H., Burnett, R., Smith-Doiron, M. 2015, Estimated public health impacts of changes in concentrations of fine particle air pollution in Canada, 2000 to 2011, Can J Public Health, 106(6) e362-e368.

Figure 10.6

Mean Annual Level of Sulphur Dioxide, Mississauga and Ontario, 2007–2016



Notes: Ontario trend is a composite mean based on data from nine monitoring sites.
Mean annual sulphur dioxide data for Mississauga was not available for 2007 and was not measured in 2016.
Sources: Ministry of Environment and Climate Change. Air Quality in Ontario 2016 Report. 2018.
Ministry of Environment and Climate Change. Air Quality in Ontario 2015 Report. 2017.

Carbon Monoxide

Carbon monoxide (CO) is a colourless, odourless and tasteless gas. CO is produced from natural and human-made sources through the incomplete combustion of carbon-containing compounds. Transportation accounted for 71% of CO emissions in Ontario for 2016 (emissions from natural and open sources were excluded).[357]

CO emissions decreased by approximately 32% between 2007 and 2016 in Ontario.[362] Peel data are not available as CO is not monitored at all air quality stations.

CLIMATE AND WEATHER EVENTS

According to the International Panel on Climate Change, the Earth has warmed by 0.75°C between 1951 and 2012.[365] In Ontario, average annual temperatures have increased by approximately 1.5°C between 1948 and 2008.[366]

This warming is due to the increase in greenhouse gas (GHG) emissions including burning of fossil fuels. GHGs include water vapour, carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ground-level ozone, perfluorinated carbons, hydrofluorocarbons and sulphur hexafluoride. GHGs trap the radiant energy of the sun and cause the earth to warm.

Sources of Greenhouse Gases

In Peel, the largest sources of GHG emissions are from energy use and transportation (Table 10.4).

Greenhouse gas emissions in Peel have increased 32% between 1990 and 2006 due to emissions from residential heating and cooling, commercial and institutional fuel combustion, waste incineration, and wastewater handling, resulting from growth in Peel.[367]

Climate Trends in Peel

Peel's climate is changing. We can measure the impact of climate change in Peel by looking at averages and extremes of temperature and precipitation patterns from measurement data taken from Toronto Pearson International Airport.

Table 10.4

Source of Community Greenhouse Gas Emissions, Peel, 2006

Source	Per Cent of Total
Stationary energy	64%
Transportation	28%
Industrial processes	5%
Waste	2%
Agriculture	1%
Total	**100%**

Source: SENES Consultants Limited. Peel Climate Change Strategy: 2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory For The Geographic Region of Peel. Ontario: SENES Consultants Limited.

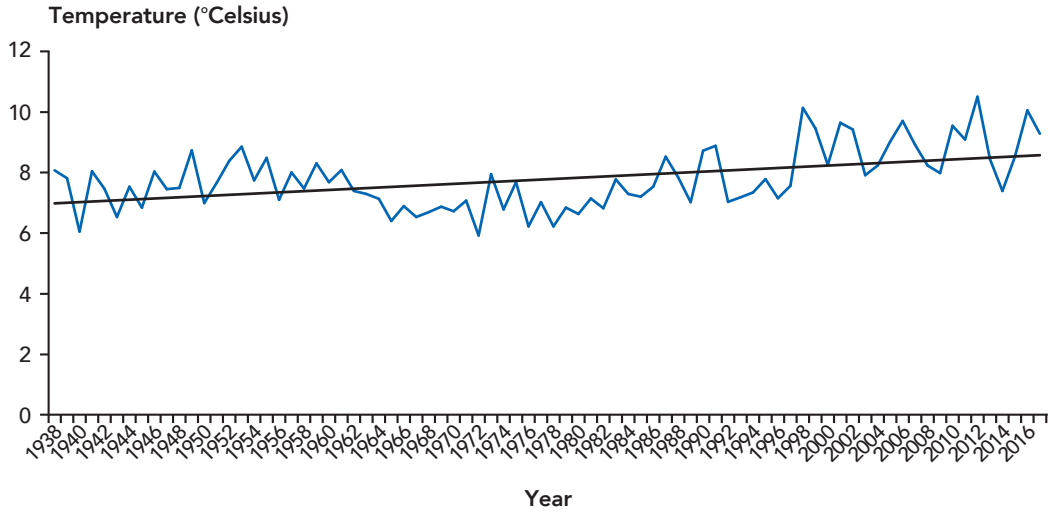
Temperatures

There has been a slow increase in annual mean temperature from 8.1°C in 1938 to 9.3°C in 2017 (Figure 10.7) at Toronto Pearson International Airport.

The mean temperature by season and decade shows a warming trend over time for all seasons. However, the most significant increases have been in the summer and winter. Mean temperature in the summer has increased from 19.8°C in the 1940s to 21.2°C in 2010. The mean temperature in the winter has increased from -5.4°C in the 1940s to -3.3°C in 2010 (Figure 10.8).

Figure 10.7

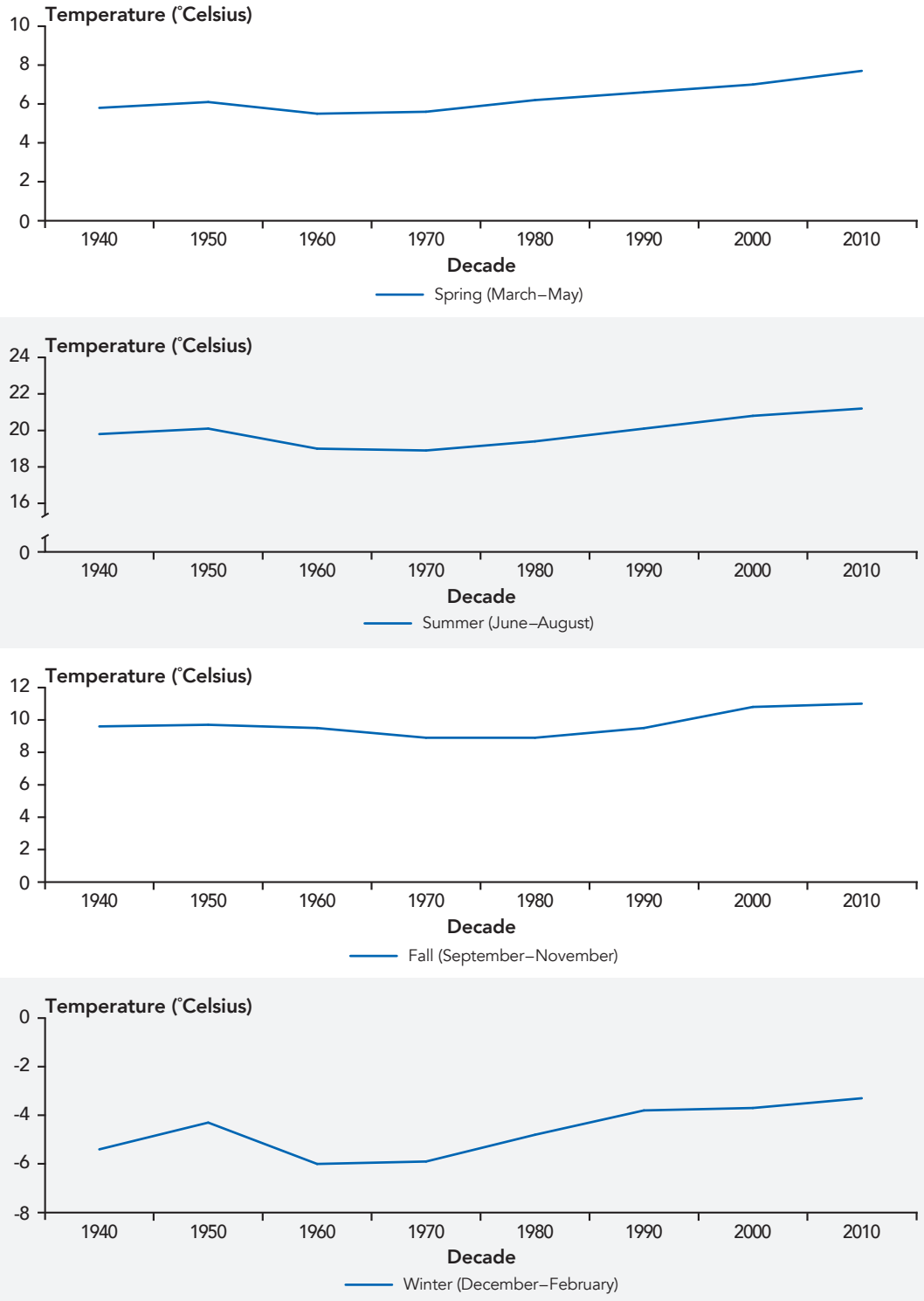
Annual Mean Temperature, Toronto Pearson International Airport, 1938–2017



Note: The black line is a linear trendline fitted to the data.
Source: Historical Climate Data, 1938–2017, Environment and Climate Change Canada. Government of Canada.

Figure 10.8

Mean Seasonal Temperature by Season and Decade, Toronto Pearson International Airport, 1940–2010



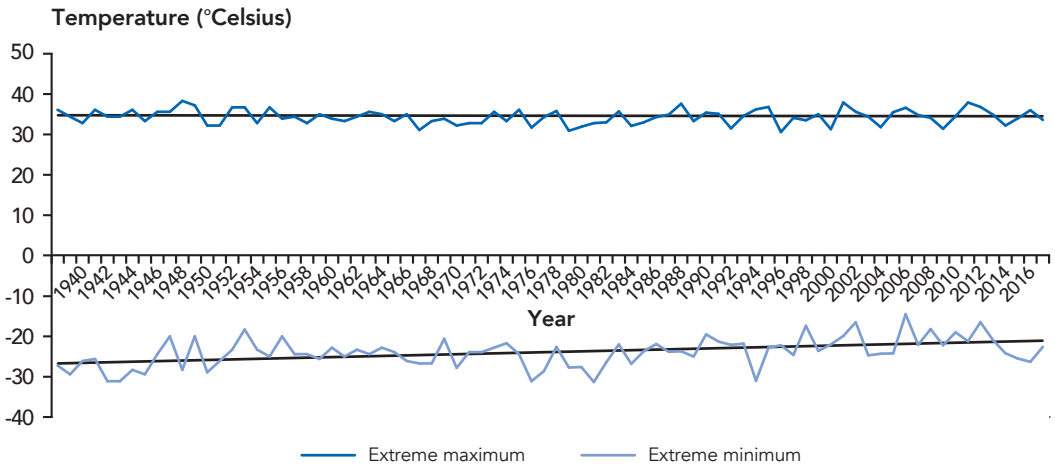
Notes: Data from the 2010 decade is based on 2010–2017.
Source: Historical Climate Data, 1930–2016, Environment and Climate Change Canada. Government of Canada.

Between 1938 and 2017, there have been fluctuations in the annual extreme maximum and minimum temperatures at Pearson Airport (Figure 10.9). Overall, annual extreme maximum temperatures have remained stable, while there is a warming trend in extreme minimum temperatures.

The number of emergency department visits due to extreme weather is low and there is variability year to year (Table 10.5). When comparing age-standardized rates, Peel is similar to Ontario (data not shown).[M]

Figure 10.9

Extreme Maximum and Minimum Temperatures, Toronto Pearson International Airport, 1938–2017



Note: The black lines are a linear trendline fitted to the data.
Source: Historical Climate Data, 1938-2017, Environment and Climate Change Canada. Government of Canada.

Table 10.5

Extreme Weather-related Emergency Department Visits, Peel, 2003–2016

Year	Natural Heat Causes		Natural Cold Causes		Other Extreme Weather-related Causes†		All Extreme Weather-related External Causes	
	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000	Number	Crude Rate per 100,000
2003	22	2.0	50	4.5	13	1.2	85	7.7
2004	16	1.4	54	4.7	8	0.7	78	6.8
2005	49	4.2	47	4.0	20	1.7	116	9.8
2006	45	3.7	25	2.1	21	1.7	91	7.5
2007	26	2.1	50	4.0	14	1.1	90	7.2
2008	12	0.9	31	2.4	9	0.7	52	4.1
2009	18	1.4	50	3.9	18	1.4	86	6.6
2010	57	4.3	25	1.9	13	1.0	95	7.2
2011	71	5.3	35	2.6	18	1.3	124	9.3
2012	69	5.1	23	1.7	15	1.1	107	7.8
2013	56	4.0	45	3.2	9	0.6	110	7.9
2014	37	2.6	101	7.1	11	0.8	149	10.5
2015	45	3.1	124	8.6	17	1.2	186	12.9
2016	78	5.3	59	4.0	10	0.7	147	10.0

† Other excludes natural heat and cold and includes exposure to sunlight, avalanche, landslide and other earth movements, cataclysmic storm, flood, other forces of nature (radiation, radon, other).
Sources: National Ambulatory Care Reporting System, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2003–2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Precipitation

Climate change has the potential to increase the number, intensity and duration of extreme forms of weather including: severe storms accompanied by rain, hail, thunder and lightning; high wind events and tornados; and high precipitation events that lead to flooding.[366]

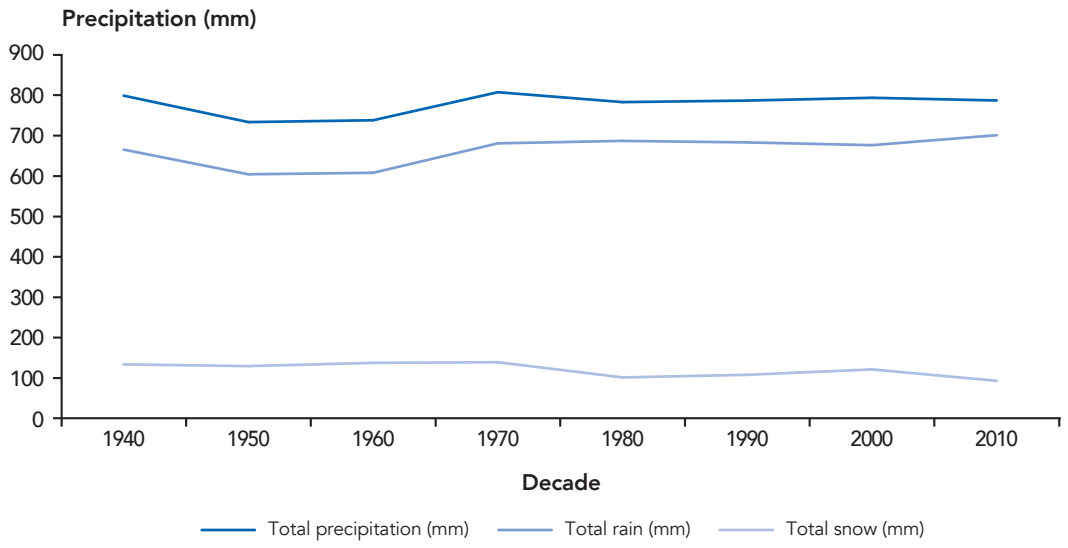
In Peel, total rain has increased slightly between 1940 (665 mm) and 2010 (701 mm) (Figure 10.10). Snowfall has decreased in the same time period. There have also been a number of drought years as well as years with flooding.

Measurement

The measurement of precipitation is expressed in terms of vertical depth of water (or water equivalent in the case of solid forms) which reaches the ground during a stated period. The millimetre (mm) is used to measure liquid precipitation, and the vertical depth of water or water equivalent is expressed to the nearest 0.2 mm. Less than 0.2 mm is called a "trace."[368]

Figure 10.10

Average Annual Precipitation by Decade, Toronto Pearson International Airport, 1940–2017



Note: The 10-year average from the 2010s is based on annual averages between 2010 and 2017 only.
Source: Historical Climate Data, 1940–2017, Environment and Climate Change Canada. Government of Canada.

On October 15, 1954, Hurricane Hazel hit Southern Ontario bringing 110 km winds and 285 millimetres of rain in 48 hours. As a result, 81 deaths were reported across the Greater Toronto Area.[370] More recent events in the Greater Toronto and Hamilton Area have had smaller total rainfall amounts. However, the one-hour maximum intensities of such storm events between 2004 and 2014 have had important effects.[370] They have implications for public health as older infrastructure (e.g., storm water and sanitary sewers, storm water management ponds) were not designed for these intensities. Flooding events have resulted in significant infrastructure damage in Peel region.

Did You Know

Peel's Future Climate and Expected Health Impacts

Peel is experiencing:

- annual and seasonal mean temperature increases;
- total precipitation increases annually and in all seasons, except the summer;
- a shift in the growing season, starting earlier and ending later in the year; and
- milder winters.

Modelling done by the federal and provincial government and the Region of Peel indicates that these climate trends will continue, which will have the potential to affect human health by:

- increasing temperature-related morbidity and mortality;
- exacerbating poor air quality, and worsening respiratory and cardiovascular conditions;
- increasing the risk of injuries and mortality resulting from extreme weather;
- increasing food and water contamination, leading to more illnesses;
- raising incidence rates of vector-borne illnesses as climates become more favourable to their survival;
- having effects on psychological health, including mental health and stress-related illnesses; and
- causing displacement of populations and crowding in emergency shelters.[371,372]

LAND

Tree Canopy

Peel's tree canopy is important to protect, maintain and enhance as it has many health-related benefits. The tree canopy includes natural areas (forest) and other treed areas such as parks, yards, street trees and immature trees (Map 10.1). There are a total of 40,528 hectares of tree canopy in the region of Peel. The Town of Caledon has the highest proportion of tree canopy at 31,480 hectares, followed by the City of Mississauga at 4,534 hectares, and the City of Brampton at 4,513 hectares.[373]

Health-related benefits of the tree canopy include:

- reduced vulnerability to heat-related illness
- improved mental health, reduction of stress, and a lower risk of depression[375]

Other benefits include:

- improved air quality by the tree canopy capturing and storing carbon dioxide
- the tree canopy controlling flooding naturally[374]

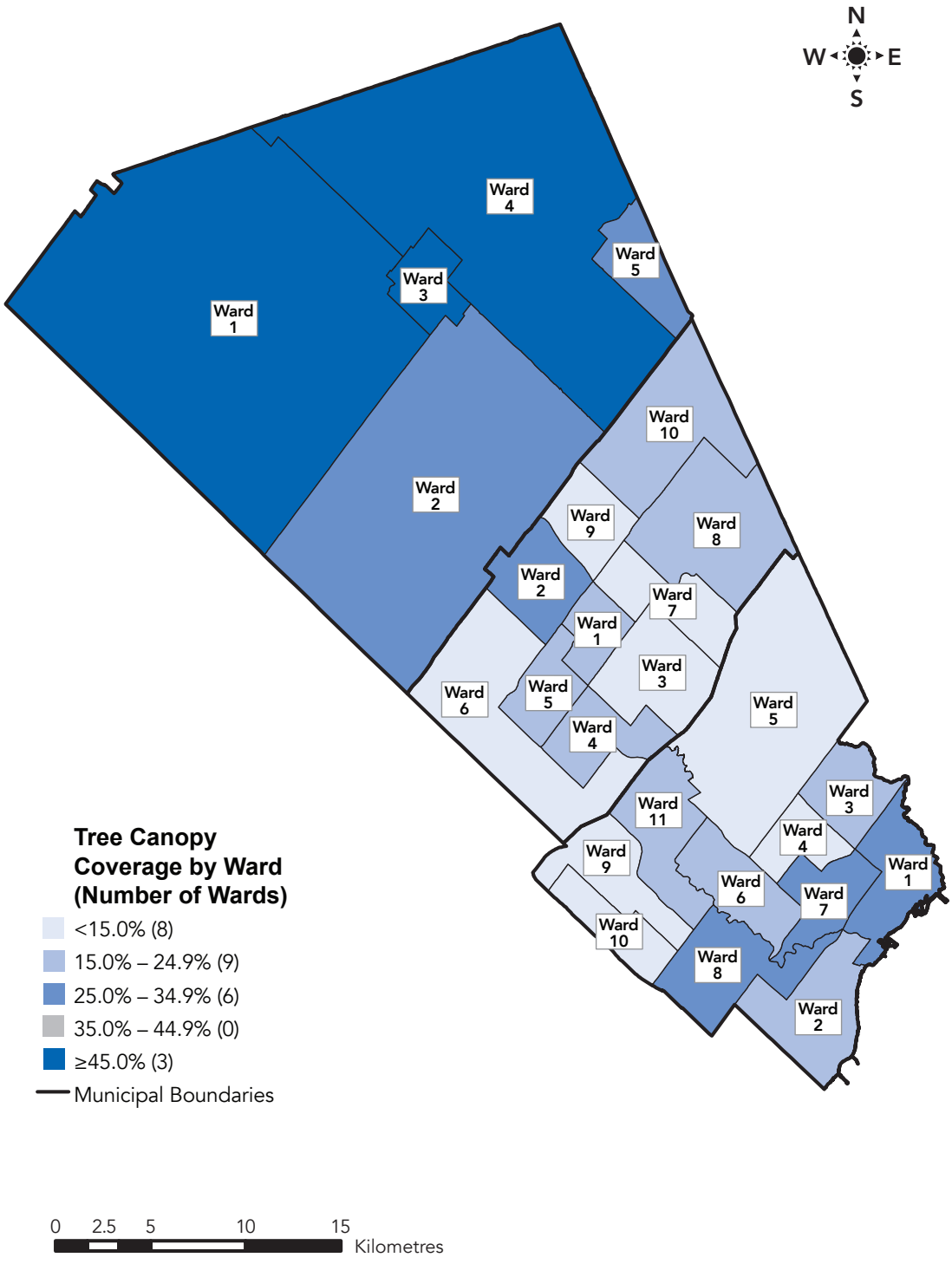
Did You Know

In Peel, the tree canopy is capable of storing approximately 12 million tonnes of carbon dioxide per year, valued at about $628.5 million and about $39.5 million in air pollution removal and carbon sequestration (i.e., capture and storage of carbon dioxide from the atmosphere).[375]

New residential areas have minimal tree cover compared to older residential areas that have more mature trees. As growth in Peel continues, areas that were once covered in vegetation are replaced with pavement and immature trees and as a result, an increase in surface temperatures occurs.

Map 10.1

Urban Tree Canopy by Ward, Peel, 2015



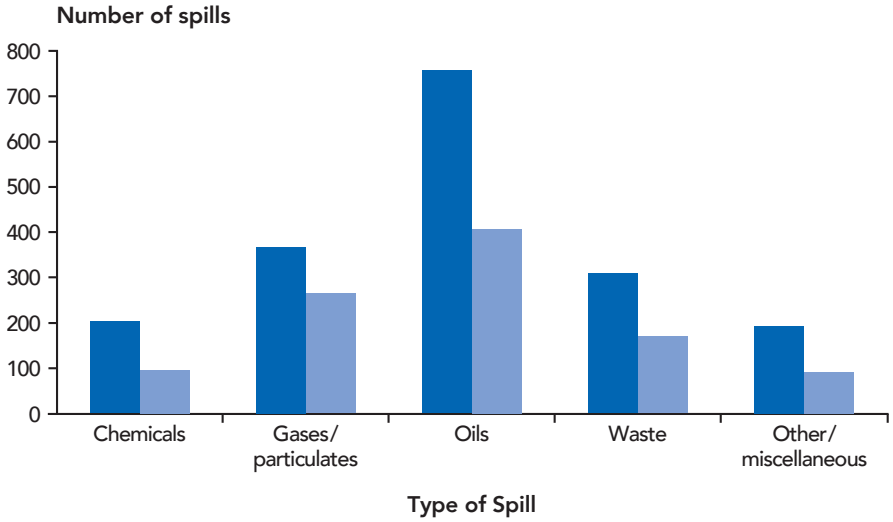
Source: Region of Peel, 2015, Peel Data Centre.

Soil Contamination and Spills

Between 2008 and 2013, 1,829 spills in Peel region were reported to the MOECP Spills Action Centre. Oils comprised the majority of these spills followed by gases and particulates (Figure 10.11). Most spills of gases and particulates were confirmed to have an environmental impact. No complaints of illness related to these spill events have been reported.

Figure 10.11

Number of Spills by Type and Environmental Impact, Peel, 2008–2013



	Chemicals	Gases/ particulates	Oils	Waste	Other/ miscellaneous
Total spills	203	367	757	309	193
Spills with confirmed environmental impact	95	265	407	170	91

Note: Environmental impact is categorized into three categories: confirmed, possible or not anticipated. An environmental impact is confirmed if it has been verified by the Ontario Ministry of Environment, Conservation and Parks or other agency. A possible impact, such as a spill to a catch basin, includes a spill which may cause an adverse effect on the environment. An example of a spill that is not anticipated to have an impact is a small spill to concrete.
Source: Environmental Occurrences and Spills, 2008-2013, Ministry of Environment and Climate Change.

WATER

Drinking Water

Safe drinking water is a foundation of good health. In Peel, drinking water comes from one of three sources: Lake Ontario, a regionally-operated well, or a private well. Approximately 99% of Peel residents are serviced by a municipal water supply, and about 1% are on a private well water supply (mostly in Caledon).[23] For those using the municipal water supply from Lake Ontario, water is treated by the Lakeview and Lorne Park water treatment facilities. These facilities provide water to Brampton, Mississauga and South Caledon.

Did You Know

In Ontario, all drinking water systems that serve the public are governed by regulations under several different laws (Regulation 170/03: Ontario Drinking Water Systems under the *Safe Drinking Water Act, 2002;* Regulation 319/08: Small Drinking Water Systems under the *Health Protection and Promotion Act;* and Regulation 169/03: Ontario Drinking Water Quality Standards). Annual reports for all Peel's drinking water systems are available to the public at: *http://www.peelregion.ca/pw/water/quality/reports/*.

Drinking water systems that serve the public are monitored and tested for potential microbiological contaminants such as total coliforms and *Escherichia coli (E. coli)*, and chemical contaminants including metals, pesticides, industrial chemicals, and disinfectant by-products (e.g., trihalomethanes).

A Drinking Water Advisory (DWA) is issued when there is a potential threat to the drinking water supply that could lead to adverse health consequences in the community. Between 2011 and 2017, a total of 12 DWAs were issued in Peel, ranging in duration from less than one day to 64 days. Seven of the DWAs during this period were issued to non-municipal well-water systems, most of which exist in Caledon, and were a result of a malfunctioning water treatment system or adverse microbiological test results. The remaining five DWAs were issued to a municipal water system due to either potential contamination from broken water mains or more commonly, adverse microbiological test results that did not meet the set standards. Six DWAs affected institutional facilities such as homes for special care, child-care centres or schools.[376]

Did You Know

Lead can enter the drinking water system in older buildings, particularly those built before the 1960s, when water pipes, plumbing fittings and/or solder used to join pipes together were made of lead compounds. If water stays in a piping system that contains lead for long periods of time, lead may dissolve into the water. Flushing of plumbing reduces lead levels in water at the tap.

Municipal drinking water is regularly tested for lead. In Peel, these tests are conducted at private taps and municipal hydrants throughout Mississauga, Brampton, and south Caledon as part of the Community Lead Testing Program. The Region of

Peel - Public Health encourages home and business owners to participate in this program if they suspect their house or building may have lead plumbing and/or was built prior to 1960.

Since 2007, the Ontario Regulation 243/07: Schools, Private Schools and Child Care Centres required schools, private schools and child-care centres to test drinking water for lead. Samples are required to be collected in standing water and water after flushing the water system.[364]

Between 2012 and 2016, the proportion of schools and child-care centres in Peel that reported at least one lead exceedance in flushed water samples was low (Table 10.6). In 2017, Regulation 243/07 was updated to ensure that samples are collected from every drinking water fixture (e.g., a drinking water fountain or tap used for food preparation or consumption) that had not yet been sampled under the previous regulation. The increased sample size in 2017 resulted in 6% of facilities (58 of 1,022) with at least one lead exceedance.

Private Drinking Water Systems

In Peel, between 2008 and 2017, the number of private drinking water samples tested by the Public Health Ontario Laboratory decreased from 2,132 in 2008 to 1,227 in 2017 (Table 10.7). The proportion of adverse results (i.e., water deemed unsafe to drink) has remained relatively consistent. Of the samples tested, between 19% and 33% were adverse each year based on standards set by Public Health Ontario.[377] These data may not be representative of all private well-water systems in Peel since it is up to the well owner to submit a water sample for testing, and a well owner may submit multiple water samples within a given year.

Table 10.6

Schools and Child-care Centres with at Least One Lead Exceedance†, Peel, 2012–2016

Year	Per Cent (Number) of Schools and Child-care Centres
2012	1.0 (9)
2013	0.9 (9)
2014	0.4 (4)
2015	0.7 (7)
2016	0.7 (7)

† After flushing the water system.
Source: Laboratory and Waterworks Inspection System, 2012–2016, Safe Drinking Water Branch, Central Region, Ministry of the Environment and Climate Change.

Table 10.7

Adverse Private Drinking Water Test Results, Peel, 2008–2017

Year	Number of Samples Tested	Per Cent (Number) of Adverse Results
2008	2,132	32.6 (696)
2009	1,866	25.4 (474)
2010	1,687	25.5 (430)
2011	1,724	28.7 (495)
2012	1,838	26.4 (486)
2013	1,383	24.2 (334)
2014	1,441	18.9 (272)
2015	1,380	22.5 (311)
2016	1,288	21.1 (272)
2017	1,227	25.2 (309)

Source: Water Testing Information System, 2008-2017, Public Health Ontario Laboratory.

Public Beaches

Injuries and the spread of gastrointestinal and respiratory illness can occur when using recreational water facilities. Swimming in contaminated water can result in gastrointestinal disease, skin rashes, upper respiratory infections and ear infections.

In Peel, there are five beaches that are monitored by Public Health: Professors' Lake in Brampton, Caledon Teen Ranch, Jack Darling Park, Richard's Memorial Park and Lakefront Promenade Park along the Lake Ontario waterfront. In the operating season, between June and August, Public Health collects water samples at least weekly to test for *E. coli*. *E. coli* concentrations fluctuate daily and are influenced by environmental conditions. In Peel, modelling found that local beach water quality is influenced by rainfall, water temperature, air temperature, wind, and sunlight.

Results of beach water quality are presented in Table 10.8.

Table 10.8

Per Cent of Beach Sampling Days with Water Quality Exceedances, Peel, 2014–2017

Year	Per Cent of Sampling Days with Exceedances				
	Professor's Lake	Richard's Memorial	Lakefront Promenade Park	Jack Darling	Caledon Teen Ranch
2014	52.5	29.8	36.5	14.3	16.7
2015	15.5	22.6	38.1	13.1	8.3
2016	22.2	11.9	18.6	10.3	10.0
2017	42.2	20.4	13.2	10.6	0.0

Notes: All public beaches are sampled five times a week during the summer beach season, with the exception of Caledon Teen Ranch which is sampled once per week. An exceedance is defined as a geometric mean exceeding 200 *E. coli* colony-forming units per 100 mL.
Source: Beach Water Quality Databse, 2014–2017. Region of Peel – Public Health.

FOOD

Peel has a diverse agricultural industry with a wide range of food products. The largest agricultural sectors in Peel are:

- beef, dairy and equine industries (33%);
- oilseed and grain crops (26%); and
- fresh flowers, maple syrup, honey, fruits and vegetables (24%).[378]

Since 2011, the number of hectares of land classified as agricultural in Peel declined by 11%. In comparison, the Greater Toronto Area experienced a 6% decline in agricultural use.[378] Food sectors such as bread and bakery product manufacturers and meat processing and distribution operations are more concentrated in populated urban areas like Mississauga and Brampton relative to the rest of the Golden Horseshoe area.[379] As of 2017, there were 70 federally inspected and 30 provincially inspected meat processing plants, 152 food production premises, and 55 food warehouses or depots in Peel.

The safety of food products sold in Canada is regulated by the federal government under the Food and Drugs Act and Regulations. Health Canada sets standards regulating the safety of Canada's food supply, and the Canadian Food Inspection Agency (CFIA) enforces them.

Many metals and elements occur naturally in food from soil, water and air, but they can also be present from the use of pesticides, food processing, or environmental contamination.[380] The CFIA tests foods for up to 20 different metals and elements. Health Canada sets the maximum limit for these contaminants.

Results of CFIA testing conducted between 2013 and 2014 indicated no violations of maximum limits in samples, and no human health concerns.[380]

The CFIA also conducts targeted sampling surveys of specific food products (e.g., lead in candy, chocolate, dried herbs and spices; or lead, arsenic cadmium and mercury in infant formulas) that are not routinely monitored based on emerging concerns from research and/or the public. Of 400 samples collected from retail stores in 11 Canadian cities, there were no human health concerns associated with chemical contamination.[381,382]

Did You Know

The Ministry of Environment, Conservation and Parks (MOECP) tests for chemical contaminants such as mercury and polychlorinated biphenyls (PCBs) in fish caught from Ontario lakes and rivers. Since 2008, PCB levels in Coho salmon (65 cm to 75 cm in length) captured from the Credit River have remained low, ranging between 0.28 to 0.52 parts per million (ppm), which is well below the maximum level of 2 ppm set by Health Canada.

Food Recalls

In Ontario, between 2008 and 2016, 1,582 Class 1 and Class 2 recall incidents occurred, which resulted in 1,971 recalls issued (54% Class 1 and 46% Class 2).[383] These numbers differ slightly as incidents may result in multiple recalls of different products or from different suppliers or importers. Class 1 recalls are issued when there is a potential for serious adverse health consequences or deaths, and Class 2 recalls are issued when there could be temporary adverse health consequences or lower risk of serious adverse health consequences.

Allergens and microbiological concerns made up the vast majority of Class 1 and Class 2 recalls. However, the number of recall incidents due to allergen concerns have increased in Ontario between 2008 and 2016, while incidents due to microbiological concerns have decreased.[382] Food commodities such as confectionary, sweeteners, snack foods, non-bakery desserts and grain derived foods were most often recalled due to allergens (Table 10.9). These food commodities may contain some of the most common allergens associated with severe allergic reactions including peanuts, tree nuts, wheat, milk, and sulphites.

Table 10.9

Class 1 and 2 Recall Incidents by Area of Concern and Food Commodity, Ontario, 2008–2016

Commodity	Number of Recall Incidents by Area of Concern			
	Allergen Number (per cent)	Microbiological Number (per cent)	Extraneous Material Number (per cent)	Chemical Number (per cent)
Confectionary, sweeteners, snack foods, non-bakery desserts	170 (25.1)	99 (13.1)	23 (20.7)	30 (42.9)
Grain derived foods	134 (19.8)	7 (0.9)	13 (11.7)	1 (1.4)
Marine products	42 (6.2)	45 (5.9)	3 (2.7)	9 (12.9)
Meat and poultry	38 (5.6)	120 (15.8)	11 (9.9)	1 (1.4)
Multiple foods	81 (11.9)	58 (7.7)	14 (12.6)	0
Nuts, grains, seeds	8 (1.2)	105 (13.9)	5 (4.5)	1 (1.4)
Processed fruit products	25 (3.7)	5 (0.7)	2 (1.8)	13 (18.6)
Processed vegetables	31 (4.6)	21 (2.8)	18 (16.2)	4 (5.7)
Spices, herbs, flavours, condiments, dressings	72 (10.6)	122 (16.1)	2 (1.8)	2 (2.9)
Other†	77 (11.4)	176 (23.2)	20 (18.0)	9 (12.9)
Total	**678 (100.0)**	**758 (100.0)**	**111 (100.0)**	**70 (100.0)**

† Other includes alcoholic beverages, dairy, egg and egg products, fats and oils, food chemicals, fresh fruit products, fresh vegetables, infant foods, non-alcoholic beverages.
Note: Some recall incidents may be counted more than once since incidents may involve multiple commodities.
Source: Food Recall Warnings, 2008–2016, Canadian Food Inspection Agency, Government of Canada.

Chapter 11

Successes and Emerging Issues

Key Messages

- Peel has a growing and aging population and Peel residents are living longer. Over half of Peel's residents are immigrants, and an increasing proportion of the population are long-term immigrants.
- Peel has a strong built environment infrastructure (e.g., drinking water, waste disposal). However, Peel residents have longer commutes when using public transit compared to Ontario.
- There has been a decrease in tobacco use and exposure to second-hand smoke in Peel, with a related decrease in chronic diseases (e.g., chronic obstructive pulmonary disease, ischaemic heart disease).
- Peel residents have low levels of alcohol consumption.
- Drug use in Peel is low, but there is a continued need to monitor use over time, specifically cannabis and opioid use.
- Other health behaviours (e.g., physical activity and nutrition) have remained unchanged and health risk behaviours (e.g., screen time) have increased.
- Overweight and obesity continues to be a significant public health concern.
- Mothers in Peel are in good health; however, there are certain factors that put them at risk, such as overweight and obesity and gaining too much weight during pregnancy.
- Diabetes incidence has leveled off, but prevalence is still high and risk factors associated with diabetes are still prevalent.
- Peel residents experience positive mental health well-being; however, there are some areas that are of concern such as high rates of psychological distress and increased emergency room visits for mental health conditions among youth and young adults.
- For many health outcomes and health behaviours Peel males have less favourable outcomes compared to females.
- Vaccination coverage rates in Peel are high and there are observed reductions in the incidence of vaccine preventable diseases. Outbreaks of enteric disease and influenza remain a burden for institutions.
- Peel is currently experiencing increasing temperatures and higher precipitation levels which have potential implications for both health and the built infrastructure.

This report provides a comprehensive overview of the health status of Peel residents. Continued monitoring and analysis of population health assessment and surveillance data improves our understanding of the health and needs of Peel residents; which in turn helps identify local strategic priorities, guides programs and service delivery, and informs public policy. This chapter summarizes key findings in this report.

Did You Know

The Ontario Public Health Standards require public health units to:

- Complete a population health assessment to identify and address current and evolving population health issues as people grow and age across the life course.
- Ensure the public, Local Health Integration Networks (LHINs), community partners, and health-care providers are aware of relevant and current population health information.

As noted throughout the report, health is determined by complex interactions between genetic, social and economic factors; the physical and social environment; and individual behaviour. In addition, there is a complex relationship between the various factors influencing health throughout life, from gestation to childhood to early and late adulthood.[383,384] For example, the health behaviours and lifestyle of parents, even before pregnancy, can affect the health of their future offspring and health behaviours in childhood and young adulthood may impact health outcomes later in life.

Population Growth and Aging

Peel continues to experience rapid population growth, with the region's population increasing by 20% over the past 10 years.[A1,A3] In 2016, Peel's population was just under 1.4 million.[A1] By 2031, Peel's population is expected to exceed 1.7 million.[B]

Residents of Peel are living longer. Peel's life expectancy is higher compared to Ontario and Canada, and mortality rates have decreased over the past 30 years. Compared to 1996, there are now more individuals aged 50 years and older and fewer in the middle and younger age groups. This shift is expected to continue over the next 20 years as the proportion of those in the older age groups increases. While the proportion of seniors in the labour force has increased, the senior dependency ratio, the number of dependants per working individual, will continue to increase.

Arising from population growth and aging is an increased overall burden due to chronic disease, particularly among those aged 65 years and older. In Peel, chronic disease accounts for the majority of the leading causes of hospitalization and death. About half of Peel's residents aged 12 years and older have been diagnosed with a chronic disease (e.g., diabetes, arthritis, chronic obstructive pulmonary disease), from 21% of youths to 86% of those aged 65 years and older.[H2] While the age-standardized incidence and prevalence of some chronic diseases have decreased over the past several years, the health system resources needed to manage and treat chronic diseases in Peel's aging population should be considered.

Over the past 30 years, birth and fertility rates in Peel have declined and mothers in Peel are having their children at older ages. In 2016, about two-thirds of births in Peel were to women 30 years of age and older.[Q1] This shift has implications for both the health and obstetric care of mothers and babies, as increased maternal age is associated with higher risk of pregnancy complications. Teen pregnancy and overall abortion rates have declined.

Immigration and Diversity

Over half of Peel's residents are immigrants.[A1] This proportion, which is higher than Ontario, has been increasing over the past 20 years. Notably, there has been a decrease in the proportion of recent immigrants, a subgroup that is usually characterized as being healthier compared to non-immigrants and long-term immigrants (i.e., the healthy immigrant effect).[A1,A3] If this trend continues, a greater proportion of the population will be experiencing disease at similar rates as non-immigrants, increasing the overall burden of disease in Peel.

Because of Peel's diverse population, a number of residents travel to countries where they are at risk of acquiring communicable diseases. Compared to Ontario, Peel's rates of hepatitis A, malaria, paratyphoid fever and typhoid fever are higher. Depending on the disease, between 81% and 96% of these cases are related to visiting friends or relatives.[BB] Peel's active tuberculosis rate is twice as high as Ontario's, with a majority of cases (93%) reporting having lived in an endemic country. [BB] However, recent data show that Peel's tuberculosis rates are declining, with low local transmission and high treatment completion rates.

Health Behaviours

Over the past decade, substantial efforts have been directed towards improving health behaviours known to influence health outcomes of importance among Peel residents. These behaviours relate to exposure to tobacco, nutrition, physical activity and sedentary behaviour, and substance use. While there has been a significant improvement in tobacco-related behaviours in Peel over the past 10 years, other health behaviours (e.g., physical activity and nutrition) have remained unchanged and health risk behaviours (e.g., screen time) have increased. Part of public health's mandate includes collaborating with partners to try to improve these health behaviours.

Tobacco

Tobacco use and exposure to environmental tobacco smoke are linked with poor physical and mental health, development of chronic and infectious diseases, and can impact neonatal and child development. The proportion of current smokers in Peel has declined over the past 15 years and remains much lower than Ontario. Exposure to second-hand smoke has also decreased in recent years. There is a global movement working towards decreasing the smoking rate to less than 5% by 2035; this seems to be well in reach for Peel if current trends continue. Related to these positive changes in tobacco use are the decreased rates of tobacco-related diseases (e.g., chronic obstructive pulmonary disease and lung cancer) observed in recent years.

Novel tobacco delivery systems such as e-cigarettes and vaporizers remain a concern, particularly among youth. The proportion of students in grades 7 to 12 smoking cigarettes is low, but a greater proportion report using a waterpipe or an e-cigarette.

Substance Use

Harms related to opioid use is an emerging issue in Peel. The number of opioid-related deaths increased over the past five years, from 21 overdose deaths in 2013 to 81 in 2017.

The Government of Canada legalized the recreational use of cannabis in October 2018. Based on information prior to legalization, 8% of Peel residents reported using marijuana, cannabis or hashish in the past 12 months.[H2] Youth are likely to encounter and use drugs during major life transitions, including transitioning from elementary to middle school and upon entry into high school.[385] Over a third of students in grades 7 to 12 report using at least one drug to get high over the past 12 months; 16% report using cannabis, with almost half of grade 12 students reporting cannabis use.[U1]

Over the past few years, the provincial government has made changes to the retail sale and distribution of alcohol which increases access. While Peel has a lower proportion of current drinkers than Ontario, the association between the physical availability of alcohol and consumption levels, as well as related harms, should be monitored, in particular among youth.

Substance use is related to overall health, mental health and life expectancy, and is a preventable cause of morbidity and death. It is important that ongoing and any future changes to substance or drug-use policies are grounded in a balanced approach which includes prevention, harm reduction and treatment that meets the needs of Peel residents.

Nutrition

Good nutrition can promote healthy early childhood development, contribute to overall physical and mental health, and prevent chronic disease. With regards to diet, there has been no change in fruit and vegetable consumption among Peel residents over the past decade, with less than half the population consuming these five times per day.[H2] This differs by sex and income, with a higher proportion of females and those in the middle- and high-income categories consuming fruits and vegetables five or more times per day. There are limited data about nutrition among Peel residents.

Movement

Physical activity and sedentary behaviour, including screen time, are modifiable risk factors for chronic disease and injury, have a significant influence on early childhood development and are important to overall physical and mental health across the lifespan. There has been no change in physical activity over the past decade. Only a quarter of Peel residents are physically active during leisure time.[H2] Two-thirds of Peel students in grades 7 to 12 spend more than the recommended two hours or less of recreational screen time per day; 14% spend seven or more hours per day on average.[U2] This increases with increasing grade.

Physical activity is influenced by the built environment. For example, high-density housing is one of many factors that contribute to active living. Over the past 10 years, there has been a decline in medium- and high-density housing in Brampton, whereas, there has been an increase in Caledon and Mississauga.

Public transit also contributes to active living. Most of Peel's residents live within a five minute walk to a bus stop. Over the past 10 years there has been a slight increase in the proportion of Peel residents taking public transit to work, but only a small proportion use active transportation (e.g., biking). Individuals taking public transit have commute times that are on average 25 minutes longer than those commuting by car, truck or van.[A1] While Peel and Toronto have similar commute times by motor vehicle, Peel has a higher average commute time by public transit compared to both Toronto and Ontario.[A1]

Overweight and Obesity

Overweight and obesity have been declared an epidemic in Canada and are of public health importance given their links to increased chronic disease and mortality (e.g., diabetes, cancer, heart disease).

The proportion of Peel's population classified as overweight or obese has not improved since the last report 10 years ago. Almost two-thirds of Peel's adult population are overweight or obese.[H2] Since 2003, the proportion of the adult population classified as normal weight has decreased, while those classified as obese has increased in Peel. Additionally, over a quarter of students in grades 7 to 12 are overweight or obese.[U1] The proportion of female students who are overweight or obese has increased over the past five years, and now is at the same level as males.[U1]

There are also pre-natal implications of overweight and obesity. A woman's weight before and during pregnancy can impact her and her baby's future health. For example, being overweight or obese prior to pregnancy can increase the risk of gestational diabetes, hypertension of pregnancy, caesarean births and pre-term births. While there is a general state of good health among expectant mothers in Peel, one-third of them entered pregnancy overweight or obese and over half gained above the recommended amount of weight during pregnancy.[Q1]

Diabetes

Diabetes is related to both health behaviours and obesity. It is the fastest growing chronic disease in Canada and the leading cause of blindness, kidney disease and heart and circulatory problems.[387] While the risk of developing diabetes increases with age, younger individuals are increasingly being diagnosed. Over the last two decades, the diabetes incidence rate for those aged 20 to 49 years almost doubled, while a parallel increase was not seen in other age groups.[W11] In Peel, the incidence of diabetes has remained stable over the previous 10 years, while the prevalence has increased as people with diabetes are now living longer. This differs by world region of birth with individuals in Peel of South Asian origin having the highest incidence rate. Given population growth and aging, and the rising rates of obesity, the prevalence of diabetes in Peel is expected to continue to increase over the coming years.

Sex Differences

Important differences by sex have been observed throughout the report. Males are more physically active, however with regards to health behaviours, males are more likely to smoke cigarettes, drink alcohol (including binge drinking), use cannabis, and are less likely to consume vegetables and fruit. Males are more likely to be overweight compared to females. In addition, the rates of several chronic conditions are higher among males compared to females; these include ischaemic heart disease, lung cancer, colorectal cancer, chronic obstructive pulmonary disease, and diabetes. There may be a need to consider new programming to reach at-risk men in Peel.

Infectious Diseases

While immunization coverage rates are high in Peel for many vaccines, more effort is needed to reach immunization coverage goals for human papillomavirus (HPV) and hepatitis B, both of which can cause cancer. As vaccine coverage increases, the rate of both HPV infection and its related cancers are expected to decline.

The burden of sexually transmitted infections is high in Peel. Gonorrhea and chlamydia rates have been increasing over time and are highest among individuals in their late teens and into young adulthood. Infectious syphilis has increased in recent years, with most cases among males.

Peel also has high rates of enteric infections. Over the past 10 years there were 380 confirmed and suspect enteric disease outbreaks affecting over 10,000 residents.[BB] There is a need to better understand interventions to mitigate enteric illness, especially given the impact on establishments caring for the growing elderly population.

Mental Health

While Peel residents are generally happy and satisfied with life, Peel students report experiencing moderate to high levels of psychological distress, particularly among female students.

Peel has seen an increase in the rate of emergency department visits for substance-related mental health issues, anxiety disorders, mood disorders and schizophrenia/psychotic disorders. Rates of these emergency department visits are increasing among those aged 0–14 and 15–24 years. They are also highest among young adults, and differ by sex. In addition, one in five female students in grades 7 to 12 have seriously considered attempting suicide, and this is twice as high compared to males.[U1] Rates of suicide-related emergency department visits and hospitalizations are higher for females, but the death rate is higher for males.

According to the Positive Mental Health Surveillance Indicator Framework, determinants of mental well-being can be organized into a socio-ecological model with four levels of influence: individual, family, community, and society.[192]

An individual's mental health is influenced by resilience, coping, childhood environment, control and self-efficacy, exposure to violence, physical health status, physical activity, substance use, and spirituality.[192] Available data indicate that lifestyle behaviours that lead to negative mental wellbeing, such as low levels of physical activity and lack of coping skills, are common among individuals in Peel. Individuals who have experienced a traumatic event are more likely to have poor mental well-being. A significant number of Peel residents have witnessed abuse or violence. More data is needed to better understand violence in Peel.

At the family level, an individual's mental health is influenced by family relationships, parenting style, family health status and substance use by family members, household composition and household income. A segment of Peel residents are negatively affected by isolation or by a family member who has a mental health or substance misuse problem.

At the community level, mental health is influenced by community involvement, social networks, the school or workplace, and the neighbourhood social and built environment. Most people in Peel have strong social networks or support that promote mental well-being.

Societal factors such as the level of inequality, the presence or absence of discrimination and political participation influence mental health. One third of Peel residents in Mississauga, Brampton and Caledon voted in the 2014 municipal election.

Physical Environment

Air quality can significantly impact health. Exposure to air pollutants from traffic emissions most affected the health of those living near highways and major roads. Half of Peel's population lives within 300 meters of a highway or major road.

Greenhouse gas emissions have continued to rise. In monitoring potential climate change impacts, temperature was noted to have increased since the start of monitoring in the 1930s. Of particular concern, extreme minimum temperature in Peel has increased by about 10 degrees. The historical temperature data in Peel currently rely on readings from the Toronto Pearson International Airport.

Future Considerations

Income

Income and social status can impact the quality of childhood, education, employment, working conditions, housing and food security. For example, in Peel low-income individuals are less likely to have access to a family physician, visit a dentist or have dental insurance, be satisfied with life, and consume vegetables and fruit.

While the region's unemployment rate is recovering from the impacts of the 2009 recession, the youth unemployment rate in Peel is still high. Median individual after-tax income is lower in Peel compared to Ontario, but median household after-tax income is higher in Peel, indicating that there are more households in the region where multiple working individuals are pooling resources.[A1] There has been no change in the proportion of low-income families over the past decade.[A1,A3]

Approximately 15% of children less than six years old live in households classified as low income. Almost half of Peel residents spend over 30% of their household income on house payments. On average Peel residents pay $300 per month more than Ontario residents.[A1]

Income is an important determinant of health, but additional analysis is needed to better understand the complex relationship between income level and health behaviours, disparities and outcomes of Peel residents.

Priority Populations

Through some of our analysis, we have identified certain groups who are at higher risk for certain health behaviours and health outcomes. However, there are still significant information gaps in our understanding of the health behaviours and health status of Indigenous peoples, children, those with disabilities, those experiencing violence, and the LGBTQ2S+ community across the lifespan.

Next Steps

This comprehensive health assessment report illustrates the:

- current population health status;
- changes in health behaviours and health outcomes over the past 10 years;
- public health issues that require attention; and
- knowledge and information gaps that need to be filled to improve understanding of the health status of Peel residents.

The information contained in this report will be used by Region of Peel - Public Health to inform and influence the allocation of public health resources towards supporting and developing local healthy public policies, programs and services, and Peel Public Health's long-term strategic priorities. Stakeholders and partners will have access to all of the population health data in this report as they plan and develop programs and services to help improve the lives of Peel residents.

Chapter 12

Data Sources and Limitations

Numerous data sources were used in this report. A description of the source and its limitations are described in this chapter. Categories of data include:

- Census
- Vital statistics
- Administrative
- Registry
- Survey
- Surveillance
- Other

Census Data

Canadian Census

Since 1956, the Census has been administered by Statistics Canada every five years to all Canadian residents.

For the censuses administered in 1971, 1976, 1981, 1986, 1991, 2006 and 2016, two forms were used to collect information from residents, the short form and the long-form. The short-form collects basic population and housing information. The long-form collects the same information as the short-form, with more housing and socio-demographic questions. Since 1996, 80% of households completed the shortform and 20% completed the long-form.

Limitations:

- Prior to 1991, the Census did not enumerate non-permanent residents.
- The Census undercounts some groups, such as the homeless, young adults and aboriginal people.
- In censuses, some people are not counted while others are counted more than once. These two types of errors result in net under-enumeration. Adjustments for this under-enumeration and for non-permanent residents have increased the Canadian population by 1.6% to 3.8%, depending on the census, province and age group.
- Comparisons between censuses are affected by changes in question wording and in the definition of the population concerned.
- Pooling of on-reserve aboriginal data into one division in the north makes interpretation difficult for areas with high aboriginal populations.

Early Development Instrument

The Early Development Instrument (EDI) was developed to assess a child's level of development before school entry. A child's ability to meet the demands of school is dependent on several factors. Expectations upon entering school include such things as being able to hold a pencil, listening to the teacher, remembering and following rules. The EDI measures readiness in five developmental domains:

- physical health and well-being;
- social competence;
- emotional maturity;
- language and cognitive development; and
- communication skills and general knowledge.

The EDI is completed by the teacher, based on their observation, for every student in Senior Kindergarten classrooms of publicly-funded schools. To improve accuracy, teachers received standardized training about how to complete the questionnaire.

Limitations:

- The teacher's ability to complete the questionnaire based on his or her knowledge of a child's development and well-being after six months of interaction may not accurately reflect the level of the child's development.
- The EDI is not a clinical diagnostic tool and is not intended to diagnose issues.
- The EDI captures measures of school readiness at specific points in time; causal associations cannot be determined.
- The cut-points used to determine vulnerability can differ by region; caution should be used when comparing Peel results that use the Ontario Cycle two cut-points to other regions that do not use the same cut-points.
- The EDI is meant to be used at the population level, not the individual level.
- Children identified as having special needs by the teacher are not included in the EDI results.

Uniform Crime Reporting Survey

The Uniform Crime Reporting Survey (UCRS) is a census of Police Services designed to measure the incidence of crime in Canada as well as its characteristics. These police-reported crime data are collected by the Canadian Centre for Justice Statistics. More than 1,000 separate police detachments across Canada respond to the cross-sectional survey each year, which represents 93 different police forces. Data include incidents of specific crimes, as well as information about the person charged.

Limitations

- While the UCRS data are an accurate measure of the number of incidents of crime that are reported to the police, they are reflective of a subset of all crimes occurring in the jurisdiction since not all crimes are reported to the police.
- Police data are not audited to ensure completeness and reporting accuracy; however, there are quality control measures in place locally.

Vital Statistics Data

Birth Registration (Live Births and Stillbirths)

Information on live births and stillbirths is collected by ServiceOntario for the Office of the Registrar General (ORG). Following a birth, the Statement of Live Birth or Statement of Stillbirth form is completed by parents and the Notice of Live Birth or Stillbirth form is completed by the birth attendant. For a stillbirth, a Medical Certificate of Stillbirth is completed by a doctor. Previously, all three forms had to be submitted for a stillbirth to be recorded. Recently, the procedure has changed, so that the stillbirth is still recorded if at least the Notice of Live Birth or Stillbirth or the Medical Certificate of Stillbirth is completed.

Limitations:

- Known data quality issues exist within the live birth registration data.[387]
- Although live birth registration is required by law, changes in registration practices and the institution of registration fees in 1996 were found to decrease the number of births. Between 2007 and 2009, an electronic system for submitting both birth registration forms was introduced, and the fees were no longer collected.

- Ethnic origin of the mother is not recorded, so geographic region of birth of the mother is used as a proxy.
- The data are not timely; most recent data available are several years behind.

Deaths

The Office of the Registrar General (ORG) obtains information about deaths from death certificates which are completed by physicians. All deaths within Ontario are registered in the Divisional Registrar office within which the death occurs. A Statement of Death (Form 15) and a Medical Certificate of Death (Form 16) must be filed with a division registrar before a Burial Permit can be issued.

Data available to Public Health Units include only the underlying cause of death, defined as:

- the disease or injury which initiated the train of events leading directly to death; or
- the circumstances of the accident or violence which produced the fatal injury.

Prior to December 31, 1999, all deaths were coded using the Ninth Revision of the International Classification of Diseases (ICD-9). Since January 1, 2000, deaths were coded using the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems, Canada (ICD-10-CA).

Limitations:

- Co-morbidity contributes to uncertainty in classifying the underlying cause of death.
- Determining the true cause of death may be influenced by the social or legal conditions surrounding the death and by the level of medical investigation (e.g., AIDS, suicide).
- Ontario residents who died outside of the province are excluded.

Administrative Data

The National Ambulatory Care Reporting System

Hospital emergency departments submit patient visit information into the National Ambulatory Care Reporting System (NACRS), which began in July 2000.

The main diagnostic code used for emergency department visits is based on the patient's main problem or diagnosis as determined by the emergency department. This is coded using the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems, Canada (ICD-10-CA).

Limitations:

- Data are not considered to be reliable until fiscal year 2002/2003.
- Ambulatory visit data provide only a crude measure of the condition being quantified since a person may not seek care at an emergency department, or may visit several times for the same disease or injury, or may visit more than one hospital for the same disease or injury.
- Data are influenced by factors that are unrelated to health status such as availability and accessibility of care, and administrative policies and procedures.
- Ontario residents visiting hospitals outside of the province are excluded.

Hospitalization

The Discharge Abstract Database (DAD) contains demographic, administrative and clinical data for hospital in-patient discharges and day surgery interventions. A hospital separation is a discharge from a hospital due to death, discharge home, or transfer to another facility. The 'most responsible diagnosis' code provides the primary reason for the hospital stay. Prior to April 1, 2001, this was coded using the Ninth Revision of the International Classification of Diseases (ICD-9). After this date, the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems, Canada (ICD-10-CA) was used.

Limitations:

- Hospitalization data provide only a crude measure of the condition being quantified for the following reasons: a person may be hospitalized several times for the same disease or injury, may be discharged from more than one hospital (when transferred) for the same disease or injury, or may not seek care at a hospital.
- Co-morbidity contributes uncertainty to classifying the most responsible diagnosis.
- Data are influenced by factors that are unrelated to health status such as availability and accessibility of care, and administrative policies and procedures.
- Ontario residents treated outside of the province are excluded.
- Effective April 1, 2006, hospitalizations for adults occupying designated mental health beds are collected in the Ontario Mental Health Reporting System (OHMRS). This change results in a reduction of hospitalizations captured in the hospital separation data, under the Mental Health ICD-10-CA, Chapter V – Mental and Behavioural Disorders (F00-F99).

Medical Services Data

Medical services information is obtained from the Ontario Health Insurance Plan (OHIP) Approved Claims files. The Approved Claims files contain service and payment information for both fee-for-service claims submitted by physicians and other licensed health professionals, including some of the "shadow billings" by providers in organizations covered by alternate payment arrangements. Included in a typical claim is information about the patient, provider, Fee Schedule Code or procedure performed, number of services or units delivered and some diagnostic information. OHIP has a unique coding system for diagnoses.

Limitations:

- Since only some of the claims from the Ontario Ministry of Health and Long-Term Care's various alternate payment programs or "shadow billers" are included, there may be undercounting of total volume for certain services.
- Some diagnosis codes may have different meanings depending on the specialty of the provider.
- Approximately half of the diagnosis codes are missing from the medical claims data since there is no requirement to include them.

Institute for Clinical Evaluative Sciences

The Institute for Clinical Evaluative Sciences (ICES) is an independent not-for-profit corporation that receives core funding from the Ontario Ministry of Health and Long-Term Care. Administrative and ICES Composite (IC) databases and registries are used along with developed algorithms to provide incidence and prevalence data for selected diseases and data about health care use.

The following data sources were used in the algorithm for one or more of the indicators included in this report:

- Registered Persons Database
- Census, 2011
- Ontario Inter-censal Population Estimates and Projections
- Immigration Refugees and Citizenship Canada – Permanent Residents Database
- Ontario Health Insurance Plan Claims
- National Ambulatory Care Reporting System
- Discharge Abstract Database
- Ontario Mental Health Reporting System
- Same Day Surgery Database
- ICES Physician Database
- Ontario Drug Database
- Ontario Diabetes Database
- Ontario Asthma Database
- Chronic Obstructive Pulmonary Disease Database
- Ontario Rheumatoid Arthritis Dataset
- Ontario Dementia Database
- Canadian Organ Replacement Registry

Numerous data sources were used in this report. A description of the source and its limitations are described in this chapter. Categories of data include:

- Census
- Vital statistics
- Administrative
- Registry
- Survey
- Surveillance
- Other

Therapeutic Abortions

The therapeutic abortions summary database contains information about abortions performed at abortion clinics, in a hospital or within private doctor's offices in Ontario, for Ontario residents. In this report, therapeutic abortions data are used as part of the calculation for the pregnancy rate.

Limitations:

- Therapeutic abortions performed out-of-province are not included.
- Therapeutic abortions data are not available below the census division level.
- Individual-level data are not available (they are pre-aggregated).
- The number of health-care settings included in the data source has changed over time.
  - Between 1986 and 1991, only hospital therapeutic abortions were included.
  - Between 1992 and 2000, clinic and hospital therapeutic abortions were included.
  - Since 2001, therapeutic abortions in hospitals, clinics and private doctor's offices have been included.

Registry Data

Better Outcomes Registry and Network

The Better Outcomes Registry and Network (BORN) is a longitudinal administrative data source. BORN collects information related to maternal, perinatal and newborn health for the Ontario population from birthing hospitals, midwifery practice groups, specialized antenatal clinics, prenatal and newborn screening labs, prenatal and newborn screening follow-up clinics, and fertility clinics.

Data are extracted from the web-based BORN Information System (BIS), which provides three standard summary reports: pregnancy, birth and newborn. Region of Peel – Public Health also has access to the public health analytic cube, which provides the ability to create customized reports of real-time aggregate BORN data for a subset of the variables collected.

Data are available about women who gave birth and their infants. All Ontario births are captured (including home births), unless the mother and infant are not Ontario residents. The registry is based on place of residence, not place of birth. For example, if a Peel resident was born in another location in Ontario (e.g., Ottawa); they would be included in Peel's data.

Limitations:

- Data for Ontario comparators are available in the standard reports for select variables only, so some Peel data may be presented on its own.
- Outside of a special request, only Peel data are available for cross-tabulation in the analytic cube.
- The number of missing or unknown responses varies by indicator, ranging from 0% to 29%.
- For some variables (e.g., substance use during pregnancy, maternal mental health concerns) some women may provide a socially desirable response to avoid perceived negative consequences or feelings of being judged by their health care provider.
- Infections during pregnancy are self-reported, and therefore may not be as accurate as infections reported by a health care provider following standardized case definitions.
- There are a limited number of demographic variables available within the Public Health BORN data. For example, information related to maternal ethnicity, income or education is not included.

Cancer Incidence and Death

The Ontario Cancer Registry (OCR) contains information on all Ontario residents who have been newly diagnosed with or have died of cancer. The OCR is a passive registry which links data from four major data sources:

- Hospital discharge and ambulatory care records with cancer diagnoses;
- Pathology reports with any mention of cancer from hospitals and private laboratories;
- Records from Regional Cancer Centres or Princess Margaret Hospital; and
- Ontario death certificates with cancer as the underlying cause of death.

All cancer-related data on these records are reviewed by an electronic system of medical logic to produce consolidated information about the cancer diagnosis. Cancer diagnoses are classified according to the International Classification of Diseases for Oncology, 3rd edition (ICD-O-3).

Limitations:

- Currently, this data source only provides information at the Census Division (CD) or Public Health Unit (PHU) level of geography.
- The population data source used for calculating rates is not as current as that used for other analyses.

Cancer System Quality Index

Cancer System Quality Index (CSQI) indicators have been developed by the Cancer Quality Council of Ontario, and were provided by the Cancer Screening Evaluation and Reporting section of Cancer Care Ontario. The CSQI use data from a number of different sources:

- OHIP Claims History Database
- Ontario Cancer Registry
- Registered Persons Database
- Postal Code Conversion File
- Integrated Client Management System – Ontario Breast Screening Program (for breast cancer screening)
- CytoBase (for cervical cancer screening)
- Laboratory Reporting Tool (for colorectal cancer screening)

Limitations:

- Historical Registered Persons Database address information is incomplete; therefore, the most recent primary address was selected for reporting, even for historical study periods.
- The reason for testing cannot be obtained; therefore, tests performed for reasons other than screening (e.g., to investigate symptoms) are included.

Survey Data

National Household Survey

In 2011, the long-form census was replaced by a voluntary National Household Survey (NHS). The reference date for the survey is May 10, 2011 (the same day as Census Day). The target population for the NHS was all persons who usually live in Canada, in all provinces and territories, at the time of the survey. This includes those on Indian reserves or settlements, permanent and non-permanent residents (including refugees and work permit holders and their families).

The NHS was conducted using two methods: self-administered survey (online or paper version) or enumerator-administered (Indian reserves and remote areas) and is available in 31 languages other than English or French. The content of the NHS varies slightly from the previous long-form census and therefore comparisons should be made with caution. The national response rate was 69%, varying by province and census subdivision.

Limitations:

- Due to the voluntary nature of the NHS in 2011, there is a possibility of non-response bias.
- Caution must be used when comparing NHS estimates to the 2006 or 2016 long-form census.
- The NHS overestimated some population groups (e.g., population born in the Philippines, per cent of population with a university certificate or diploma below bachelors level) and underestimated other population groups (e.g., population born in Pakistan, recent immigrants).
- Trends in low income estimates from the NHS are markedly different from those derived using other surveys and administrative data sources. Therefore, low income data from the NHS should be used with caution and comparisons to previous census data should not be made.
- Not all Indian reserves or settlements were completely enumerated during the collection period of the 2011 NHS. The biggest impact will be seen for variables associated with Aboriginal or First Nation identity or language.

Canadian Community Health Survey

The Canadian Community Health Survey (CCHS) is a national cross-sectional survey of the Canadian population aged 12 years and older, aimed at providing health information at the regional and provincial levels. This survey collects information related to health status, health care utilization and health determinants. About 130,000 Canadians aged 12 years and older are surveyed per survey cycle, with one resident per household being asked to complete the survey. CCHS data are collected by telephone or in-person interviews, using computer-assisted personal or telephone interviewing techniques. Survey data have been collected since 2000/2001. The most recent cycle of data available for 2015/2016 is considered as a new time series as a result of methodological and survey question changes.

Through the application of population weights, measures such as percentages are presented and reflect estimates of the total population.

Canadian Community Health Survey - Mental Health Module

For the 2012 CCHS, a Mental Health Module was added to measure prevalence of select mental disorders, mental well-being and determinants of mental health. This was an update to the 2002 CCHS Mental Health Module. Due to changes in measurement, results from the 2002 and 2012 modules are not comparable.

Limitations:

- Depending upon the question, self-reported data may be subject to a number of survey biases, including social desirability bias, response bias or recall bias.
- Errors may occur from proxy reporting (when another member of the household completes the survey for the randomly selected household member).
- Individuals and/or households without a telephone are excluded from the sampling frame.
- Some analyses are limited by sample size.

Ontario Student Drug Use and Health Survey

The Ontario Student Drug Use and Health Survey (OSDUHS) is a survey of over 10,000 grade 7 to 12 students in Ontario, implemented by the Centre for Addiction and Mental Health (CAMH). The survey collects information about health and substance use, including physical and mental well-being, and perceptions, awareness and use of alcohol, tobacco and drugs. Student respondents complete a self-administered paper-and-pencil questionnaire during a regularly-scheduled classroom period.

The survey is conducted every two years and has been ongoing since 1977. OSDUHS offers the opportunity for Ontario public health units to purchase an additional student sample in their region (includes approximately 1,500 additional students). This allows health units to provide more precise regional estimates on key health measures of interest. Peel Public Health purchased an additional regional sample starting in 2013.

By applying population weights provided by CAMH, measures such as percentages allow for estimates of the total population.

Limitations:

- The sampling frame excludes students not enrolled in Ontario's four publically funded school systems. This represents approximately 8% of students between grades 7 to 12.
- The list of schools used to select the sampling frame would not have included any schools built after the date that the most current list was produced. This would have the largest impact on high growth areas.
- Response rates have decreased since the survey's inception in 1977, due to both non-consent and absenteeism. Students who did not have consent to complete the survey, or who were absent from class on the day of the survey may be different than students who complete the survey.
- Student responses may be subject to social desirability bias, especially for questions addressing sensitive topic areas, including alcohol and drug use. In addition, results may be impacted by response or recall bias.

Rapid Risk Factor Surveillance System

The Rapid Risk Factor Surveillance System (RRFSS) is an on-going telephone survey administered in various public health units across Ontario. The survey collects information about health-related behaviours among adults aged 18 years and older. The purpose of RRFSS is to provide timely, useful information to help plan local public health programs and services.

Monthly, a random sample of 100 Peel residents, aged 18 years and older, are interviewed by telephone regarding risk behaviours, knowledge, attitudes and awareness about health-related topics of importance to the public health unit. The survey topics vary from year to year.

Limitations:

- Depending upon the question, self-reported data may be subject to a number of survey biases, including social desirability bias, response bias or recall bias.
- Individuals and/or households without a telephone (household or cell) would be excluded from the sampling frame.
- In Peel, the survey is administered in English only.
- Some analyses are limited by sample size.

Peel Infant Feeding Survey

The Peel Infant Feeding Survey (PIFS) is an annual cross-sectional survey designed to support the collection, analysis, and dissemination of information regarding infant feeding practices of Peel mothers until their infant is between six and eight months of age. Peel Public Health initiated PIFS in 2015. For each survey cycle, 455 eligible Peel mothers are surveyed over the telephone in the spring and summer of the survey year.

Limitations:

- The sampling frame for PIFS does not include all births in the Region of Peel because not all women consent to have their data collected at the time of birth.

Surveillance Data

Congenital Anomalies

The Canadian Congenital Anomalies Surveillance System (CCASS) is operated by the Public Health Agency of Canada (PHAC). Until 2000, CCASS captured congenital anomaly (CA) cases diagnosed in acute care hospitals in infants from birth through the first year of life. Data collected between 2001 and 2011 came from the Canadian Institute for Health Information (CIHI), and were based on anomalies identified within the first month of life. Starting in 2012, Ontario congenital anomaly data are submitted to CCASS by the Better Outcomes Registry and Network (BORN) Ontario, and include identification of anomalies up to one year after birth.

Limitations:

- The total number of live births given by CCASS is different from that of the Office of the Registrar General. This may be due to the inclusion of out-of-province births. Since the numbers and rates are taken from the data as provided by CCASS, these rates may differ from those of other reproductive indicators.
- Because there are no unique linkable identifiers kept in the database (to protect confidentiality), the process of matching records of the same individual is difficult, especially when other information is missing. This can result in over-counting the number of cases.

- Pregnancy terminations which occur as a result of the detection of congenital anomalies through prenatal testing started to be included in the 2012 BORN Ontario data.
- Data are influenced by factors that are unrelated to health status such as availability and accessibility of care, and administrative policies and procedures.

Integrated Public Health Information System (iPHIS)

In Ontario, the integrated Public Health Information System (iPHIS) is used for reporting case information on all diseases of public health significance (DOPHS) for provincial and national surveillance, as mandated under the Health Protection and Promotion Act (HPPA). Each public health unit is responsible for collecting case information on DOPHS occurring within their boundaries and entering information into iPHIS. Cases are classified in iPHIS according to the Ontario Ministry of Health and Long-Term Care case definitions.

Under the authority of the HPPA, Ontario Regulation 135/18, designated that communicable diseases or suspected occurrences of these diseases must be reported to the local health unit by physicians, laboratories, administrators of hospitals, schools and institutions.

Limitations:

- Comparison of trends for specific diseases before and after 2009 must be interpreted with caution due to changes in case definitions.
- There may be considerable under-reporting of actual cases for some diseases in iPHIS. For instance, when an infected person has mild clinical symptoms they may not seek medical care and/or laboratory testing may not be performed.

Panorama

Panorama is a provincial database supported by eHealth Ontario that links Ontario health units and the Ontario Government Pharmacy and Medical Supply Service (OGPMSS). There are two active modules in Panorama: Immunization and Inventory. The Immunization module provides tools to create and manage immunization information and evaluate immunization coverage. The Inventory module manages OGPMSS product inventory and supports vaccine cold chain maintenance.

Limitations:

- As residents move between different health units there can be duplicate records that require reconciliation in Panorama.
- Data quality of demographic information is based on what is provided through school board imports, immunization consent collection and client reporting.
- Immunization coverage only reflects information that was communicated to Public Health.

Region of Peel – Public Health Enhanced Surveillance Data for Select Travel Diseases (program database)

The Enhanced Surveillance Data for Select Travel Diseases is collected by the Region of Peel – Public Health and is used for reporting additional travel information that cannot be entered into iPHIS. These data are collected for the following reportable communicable diseases which are mandated under the Health Protection and Promotion Act (HPPA): hepatitis A, typhoid fever, paratyphoid fever and malaria (as of 2018, malaria is no longer listed as a disease of public health significance).

Limitations:

- Travel information is based on self-report and may not have been available for cases that were lost to follow-up.
- Cases may not have been asked all questions about their travel risks.

Region of Peel – Public Health Enhanced Sexually Transmitted Infection Risk Factor Surveillance (program database)

The Enhanced Sexually Transmitted Infection Risk Factor Surveillance data are collected by the Region of Peel – Public Health and is used for reporting additional risk factor information that cannot be entered into iPHIS. These data are collected for the following reportable communicable diseases which are mandated under the Health Protection and Promotion Act (HPPA): Gonorrhea, infectious syphilis, and HIV/AIDS.

Limitations:

- Risk factors are based on self-report by the client.
- Due to the complex nature of case management, cases may not have been asked all questions about their risk factors. As a result, the denominator for each risk factor may vary.

Region of Peel – Public Health Beach Water Quality Database (program database)

The Region of Peel – Public Health conducts routine surveillance and inspections of public beaches, communicates test results and recommended actions to beach operators, and communicates information on the status of public beaches to the public. Beach water quality is assessed by measuring the concentration of *Escherichia coli* in water samples, as well as observing environmental conditions such as temperature, rainfall, water clarity, and pollution sources. The Region of Peel – Public Health conducts routine water testing for five public beaches: Caledon Teen Ranch, Jack Darling Park, Lakefront Promenade Park, Professor's Lake, and Richard's Memorial Park.

Limitations:

- Beach water quality is highly variable and depends on various factors including weather conditions. Because of the time delay to receive laboratory test results (up to 24 hours after sample collection), results may not be indicative of the current beach water quality.
- Frequency of beach water testing varies between beaches (e.g., Caledon Teen Ranch is tested once a week, whereas other beaches are tested more frequently). Comparison across beaches should not be conducted.
- Use caution when comparing data across years as reporting requirements may vary.

Other Data

Population Estimates

The population estimates used to calculate rates are produced by the Demography Division, Statistics Canada, and are based on the 1986, 1991, 1996, 2001, 2006 and 2011 census counts adjusted for net under-coverage. Population estimates for 1986 to 2000 are final inter-censal estimates that were interpolated using the adjusted census counts from the 2006 census; population estimates for 2001 to 2012 use the 2011 census. Population estimates for 2012 onwards are extrapolated by applying the growth rates by age and sex of each Census Division (CD) to the Census Subdivisions that comprise that CD.

Statistics Canada estimates what the population is on July 1st each year. Post-censal estimates are based on the most recent census counts adjusted for net under-coverage and changes in the population between Census Day and July 1st. These estimates consider data on births, deaths, international migration and internal migration when these data are available (component method). Preliminary estimates using a regression model are released for current years and then revised using the component method. When the population estimates for a new census year are ready, post-censal estimates for the years between the last two censuses are revised as inter-censal estimates. Population estimates are available at the Census Subdivision (CSD) level.

Limitations:

- Because of the delay in updating population estimates following a census, estimates may differ from the census counts.

Population Projections

Two sources for population projections were used in this report, those produced by the Ministry of Finance and those produced by Hemson Consulting Ltd. The methodology used for each of these projections is different.

Ministry of Finance

Projections are produced for July 1st of each year for the 30-year period following every Census using the cohort-component method. A base population is produced for one year by age group and sex from Statistics Canada's population estimates. A separate analysis and projection is produced for each component of population growth – births, deaths, migration (including immigration, net emigration, net change in non-permanent residents, interprovincial in- and out-migration, and intraprovincial in- and out-migration). These figures are added to the base population for each age and sex group to obtain the population for the subsequent year. This methodology is completed for each census division in Ontario. The sum of the projections for each of the census divisions is the Ontario-level total.

Population projections are available at the provincial, LHIN and census division level.

The population projections are updated periodically using the following population estimates from Statistics Canada – preliminary postcensal, updated postcensal and final postcensal. These updates result in slight differences in the population projections.

Hemson Consulting Ltd.

Hemson Consulting Ltd. is contracted to produce population forecasts for the Region of Peel, three municipalities (Brampton, Mississauga and Caledon), Ward and Census Tract (CT). This includes an age structure forecast by single year of age for all census years between 2016 and 2041.

The population forecasts of growth for the Region of Peel as a whole are based on total populations at 2031 and 2041 contained in Schedule 3 of the Growth Plan for the Greater Golden Horseshoe (Growth Plan) completed in 2013. In addition to births, deaths, and migration (used by the Ministry of Finance projections), Hemson projections consider the Region's Growth Management Regional Official Plan Amendment (ROPA), which includes planned housing development and growth. These estimates are determined using Small Geographic Units (SGU) which are then used to determine the projections for each Census Tract, Ward, Municipality, and the Region.

The forecast age structure for each Census year and each five-year age group is based on the application of a standard cohort survival model, which accounts for the death rate, fertility rate, and migration. To obtain a population age structure by single year of age, the populations within the five-year age groups are interpolated based on the single-year pattern.

Limitations:

- The population projections are founded in demographic assumptions about recent trends in births, deaths and migration over the projection period. Therefore, there is a degree of uncertainty, which can range from low- to high-growth scenarios. The population projections provided by the Ministry of Finance represent the medium-growth scenario.
- The Hemson population forecasts are available for geographies within Peel only and cannot be compared with projections from other locations.
- The methodology used for the Hemson population forecasts is different than those used by the Ministry of Finance and therefore the population projections and population forecasts are not directly comparable.

Chapter 13

Data Methods

GENERAL METHODS

This chapter describes general and chapter speific methods used throughout this report.

Rounding

Values are presented to one decimal of precision for most tables and figures in this report while values in the text of the report are rounded to the nearest whole number. Due to rounding, some values may not sum to 100%.

Confidence Intervals

In this report, 95% confidence intervals are used as a conservative method to determine statistical significance regarding differences between groups (e.g., age groups, immigrant status categories). When the 95% confidence interval of the estimate for one group does not overlap with that of the estimate for another group, the difference between the estimates is considered statistically significant. If the confidence intervals of two estimates do overlap, the estimates may still be significantly different. However, an appropriate statistical test would be required to assess whether there is a statistical difference between the two estimates. We did not conduct additional tests to determine significance in this report and therefore we acknowledge that some differences between groups may have been missed. However, our intention was to provide general descriptive statistical analyses and not accept or reject specific hypotheses.

Data Releasability

To ensure confidentiality, data were suppressed under the following conditions:

Canadian Community Health Survey:

- "* Use estimate with caution" is noted when the coefficient of variation (%) is between 16.6 and 33.3; and
- if unweighted numerators or counts are less than 10 respondents, or if unweighted denominators are less than 20 respondents, or when the coefficient of variation (%) is greater than 33.3, this is noted within the report as "NR - not releasable due to small numbers."

Ontario Student Drug Use and Health Survey:

- "* Use estimate with caution" is noted when the coefficient of variation (%) is between 16.6 and 33.3.
- if unweighted numerators or counts are less than ten respondents or when the coefficient of variation (%) is greater than 33.3, this is noted within the report as "NR - not releasable due to small numbers";

Rapid Risk Factor Surveillance System:

- "* Use estimate with caution" is noted when the coefficient of variation (%) is between 16.6 and 33.3;
- if unweighted numerators or counts are less than five respondents, or
- if unweighted denominators are less than 30 respondents, or when the coefficient of variation (%) is greater than 33.3, this is noted within the report as "NR = not releasable due to small numbers."

Better Outcomes Registry and Network:

- "NR – not releasable due to small numbers" is noted when the number for a cell is less than six.

Missing Data

For analyses using the Canadian Community Health Survey and the Ontario Student Drug Use and Health Survey, missing responses were excluded from the analyses, unless the missing responses were greater than five per cent of the total. When five per cent or greater of the total respondents were missing for an outcome of interest, these missing values were included in the analysis and a note was added below the results to indicate the percentage of missing responses.

For analyses using the Rapid Risk Factor Surveillance System, "do not know" or "refused" responses are excluded, unless "do not know" is a valid response option. When five per cent or greater of the total respondents were missing for a RRFSS outcome of interest, a note below the results indicates the percentage of missing responses.

For analysis using data from the Better Outcomes Registry and Network and Live Births, missing values were included in the denominator, regardless of the per cent missing. This is due to a high proportion of missing data for some BORN variables, and to prevent variability in the denominators. The following rules were applied for missing data:

- <10% missing – Release.
- ≥10% to <30% – Release with a "* Use with caution" statement.
- ≥30% – Data should not be released.

Standardized Rates

A standardized rate expresses the frequency of a disease or condition that would be observed if the population had the same distribution (e.g., age and/or sex) as the "standard population." A standardized rate is a hypothetical summary rate which allows for comparison between two or more populations (e.g., different geographic areas or by year).

Comparison of crude rates for two or more different populations is difficult because the underlying structure of the populations may be different and therefore the differences observed between crude rates may be solely due to this different structure. For example, crude death rates due to cancer will be lower in a younger population than they would be in an older population.

Throughout this report, the 2011 Canadian population is used as the "standard population" to calculate age-standardized rates using the direct method.

International Classification of Diseases

The Ninth Revision of the International Classification of Diseases (ICD-9) and Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems, Canada (ICD-10-CA) were used throughout the report to describe diseases for emergency department visits, hospitalizations, deaths and stillbirths.

As changes in the coding system may cause artificial changes in the number of cases of a particular cause or illness, trends for specific causes must be interpreted with caution. These were noted in the text when applicable.

Criteria and definitions, including ICD codes, for indicators throughout the report are available upon request.

Mapping Methods

Peel Health Data Zones are defined geographic areas within Peel that are smaller than the municipality level. Peel Health Data Zones use Census Tracts as the building blocks, and where possible, respect natural and human-made boundaries such as rivers, highways and municipal boundaries (i.e., Peel Health Data Zones are entirely within municipalities). Based on 2006 Census data, Peel Health Data Zone populations range from 22,719 to 106,064 people. Additional details about the methods used to create data zones can be found at www.peelregion.ca/health/statusdata/DataSources/HSD12_15.asp.

CHAPTER-SPECIFIC METHODS

The following outlines methods that were specific to particular chapters of the report.

Chapter 3 - General Health Status

Life Expectancy and Health-Adjusted Life Expectancy

Life expectancy estimates the average age at death for a group or cohort at birth. Life expectancy is calculated based on the current death rates experienced by all age groups in the population. Health-adjusted life expectancy accounts for a measure of health-related quality of life. Both measures were calculated using the Life Table template provided by the Association of Public Health Epidemiologists in Ontario (APHEO). This template combines Chiang's [388], adapted for regional/local planning [389], and Hsieh's method for the 90 years and older interval.[390]

Age group-specific death rates were calculated for Peel by sex for 2010 to 2012. Health-related quality of life was estimated using the mean Health Utility Index and calculated by combining data from the 2009/2010 and 2013/2014 Canadian Community Health Survey (CCHS) for Peel and Ontario by five-year age group. Due to small sample size for those aged 90 years and older, the Peel mean Health Utility Index was not reportable; the Ontario value was used for Peel for this age group.

Regression Analysis

In this chapter, a binomial logistic regression model was developed specific to the outcome of having dental insurance.

Dental Insurance

A regression model was developed using Canadian Community Health Survey data from the following years: 2009/2010 and 2013/2014. Having dental insurance was defined as the proportion of respondents who indicated that they had insurance that covers all or part of their dental expenses.

Inclusion and Exclusion Criteria: This model was restricted to residents of the region of Peel who were 15 to 75 years of age; the latter restriction was due to the inclusion of the employment status variable as a predictor, which was limited to individuals within this age group.

The following independent variables were used in the dental insurance regression model:

- **Cycle:** A categorical variable was created to represent the survey cycle from which the data originated. The most recent cycle, 2013/2014, was used as the referent group.
- **Age:** Age was categorized into the following age groups: 15–18, 19–24, 25–34, 35–44, 45–54, 55–64 and 65–75 years.

- **Sex:** Sex was categorized into males and females, with females as the referent category (when applicable).
- **Education level:** Education level was defined as the highest level of education reported by the respondent, with the variable categorized as less than a secondary school graduate, a secondary school graduate, some post-secondary education, and a post-secondary graduate. Respondents who were post-secondary graduates were defined as the referent group.
- **Ethnicity:** The variable for ethnicity was categorized into respondents who identified as the following:
  - White (referent category)
  - Black
  - East or Southeast Asian
  - South Asian
  - Other (West Asian or Arab, Latin American, Indigenous, or other racial/ethnic origins (including multiple origins))
- **Household income level:** Household income level was derived using the total household income and the number of people living in the household.
- **Immigrant status:** A variable for immigrant status was derived using self-reported time since immigration to Canada. Respondents were categorized as recent immigrants (immigrated 10 years ago or less), long-term immigrants (immigrated to Canada 11 years ago or longer) and non-immigrants (Canadian-born respondents).
- **Marital status:** Marital status consists of three categories, with respondents grouped as currently married or in a common-law relationship; separated, divorced, or widowed; and single, never married. The married/common-law category was defined as the referent group.
- **Employment status:** The employment status of respondents was categorized as those who reported being at work in the last week or being absent from work in the last week, and as those who reported having no job in the last week or permanently unable to work. Data for this indicator were limited to respondents aged 15 to 75 years of age.
- **Having one or more of one's own teeth:** This variable consisted of two categories: respondents who reported that they had one or more of their own teeth (referent category), and those who reported that they had none of their own teeth.
- **Children under 18 years of age in household:** The number of household members who were under the age of 18 years was collapsed into three categories: households with zero members under the age of 18, households with one member under the age of 18 and households with two or more members under the age of 18.
- **Rural vs. urban residence:** Rural versus urban location of residence was a dichotomous variable, where respondents were classified based on living in a population centre (urban) or a rural area, as informed by respondents' postal codes and Census geography.

Statistical Analysis

Analyses were performed using Stata statistical software 15.1. All determinants of health variables, as well as additional explanatory variables identified in the literature were considered for inclusion in the analyses. Common variables were identified across each individual Canadian Community Health Survey cycle and were combined to create a merged data set. Changes in questionnaire content across each cycle were considered prior to merging to ensure the appropriateness of combining cycles. For the final binomial logistic regression analyses, a statistical software package within Stata, using bootstrap variance estimation, accounted for the complex sampling design of the Canadian Community Health Survey.

To better understand the distributions of the dependent and independent variables, and to preliminarily explore the relationships between the outcomes and their potential predictors, univariate and bivariate analyses were completed. Independent variables were collapsed where necessary, due to small sample sizes.

Apart from the cycle variable, a block approach was used during model building, where all variables identified a priori were included in the final, fully adjusted binomial logistic regression models. When the outcomes of interest appeared to change over time and/or the unadjusted model indicated that cycle was a significant predictor of the outcome, the cycle variable was forced into the final adjusted models. Cycle was included in the regression models for having dental insurance, being overweight or obese and being a current smoker. Missing data were excluded from the analyses.

Odds ratios and 95% confidence intervals were generated. Model fit was assessed by checking for model specification error and reviewing the standard errors of the effect estimates.

There are several limitations of this analysis:

- Due to their lack of availability in the Canadian Community Health Survey, there were several important potential predictors that could not be included in some of the models (e.g., emotional support or early drinking initiation indicators).
- Some variables of importance were not included because they were not consistently collected or were not measured in a useful way (e.g., language spoken at home changed between cycles and illicit drug use indicators are not available for every cycle).
- Some of the determinants of health may not have been measured in a manner that would reflect distinctions in fair or poor health status.
- The process of combining years of CCHS data will also dilute any changes that might have occurred over the years from 2003 to 2013/2014.
- The combined sample may not be representative of any of the original populations sampled for each cycle – instead, effect estimates reflect the new, combined sample.
- Many regression diagnostic tools were not available when using the function to account for complex sampling design; therefore, a full picture of the model fit is not available.

Emergency Department Visits for Family Practice Sensitive Conditions

Family practice sensitive conditions (FPSC) are emergency department visits for health conditions that could be managed in a family physician's office. Analysis was conducted using the methods described in the 2014 Canadian Institute for Health Information (CIHI) report, Sources of Potentially Avoidable Emergency Department Visits.[77] Emergency department visits were considered a FPSC and included in the numerator if it was an unscheduled visit, the patient was discharged home and was assigned an ICD-10-CA code from a list modified by CIHI (available upon request to CIHI). This list was modified from a list of FPSCs developed by the Health Quality Council of Alberta.[391] In this report, International Classification of Disease Version 10 Chapter 15: Pregnancy, Childbirth and the Puerperium and Chapter 21: Factors influencing health status and contacts with health services were not included in the numerator or denominator.

Hospitalizations for Ambulatory Care Sensitive Conditions

Ambulatory care sensitive conditions (ACSC) are hospitalizations for health conditions that would not have resulted if treated effectively in community settings among individuals less than 75 years old. Analysis was conducted using the methods described in the 2011 Statistics Canada Working Paper, Hospitalizations for Ambulatory Care Sensitive Conditions (ACSC): The Factors that Matter.[78] Briefly, hospitalizations were considered an ACSC and included in the numerator if the patient was less than 75 years of age, discharged home and was assigned an ICD-10-CA code for grand mal status and other epileptic convulsions, chronic obstructive pulmonary disease, acute lower respiratory infection, asthma, diabetes, heart failure and pulmonary edema, hypertension, and angina.

High-Resource Utilization Population Risk Tool

The High-Resource Utilization Population Risk Tool (HRUPoRT) was developed to better understand how high resource users will be distributed by geographic region and demographic groups, project the health system costs, identify targets for prevention, priority setting, decision making and to inform resource planning.

The process of developing the HRUPoRT included linking administrative claims data to Canadian Community Health Survey data for model development (2005 and 2007/2008 CCHS) and validation (2009/2010 CCHS).[80]

HRUPoRT was used in this report to estimate the five-year probability and number of individuals becoming high-resource users using the 2013/2014 CCHS.

Chapter 5 - Health and Behaviours

Population-Attributable Fractions

In this chapter, the population-attributable fraction (PAF) was used to determine the annual number of cases for selected diseases or injuries, hospitalizations, and deaths attributable to smoking and alcohol use.

Relative risks for smoking (Table 13.1) and the per cent of smokers (Table 13.2) were used to determine the population-attributable fraction.

For this analysis, per cent of smokers was categorized as into never, former and current (Table 13.2).

Smoking

Table 13.1
Relative Risks for Diseases by Smoking Status and Sex

	Former Smoker Relative Risk		Current Smoker Relative Risk	
	Male	Female	Male	Female
Cancer				
Lung cancer (morbidity)	4.06	4.06	13.10	13.10
Lung cancer (death)	4.10	4.10	11.50	11.50
Colorectal cancer (morbidity)	1.20	1.20	1.20	1.20
Colorectal cancer (death)	1.22	1.22	1.35	1.35
Stomach cancer (morbidity)	1.18	1.18	1.74	1.74
Stomach cancer (death)	1.31	1.31	1.73	1.73
Pancreatic cancer (morbidity)	1.13	1.13	1.90	1.90
Pancreatic cancer (death)	1.19	1.19	2.19	2.19
Bladder cancer (morbidity)	1.98	1.98	3.37	3.37
Bladder cancer (death)	1.66	1.66	1.89	1.89
Kidney cancer (morbidity)	1.14	1.14	1.29	1.29
Kidney cancer (death)	1.01	1.01	1.32	1.32
Esophageal cancer (morbidity)	2.03	2.03	2.50	2.50
Esophageal cancer (death)	4.46	2.79	6.76	7.75
Acute myeloid leukemia (morbidity)	1.96	1.08	1.77	1.04
Acute myeloid leukemia (death)	1.33	1.38	1.86	1.13
Cervical cancer (morbidity)	NA	1.12	NA	1.60
Cervical cancer (death)	NA	1.14	NA	1.59
Laryngeal cancer (morbidity)	4.65	4.65	6.98	6.98
Laryngeal cancer (death)	6.34	5.16	14.60	13.02
Oral cavity and pharyngeal cancer†	3.40	2.29	10.89	5.08
Other conditions				
Ischaemic heart disease (morbidity)	1.16	1.30	1.95	4.12
Ischaemic heart disease (death)	–	–	–	–
35–64 years	1.64	1.32	2.80	3.08
65+ years	1.21	1.20	1.51	1.60
Other heart disease†	1.22	1.14	1.78	1.49
Cerebrovascular disease (morbidity)	1.08	1.17	1.67	1.83
Cerebrovascular disease (death)	–	–	–	–
35–64 years	1.04	1.30	3.27	4.00
65+ years	1.04	1.03	1.63	1.49

Table 13.1 continues...

Table 13.1 continued

	Former Smoker Relative Risk		Current Smoker Relative Risk	
	Male	Female	Male	Female
Other conditions				
Atherosclerosis†	1.33	1.00	2.44	1.83
Aortic aneurysm†	3.07	2.07	6.21	7.07
Other arterial diseases†	1.01	1.12	2.07	2.17
Bronchitis, emphysema†	15.64	11.77	17.10	12.04
Chronic airway obstruction† (other chronic obstruction pulmonary disease)	6.80	6.78	10.58	13.08
Influenza, pneumonia†	1.36	1.10	1.75	2.17

† RR associated with the outcome of death.

Sources:

Lung, colorectal, stomach, and pancreatic cancer (morbidity and death): Ordonez-Mena et al. Quantification of the smoking-associated cancer risk with rate advancement periods: Meta-analysis of individual participant data from cohorts of the CHANCES consortium; 2016.

Bladder and kidney cancer (morbidity and death): Cumberbatch et al. The Role of Tobacco Smoke in Bladder and Kidney Carcinogenesis: A Comparison of Exposures and Meta-analysis of Incidence and Mortality Risks; 2016.

Esophageal and laryngeal cancer (morbidity): Gandini et al. Tobacco smoking and cancer: A meta-analysis. Int. J. Cancer: 2008; 122, 155–164.

Acute myeloid leukemia (morbidity): Colamesta et al. Do the smoking intensity and duration, the years since quitting, the methodological quality and the year of publication of the studies affect the results of the meta-analysis on cigarette smoking and Acute Myeloid Leukemia (AML) in adults? Critical Reviews in Oncology/Hematology 99 376–388; 2016.

Cervical cancer (squamous cell carcinoma only) (morbidity and death): International Collaboration of Epidemiological Studies of Cervical Cancer (2006). Carcinoma of the cervix and tobacco smoking: Collaborative reanalysis of individual data on 13,541 women with carcinoma of the cervix and 23,017 women without carcinoma of the cervix from 23 epidemiological studies. Int. J. Cancer. 2006; 118, 1481–1495.

Ischaemic heart disease (morbidity): Tolstrup et al. Smoking and Risk of Coronary Heart Disease in Younger, Middle-Aged, and Older Adults. Am J Public Health. 2014; 104:96–102.

Cerebrovascular disease (morbidity): Peters et al. Smoking as a Risk Factor for Stroke in Women Compared with Men - A Systematic Review and Meta-analysis of 81 Cohorts, Including 3 980 359 Individuals and 42 401 Strokes. Stroke. 2013; 44:2821–2828.

Esophageal cancer, acute myeloid leukaemia, laryngeal cancer, oral cavity and pharyngeal cancer, ischaemic heart disease, other heart disease, cerebrovascular disease, atherosclerosis, aortic aneurysm, other arterial diseases, bronchitis and emphysema, chronic airway obstruction and influenza and pneumonia (death): U.S. Department of Health and Human Services. The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014.

The diseases selected were those where strong relative risk data existed between smoking and the disease.

PAFs for incident cases, hospitalizations and deaths were calculated using Peel specific per cent of smokers from Table 13.2 and relative risk estimates from Table 13.1 for inclusion in the following formula:

$$PAF = \frac{p0 + p1(RR1) + p2(RR2) - 1}{p0 + p1(RR1) + p2(RR2)}$$

The most recent five years of data available were used to get an average annual number for inclusion in the calculation.

Table 13.2

Smoking Status by Age group and Sex, Peel, 2009/2010, 2011/2012, 2013/2014 Combined

Age group (years)	Smoking Status								
	Male			Female			Total		
	Never Per cent	Former Per cent	Current Per cent	Never Per cent	Former Per cent	Current Per cent	Never Per cent	Former Per cent	Current Per cent
20+	57.1	22.7	20.2	74.5	15.2	10.3	66.0	18.9	15.1
35+	52.7	27.9	19.5	73.2	17.6	9.2	63.2	22.6	14.2
35–64	54.3	23.5	22.2	72.9	16.7	10.3	63.7	20.1	16.2
65+	45.6	46.8	7.6*	74.2	20.7	5.1*	61.0	32.8	6.3

* Use estimate with caution.
Source: Canadian Community Health Survey Share File, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Alcohol

Relative risks for alcohol consumption (Table 13.4) and the prevalence of alcohol use (Table 13.5) were used to determine the population-attributable fraction.

Table 13.3

Description of Formula Parameters for Smoking Population-attributable Fraction Calculation

Measure	Definition
p0	Percentage of the population by specific age group who are never smokers
p1	Percentage of the population by specific age group who are former smokers compared to never smokers
p2	Percentage of the population by specific age group who are current smokers compared to never smokers
RR1	Relative risk of death or disease for the population who are former smokers compared to never smokers
RR2	Relative risk of death or disease for the population who are current smokers compared to never smokers

Table 13.5

Number of Drinks Consumed by Sex, Peel, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014 Combined

Number of Drinks	Male Per cent	Female Per cent	Total Per cent
0	72.6	87.9	80.4
1	17.3	9.9	13.5
2	5.8	1.6	3.6
3–4	3.4	0.6*	2.0
5–6	0.6*	NR	0.3*
>6	0.3*	NR	0.1*

* Use estimate with caution.
NR – Not reportable due to small numbers.
Source: Canadian Community Health Survey Share File, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Table 13.4

Relative Risks for Diseases by Alcohol Consumption and Sex

Type of Disease	Relative Risk by Number of Drinks Per Day and Sex									
	1		2		3–4		5–6		>6	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Respiratory Disease										
Tuberculosis†	1.00	1.00	1.00	1.00	2.94	2.94	2.94	2.94	2.94	2.94
Lower respiratory infections‡	1.07	1.07	1.14	1.14	1.25	1.25	1.43	1.43	1.79	1.79
Cardiovascular Disease										
Ischaemic heart disease†	0.81	0.81	0.81	0.81	0.86	0.86	0.98	0.98	1.31	1.31
Conduction disorders and other dysrhythmias‡	1.08	1.08	1.17	1.17	1.32	1.32	1.54	1.54	2.02	2.02
Hemorrhagic stroke (morbidity)	1.11	0.71	1.23	0.86	1.44	1.18	1.78	1.78	2.56	3.49
Hemorrhagic stroke (death)	1.10	1.22	1.21	1.49	1.39	2.01	1.68	2.99	2.33	6.02
Ischaemic stroke (morbidity)	0.87	0.82	0.94	0.87	1.07	1.01	1.25	1.31	1.63	2.21
Ischaemic stroke (death)	0.87	0.66	0.95	0.75	1.08	1.05	1.29	1.86	1.70	5.97
Hypertension¥	1.13	0.99	1.28	1.47	1.54	2.61	1.97	5.17	3.03	15.14
Gastrointestinal Disease										
Pancreatitis†	1.03	1.03	1.12	1.12	1.41	1.41	2.33	2.33	9.51	9.51
Liver cirrhosis (morbidity)	1.26	2.39	1.59	3.42	2.22	5.05	3.54	7.66	7.91	13.51
Liver cirrhosis (death)	1.47	3.34	2.15	5.48	3.76	9.38	8.12	16.71	30.69	36.61
Digestive system diseases										
Oral cavity and pharyngeal cancer†	1.42	1.42	1.96	1.96	2.97	2.97	4.68	4.68	7.97	7.97
Esophageal cancer†	1.20	1.20	1.43	1.43	1.87	1.87	2.64	2.64	4.67	4.67
Colon cancer†	1.03	1.03	1.05	1.05	1.09	1.09	1.15	1.15	1.26	1.26
Rectum cancer†	1.05	1.05	1.10	1.10	1.18	1.18	1.30	1.30	1.53	1.53
Liver cancer†	1.10	1.10	1.21	1.21	1.38	1.38	1.60	1.60	1.99	1.99
Laryngeal cancer†	1.21	1.21	1.47	1.47	1.95	1.95	2.81	2.81	4.99	4.99
Other										
Breast†	NA	1.13	NA	1.27	NA	1.52	NA	1.93	2.93	2.93
Epilepsy†	1.19	1.19	1.41	1.41	1.81	1.81	2.52	2.52	4.53	4.53
Diabetes mellitus¥	0.88	0.64	0.88	0.60	0.94	0.96	1.11	8.39	1.72	16.60
Low birth weight‡	1.05	1.05	1.29	1.29	1.84	1.84	3.07	3.07	7.85	7.85

† Relative risk (RR) associated with the outcome of death.
‡ Unknown if RR outcome of morbidity or death.
¥ RR associated with the outcome of morbidity.
NA - Data not available.
Those RR outcomes that are specific to death and to morbidity have been used interchangeably.
Notes: The relative risks described reflect those that were assessed for the creation of the new Canadian low-risk drinking guidelines. It should be noted that while there are other diseases that have been attributed to alcohol use (e.g., cholelithiasis, spontaneous abortion, prematurity, intra-uterine growth restriction, and psoriasis), the relative risks for these conditions were not available by number of drinks per day and are therefore not presented in the results.
Source: Rehm, J; Kekoe, T; Taylor, B; Patra J. Evidence Base for the Development of Canadian Drinking Guidelines. Toronto, Ontario: Centre for Addiction and Mental Health; September 2009.

Table 13.6 describes existing PAFs for injuries related to alcohol. A caveat to using these PAFs for Peel calculations is that they have been derived from other Canadian or Australian studies using the drinking patterns from those contexts. As a result, the calculations that use the Canadian or Australian PAFs may not be the most accurate representation of alcohol-related injury outcomes for Peel.

Table 13.6

Population-attributable Fractions (PAF) for Alcohol by Injury and Sex

Type of injury	Male PAF per cent	Female PAF per cent
Motor vehicle crashes (morbidity)	24	11
Motor vehicle crashes (death)	33	11
Cycling Collisions	20	20
Water transport accidents	20	20
Accidental falls <65 years	22	14
Accidental falls 65+ years	12	4
Accidental excessive cold	25	25
Accidental drowning	34	34
Accidental aspiration	25	25
Striking against, struck by, caught in/between objects	7	7
Occupational and machine	7	7
Accidental firearm	25	25
Suicide, self-inflicted (excluding suicide by alcohol)	32	29
Assault†	47	47

† Defined as a victim of a fight, brawl, rape; assault with firearms or a cutting instrument; or victim of assault other.
Source: Rehm J, Room R, Monteiro M, Gmel G, Graham K, Rehn N, et al. Alcohol use. In: Ezzati M, Lopez A, Rodgers A, Murray C, editors. Comparative Quantification of Health Risks. Global and Regional Burden of Disease Attributable to Selected Major Risk Factors. Volume 1. Geneva: World Health Organization; 2004. p. 959-1108.

The most recent five years of data available were used to get an average annual number for inclusion in the calculation.

For some alcohol-related diseases, the PAFs for incident cases, hospitalizations and deaths were calculated using Peel-specific daily alcohol use prevalence from Table 13.5 and relative risk estimates from Table 13.4 for inclusion in the following formula:

$$PAF = \frac{p0 + p1(RR1) + p2(RR2) + p3(RR3) + p4(RR4) + p5(RR5) - 1}{p0 + p1(RR1) + p2(RR2) + p3(RR3) + p4(RR4) + p5(RR5)}$$

Formula parameters for alchohol-attributable fraction calculations are described in Table 13.7.

Table 13.7

Description of Formula Parameters for Alcohol Population-attributable Fraction Calculation

Measure	Definition
p0	Percentage of the population aged 12 years and older who do not currently drink alcohol
p1	Percentage of the population aged 12 years and older who consume one drink per day
p2	Percentage of the population aged 12 years and older who consume two drinks per day
p3	Percentage of the population aged 12 years and older who consume three to four drinks per day
p4	Percentage of the population aged 12 years and older who consume five to six drinks per day
p5	Percentage of the population aged 12 years and older who consume more than six drinks per day
RR1	Relative risk of death or disease for the population who consume one drink per day compared to non-drinkers
RR2	Relative risk of death or disease for the population who consume two drinks per day compared to non-drinkers
RR3	Relative risk of death or disease for the population who consume three to four drinks per day compared to non-drinkers
RR4	Relative risk of death or disease for the population who consume five to six drinks per day compared to non-drinkers
RR5	Relative risk of death or disease for the population who consume more than six drinks per day compared to non-drinkers

Note: Only RRs greater than 1 were included in the calculation.

Regression Analysis

In this chapter, three separate binomial logistic regression models were developed specific to the outcomes of being overweight or obese, being a current smoker and in binge drinking.

Overweight and Obesity

The regression model was developed using Canadian Community Health Survey data from the following years: 2007/2008, 2009/2010, 2011/2012, 2013/2014. Being overweight or obese was defined as those respondents who had an adjusted Body Mass Index (BMI) of 25 or greater (i.e., with overweight defined as 25-29.9 and obese defined as 30 or greater). BMI values were generated using a statistical model that adjusted for bias in self-report data.

Inclusion and Exclusion Criteria: This model was restricted to those aged 18 to 75 years who were residents of the region of Peel.

Current Smoking Status

A regression model was developed using Canadian Community Health Survey data from the following years: 2007/2008, 2009/2010, 2011/2012, 2013/2014. Smoking status was categorized as current smokers and non-smokers. A current smoker was defined as a person who smoked daily or occasionally, had smoked at least 100 cigarettes in their lifetime and who had smoked in the past 30 days. Respondents who were former smokers (daily and occasional) were grouped with those who had never smoked and were categorized as non-smokers.

Inclusion and Exclusion Criteria: This model was restricted to residents of the region of Peel who were between 18 and 75 years of age.

Binge Drinking

Regression model was developed using Canadian Community Health Survey data from the following years: 2003, 2005, 2007/2008, 2009/2010, 2011/2012, 2013/2014. Binge drinking was defined as the proportion of respondents who reported drinking five or more alcoholic drinks on one occasion at least once a month over the preceding twelve months for data prior to 2013/2014. For 2013/2014 data, binge drinking was defined as having four (females) and five (males) or more drinks on one occasion, at least once per month in the last 12 months.

Inclusion and Exclusion Criteria: This model was restricted to residents of the region of Peel who were 15 to 75 years of age.

Regression Variables

The following independent variables were used in some or all the regression models developed:

- **Cycle:** A categorical variable was created to represent the survey cycle from which the data originated. The most recent cycle, 2013/2014, was used as the referent group.
- **Age:** For the overweight/obese model (ages 18 to 75 years) and current smoking status (ages 18 to 75 years), age was a continuous variable. For the binge drinking model, age was categorized into the following age groups: 15–18, 19–24, 25–34, 35–44, 45–54, 55–64, and 65–75 years.
- **Household income level:** Household income level was derived using the total household income and the number of people living in the household.
- **Education level:** Education level was defined as the highest level of education reported by the respondent, with the variable categorized as less than a secondary school graduate, a secondary school graduate, some post-secondary education, and a post-secondary graduate. Respondents who were post-secondary graduates were defined as the referent group.
- **Ethnicity:** The variable for ethnicity was categorized into respondents who identified as the following:
  - White (referent category)
  - Black
  - East or Southeast Asian
  - South Asian
  - Other (West Asian or Arab, Latin American, Indigenous, or other racial/ethnic origins (including multiple origins))
- **Immigrant status:** A variable for immigrant status was derived using self-reported time since immigration to Canada. Respondents were categorized as recent immigrants (immigrated 10 years ago or less), long-term immigrants (immigrated to Canada 11 years ago or longer) and non-immigrants (Canadian-born respondents).
- **Marital status:** Marital status consists of three categories, with respondents grouped as currently married or in a common-law relationship; separated, divorced, or widowed; and single, never married. The married/common-law category was defined as the referent group.
- **Employment status:** The employment status of respondents was categorized as those who reported being at work in the last week or being absent from work last week, and as those who reported having no job in the last week or permanently unable to work. Data for this indicator were limited to respondents aged 15 to 75 years of age.
- **Sense of community belonging:** This variable was collapsed into two categories: very strong or somewhat strong (referent group), and somewhat weak or very weak.

- **Self-perceived life stress:** Self-perceived life stress was dichotomized into respondents who reported the amount of stress in their life as extremely stressful or quite a bit stressful, and those reporting it as not at all stressful, not very stressful, or a bit stressful (referent category). Data for this indicator were limited to respondents aged 15 years and older in 2003, 2005, and 2007/2008.
- **Self-perceived mental health:** Self-perceived mental health consisted of two categories: excellent, very good, or good mental health; and fair or poor mental health. Respondents reporting excellent, very good, or good mental health were used as the referent category.
- **Self-perceived general health:** Self-perceived general health was collapsed similarly into two groups: excellent, very good, or good general health (referent group); and fair or poor general health.
- **Physical activity level:** Physical activity levels were defined using calculated energy expenditure values and were categorized as active (3.0 kcal/kg/day or more, referent group), moderate (1.5-2.9 kcal/kg/day), and inactive (less than 1.5 kcal/kg/day).
- **Weekly alcohol consumption:** In the overweight/obese and current smoking status models, weekly alcohol consumption was categorized into those who reported consuming alcohol at least once a week during the past 12 months, and those who did not (referent group).
- **Vegetable and fruit consumption:** In the overweight and/obese model, a dichotomous variable for vegetable and fruit consumption was created, which categorized respondents into those who reported consuming vegetables and fruits five or more times per day (referent group), and those who reported consuming vegetables and fruits less than five times per day.
- **Has a regular doctor:** In the current smoking model, this variable consisted of two categories: those who reported that they had a regular medical doctor (referent category), and those who reported that they did not.
- **Smoking status:** In the binge drinking model, this variable consisted of two categories: current smokers and non-smokers (referent category). Current smoker were respondents who smoked daily or occasionally, had smoked at least 100 cigarettes in their lifetime, and who had smoked in the past 30 days. Respondents who were former smokers and those who had never smoked were categorized as non-smokers.
- **Rural vs. urban residence:** Rural versus urban location of residence was a dichotomous variable, where respondents were classified based on living in a population centre (urban) or a rural area, as informed by respondents' postal codes and Census geography.

Statistical Analysis

Details about statistical analysis can be found in data methods for ***Chapter 3 – General Health Status***.

Chapter 7 - Chronic Diseases

Growth in Number of Cases of Selected Chronic Conditions

Trends in the number of new cases of selected chronic conditions (i.e., ischaemic heart disease, cerebrovascular disease, cancer, chronic obstructive pulmonary disease and diabetes) due to changes in disease risk, population growth and population aging were calculated using a method that Cancer Care Ontario uses for their Cancer System Quality Index.[392]

The indicator "growth in new cases of disease" has four components:

- Baseline risk (i.e., number of new cases of disease observed during the baseline year).
- Number of cases attributed to changes in disease rates (calculated by taking the age-specific rate for each year and multiplying it by the age-specific population of the baseline year).
- Number of cases of disease due to population growth (assumes that each year has the same age distribution as the baseline year. The age-specific rates for each year are then applied to that year's population with the modified age structure).
- Number of cases due to population aging (the difference between the observed number of cases of disease and the number attributed to population growth).

The growth in the number of new cases between 1996 and 2015 was calculated using this method with the exception of cancer which was calculated for 1986 to 2012.

Chapter 9 - Infectious Diseases

For the top reportable diseases ranked by laboratory-confirmed case counts, ICD-10 codes were determined using a combination of codes from The Ontario Burden of Infectious Diseases Study (ONBOIDS) and the Ministry of Health and Long-Term Care Infectious Diseases Protocol Appendix B: Provincial Case Definitions for Diseases of Public Health Significance.

For cancer associated with infectious agents, ICD-O-3 codes were obtained from the Burden of Cancer Caused by Infections in Ontario report.[325]

Chapter 10 - Environment and Health

Emergency Department Visits

ICD-10 codes used for extreme-weather related emergency department visits were recommended by Public Health Ontario.[393] Rates only include emergency department visits coded as having a weather-related external cause.

Population and Sites Located within 300 Meters of High Traffic Volume Roads

Table 10.2 summarizes the number and per cent of the population and sites where vulnerable populations may be subjected to poor air quality as a result of being located within 300 meters of high traffic volume roads. Data were prepared by the Population Health Assessment Team, Office of the Medical Officer of Health, Region of Peel - Public Health on April 13, 2013 and used 2011 Census data to estimate the population being exposed.

- **Schools:** The shapefile for schools was filtered to exclude Board office and other specialized institutions, colleges and universities. The shapefile was based on address points, not polygons representing the property boundary of a given institution. For this reason, a 50 metre buffer zone was calculated around each point, and the resulting polygons were intersected with the major road buffer zones to determine which facilities were in close proximity to high volume traffic corridors.
- **Recreation centres:** The shapefile for Active Recreation was filtered to include both outdoor and indoor recreation facilities (e.g., aqua centres, arenas, community centres, golf courses, indoor or outdoor swimming pools, playing fields). Parks, playgrounds, splash pads and other playground equipment were excluded from this group, although the properties may overlap (e.g., swings located outside a recreation centre). The shapefile was based on polygons representing the property boundary of a given facility, and their polygons were intersected with the major road buffer zones to determine which facilities were in close proximity to high-volume traffic corridors.
- **Parks and playgrounds:** The shapefile for Active Recreation was filtered to include only parks (both provincial and municipal) and playground equipment such as climbing apparatus, playsets, swings, splashpads and wading pools, although the properties may overlap with other sports field locations. The shapefile was based on polygons representing the property boundary of a given facility, and their polygons were intersected with the major road buffer zones to determine which facilities were in close proximity to high volume traffic corridors.
- **Licensed daycares:** Seven childcare centres were excluded from the shapefile for Childcare because they are located outside of Peel's boundaries. These data were also based on address points, so a 50 metre buffer zone was calculated around each point, and the resulting polygons were intersected with the major road buffer zones as done with schools.
- **Long-term care facilities:** Data from the shapefile for Landmarks, filtered for long-term care facilities, were based on address points, so a 50 metre buffer zone was calculated around each point, and the resulting polygons were intersected with the major road buffer zones as done with schools.

Chapter 14

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Chapter 15

Text References

TEXT REFERENCES

1. What is the population health approach? [Internet].: Government of Canada [updated February 7, 2012; cited July 13, 2018]. Available from: https://www.canada.ca/en/public-health/services/health-promotion/population-health/population-health-approach.html.
2. Peel (Ont.: County. A history of Peel County, 1867-1967: To mark its centenary as a separate county. Brampton, Ontario: Brampton: County; 1967.
3. Bull WP. From medicine man to medical man; A record of a century and a half of progress in health and sanitation as exemplified by developments in Peel. Toronto, Canada: The Perkins Bull Foundation, G. McLeod ltd.; 1934.
4. Fedak KM, Bernal A, Capshaw ZA, Gross S. Applying the Bradford Hill criteria in the 21st century: How data integration has changed causal inference in molecular epidemiology. Emerg Themes Epidemiol. 2015 Sep 30;12:14,015-0037-4. eCollection 2015.
5. Ministry of Health and Long-Term Care. Protecting and promoting the health of Ontarians. Ontario Public Health Standards: Requirements for programs, services, and accountability. Toronto, ON: Government of Ontario; January 1, 2018.
6. Canadian Institute for Health Information (CIHI). In pursuit of health equity: Defining stratifiers for measuring health inequality - A focus on age, sex, gender, income, education and geographic location. Ottawa, ON: CIHI; 2018.
7. What makes Canadians healthy or unhealthy? [Internet]. Ottawa, ON: Government of Canada [updated January 1, 2013; cited August 22, 2018]. Available from: https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health/what-makes-canadians-healthy-unhealthy.html#physenviron.
8. The Regional Municipality of Peel. The Peel water story: A water curriculum resource for Peel schools. Brampton, Ontario: The Regional Municipality of Peel; 2006.
9. Public Health Agency of Canada. The chief public health officer's report on the state of public health in Canada 2017: Designing healthy living. Ottawa, Ontario: Public Health Agency of Canada; 2017.
10. Ewing R, Hamidi S. Measuring urban sprawl and validating sprawl measures. Metropolitan Research Centre.
11. Filipowicz J. Room to grow: Comparing urban density in Canada and abroad. Fraser Research Bulletin. 2018:1-14.
12. Ministry of Municipal Affairs. Growth plan for the greater golden horseshoe (2017). Government of Ontario; 2017.
13. Lee AC, Jordan HC, Horsley J. Value of urban green spaces in promoting healthy living and wellbeing: Prospects for planning. Risk Manag Healthc Policy. 2015 Aug 27;8:131-7.
14. Lee AC, Maheswaran R. The health benefits of urban green spaces: A review of the evidence. J Public Health (Oxf). 2011 Jun;33(2):212-22.

15. Wellesley Institute. Housing and health: Examining the links. Toronto, ON: Wellesley Institute; March 2012.
16. Region of Peel. Annual housing system report. 2015.
17. Public and Safety Information Branch Historical Committee. Footpaths to freeways: The story of Ontario's roads: Ontario's bicentennial, 1784-1984. 1st edition. Ontario Ministry of Transportation and Communications; 1984.
18. Moudon AV, Lee C, Cheadle AD, Garvin C, Johnson D, Schmid TL, et al. Operational definitions of walkable neighborhood: Theoretical and empirical insights. J Phys Act Health. 2006 Feb;3(s1):S99-S117.
19. Dunn J, Creatore M, Peterson E, Weyman J, Glazier R. Final report: Peel healthy development index. December, 2009.
20. Explore Peel: An interactive timeline [Internet].: Region of Peel; [cited July 23, 2018]. Available from: http://www.peelregion.ca/planning-maps/SettlementHistory.
21. Morency C, Trepanier M, Demers M. Walking to transit: An unexpected source of physical activity. Transport Policy. 2011;18(6):800-6.
22. Wener, RE, Evans GW, Lutin J. In: American Public Association Rail Conference, editor. Leave the driving to them: Comparing stress of car and train commuters. June 11-14, 2006; New York, NY.
23. Ulman S. 2018;Specialist, Water Quality and Compliance, Public Works, Region of Peel.
24. Phillips SP. Defining and measuring gender: A social determinant of health whose time has come. Int J Equity Health. 2005 Jul 13;4:11,9276-4-11. doi: 10.1186/1475-9276-4-11 .
25. Smylie J, Firestone M. Our health counts - urban indigenous health database project. Ottawa, ON: July 2017.
26. Rotondi MA, O'Campo P, O'Brien K, Firestone M, Wolfe SH, Bourgeois C, et al. Our health counts Toronto: Using respondent-driven sampling to unmask census undercounts of an urban indigenous population in Toronto, Canada. BMJ Open. 2017;7:e018936.
27. Chawla R. Dependency ratios: An international comparison. Perspectives on Labour and Income. Summer, 1990;2(2):50-7.
28. Williams C. The sandwich generation. Canadian Social Trends. 2005:16. Summer; 519:16-21.
29. Dependency ratio [Internet].: Statistics Canada [updated September 28, 2016; cited April 30, 2018]. Available from: http://www.statcan.gc.ca/pub/82-229-x/2009001/demo/dep-eng.htm.
30. Definitions of sex and gender [Internet].: Government of Canada [updated June 17, 2015; cited July 20, 2018]. Available from: http://www.cihr-irsc.gc.ca/e/47830.htm.
31. American Psychological Association. Guidelines for psychological practice with lesbian, gay, and bisexual clients. Am Psychol. 2012 Jan;67(1):10-42.
32. Dharma C, Bauer GR. Understanding sexual orientation and health in Canada: Who are we capturing and who are we missing using the Statistics Canada sexual orientation question? Can J Public Health. 2017 Apr 20;108(1):e21-6.

33. Marmot M, Ryff CD, Bumpass LL, Shipley M, Marks NF. Social inequalities in health: Next questions and converging evidence. Soc Sci Med. 1997 Mar;44(6):901-10.

34. Winkleby MA, Jatulis DE, Frank E, Fortmann SP. Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. Am J Public Health. 1992 Jun;82(6):816-20.

35. Doornbos G, Kromhout D. Educational level and mortality in a 32-year follow-up study of 18-year-old men in the Netherlands. Int J Epidemiol. 1990 Jun;19(2):374-9.

36. Kunst AE, Mackenbach JP. The size of mortality differences associated with educational level in nine industrialized countries. Am J Public Health. 1994 Jun;84(6):932-7.

37. Matthews KA, Kelsey SF, Meilahn EN, Kuller LH, Wing RR. Educational attainment and behavioral and biologic risk factors for coronary heart disease in middle-aged women. Am J Epidemiol. 1989 Jun;129(6):1132-44.

38. Krokstad S, Kunst AE, Westin S. Trends in health inequalities by educational level in a Norwegian total population study. J Epidemiol Community Health. 2002 May;56(5):375-80.

39. Scharoun-Lee M, Adair LS, Kaufman JS, Gordon-Larsen P. Obesity, race/ethnicity and the multiple dimensions of socioeconomic status during the transition to adulthood: A factor analysis approach. Soc Sci Med. 2009 Feb;68(4):708-16.

40. Galobardes B, Shaw M, Lawlor DA, Lynch JW, Davey Smith G. Indicators of socioeconomic position (part 1). J Epidemiol Community Health. 2006 Jan;60(1):7-12.

41. Janus M, Viveiros H, Duku E O, D. In: School readiness to learn and neighbourhood characteristics. April 24-27, 2003; Tampa, Florida. SRCS Biennial Meeting.

42. Peel District School Board annual report, 2016-17 [Internet]. Mississauga, Ontario, Canada: Peel District School Board; [cited August 22, 2018]. Available from: http://www.peelschools.org/aboutus/annualreport/Pages/default.aspx.

43. Dufferin-Peel Catholic District School Board. Director's annual report 2015-2016. Mississauga, Ontario, Canada: 2016.

44. Evans R, Barer M, Marmor T, editors. Why are some people healthy and others not? The determinants of health of populations. New York, NY: Routledge; 1994.

45. Galobardes B, Shaw M, Lawlor DA, Lynch JW, Davey Smith G. Indicators of socioeconomic position (part 2). J Epidemiol Community Health. 2006 Feb;60(2):95-101.

46. Dictionary, Census of population, 2016. [Internet].: Statistics Canada [updated April 26, 2017; cited July 13, 2018]. Available from: http://www12.statcan.gc.ca/census-recensement/2016/ref/dict/pop108-eng.cfm?wbdisable=true.

47. Section 2: Determining labour force status [Internet].: Statistics Canada [updated March 23, 2010; cited July 23, 2018]. Available from: https://www.statcan.gc.ca/pub/71-543-g/2010001/part-partie2-eng.htm.
48. Table 14-10-0029-01 part-time employment by reason, annual (x 1,000) [Internet].: Statistics Canada [updated August 23, 2018; cited August 22, 2018]. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410002901.
49. McIntosh CN, Fines P, Wilkins R, Wolfson MC. Income disparities in health-adjusted life expectancy for Canadian adults, 1991 to 2001. Health Rep. 2009 Dec;20(4):55-64.
50. Wilkins R, Berthelot J, Ng E. Trends in mortality by neighbourhood income in urban Canada from 1971 to 1996. Supplement to Health Reports. 2002;13:1-28.
51. Stratton J, Mowat DL, Wilkins R, Tjepkema M. Income disparities in life expectancy in the city of Toronto and Region of Peel, Ontario. Chronic Dis Inj Can. 2012 Sep;32(4):208-15.
52. Ostrovsky Y. Doing as well as one's parents? Tracking recent changes in absolute income mobility in Canada. Economic Insights. 2017 May(073):1-6.
53. Statistics Canada. Household income in Canada: Key results from the 2016 Census. The Daily. 2017.
54. Income Statistics Division, Statistics Canada. Low income cut-offs for 2008 and low income measures for 2007. Ottawa, Ontario, Canada: Statistics Canada; 2009.
55. Burton P, Phipps S. Economic well-being of Canadian children. Canadian Public Policy. 2017;43(4):299-330.
56. Kim H. Statistics Canada, joint custody income; case ID 869779. May 8, 2018.
57. Housing affordability [Internet].: Statistics Canada [updated September 28, 2016; cited July 20, 2018]. Available from: https://www.statcan.gc.ca/pub/82-229-x/2009001/envir/hax-eng.htm.
58. Luffman J. Measuring housing affordability. Perspectives on Labour and Income. November 2006;7(11): 16-26.
59. Ng E, Pottie K, Spitzer D. Official language proficiency and self-reported health among immigrants to Canada. Health Rep. 2011 Dec;22(4):15-23.
60. Population and Public Health Division, Ministry of Health and Long-Term Care. Relationship with Indigenous communities guideline, 2018. Toronto: Government of Ontario; 2018.
61. Ng E, Wilkins R, Gendron F, Berthelot J. The changing health of immigrants. Canadian Social Trends. Autumn 2005:15-9.
62. Ng E. The healthy immigrant effect and mortality rates. Health Rep. 2011 Dec;22(4):25-9.
63. Ng.E., LHAD research team. Health research working paper series: Insights into the healthy immigrant effect: Mortality by period of immigration and birthplace. Ottawa, ON: Statistics Canada; 2011. Report No.: 82-622-X.
64. Ng E, Sanmartin C, Tu JV, Manuel DG. All-cause and circulatory disease-related hospitalization, by generation status: Evidence from linked data. Health Rep. 2015 Oct;26(10):3-9.

65. Ali J. Mental health of Canada's immigrants. Health Rep. 2002;13(Suppl.):1-11.

66. Lou Y, Beaujot R. What happens to the 'healthy immigrant effect': The mental health of immigrants to Canada. PSC Discussion Paper Series. 2005;19(15).

67. Wu Z, Schimmele CM. The healthy migrant effect on depression: Variation over time? Canadian Studies in Population. 2005;32(2):271-95.

68. Perez C. Health status and health behaviour among immigrants. Supplement to Health Reports, Volume 13. Statistics Canada; 2002.

69. Martel L, D'Aoust C. Permanent and temporary immigration to Canada from 2012 to 2014. Statistics Canada; 2016.

70. Mossey JM, Shapiro E. Self-rated health: A predictor of mortality among the elderly. Am J Public Health. 1982 Aug;72(8):800-8.

71. Mansson NO, Merlo J. The relation between self-rated health, socioeconomic status, body mass index and disability pension among middle-aged men. Eur J Epidemiol. 2001;17(1):65-9.

72. Rumsfeld JS, MaWhinney S, McCarthy M,Jr, Shroyer AL, VillaNueva CB, O'Brien M, et al. Health-related quality of life as a predictor of mortality following coronary artery bypass graft surgery. Participants of the Department of Veterans Affairs cooperative study group on processes, structures, and outcomes of care in cardiac surgery. JAMA. 1999 Apr 14;281(14):1298-303.

73. Idler EL, Benyamini Y. Self-rated health and mortality: A review of twenty-seven community studies. J Health Soc Behav. 1997 Mar;38(1):21-37.

74. Goldstein MS, Siegel JM, Boyer R. Predicting changes in perceived health status. Am J Public Health. 1984 Jun;74(6):611-4.

75. DeSalvo KB, Bloser N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health question. A meta-analysis. J Gen Intern Med. 2006 Mar;21(3):267-75.

76. Frequency of eye examinations [Internet]. Ottawa, ON: Canadian Association of Optometrists; 2017; cited September 20, 2018]. Available from: *https://opto.ca/health-library/frequency-of-eye-examinations.*

77. Canadian Institute for Health Information. Sources of potentially avoidable emergency department visits report. Ottawa, ON: Canadian Institute for Health Information; November 2014.

78. Sanmartin C, Khan S. Hospitalizations for ambulatory care sensitive conditions (ACSC): The factors that matter. Ottawa, ON: Minister of Industry; June 2011.

79. Ambulatory care sensitive conditions [Internet].: Canadian Institute for Health Information [updated 1996-2018; cited September 21, 2018]. Available from: *http://indicatorlibrary.cihi.ca/display/HSPIL/Ambulatory+Care+Sensitive+Conditions.*

80. Rosella LC, Kornas K, Yao Z, Manuel DG, Bornbaum C, Fransoo R, et al. Predicting high health care resource utilization in a single-payer public health care system: Development and validation of the high resource user population risk tool. Med Care. 2018 Oct;56(10):e61-9.

81. Rosella LC, Fitzpatrick T, Wodchis WP, Calzavara A, Manson H, Goel V. High-cost health care users in Ontario, Canada: Demographic, socio-economic, and health status characteristics. BMC Health Serv Res. 2014 Oct 31;14:532,014-0532-2.
82. Region of Peel - Public Health. Nurturing the next generation foundational report. Mississauga, Ontario: Region of Peel; June 2017.
83. 2016 Census of population long-form guide [Internet]. Ottawa, Ontario: Statistics Canada [updated November 27, 2017; cited September 20, 2018]. Available from: : *http://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=getInstrumentList&Item_Id=295122&UL=1V&.*
84. Hou F, Margolis R, Haan M. Estimating parental leave in Canada using administrative data. Statistics Canada; August 27, 2017.
85. Region of Peel - Human Services. Statistical profile of Peel's early years and child care system: Year-end 2017. 2017.
86. Macdonald D, Friendly M. Time out: Child care fees in Canada 2017. Canadian Centre for Policy Alternatives; 2017.
87. Age and fertility [Internet].: The Society of Obstetricians and Gynaecologists of Canada (SOGC); [cited June 22, 2018]. Available from: *http://pregnancy.sogc.org/fertility-and-reproduction/age-and-fertility/.*
88. World Health Organization. Meeting to develop a global consensus on preconception care to Reduce Maternal and child mortality and morbidity: World Health Organization headquarters, geneva, February 6-7, 2012: Meeting report. Geneva, Switzerland: World Health Organization; 2013.
89. Rasmussen KM, Yaktine AL, editors. Weight gain during pregnancy: Reexamining the guidelines. Washington, D.C.: The National Academies Press; 2009.
90. DynaMed Plus. Record no. 909503, obesity in pregnancy. [Internet] April 19, 2017 [cited October 19, 2017]:about 30 screens.
91. DynaMed Plus. Record no. 116522, hypertensive disorders of pregnancy. [Internet] September 11, 2017 [cited October 17, 2017]:about 67 screens.
92. Bushnik T, Cook JL, Yuzpe AA, Tough S, Collins J. Estimating the prevalence of infertility in Canada. Hum Reprod. 2012 Mar;27(3):738-46.
93. Pregnancy [Internet].: BORN Ontario; 2018; [cited October 10, 2018]. Available from: *https://www.bornontario.ca/en/about-born/governance/annual-reports/2014-2016-annual-report/facts-from-ontario/.*
94. Folic acid and neural tube defects [Internet].: Government of Canada; January 29, 2018; [cited July 24, 2018]. Available from: *https://www.canada.ca/en/public-health/services/pregnancy/folic-acid.html.*
95. Wilson RD, Genetics Committee, MOTHERISK. Pre-conceptional vitamin/folic acid supplementation 2007: The use of folic acid in combination with a multivitamin supplement for the prevention of neural tube defects and other congenital anomalies. J Obstet Gynaecol Can. 2007 Dec;29(12): 1003-13.
96. Muresan J, Carkner J, Morin C, Machado D. Outcomes associated with weight gain during pregnancy: A rapid review. Region of Peel - Public Health; 2017.

97. DynaMed Plus. Record no. 116237, gestational diabetes mellitus (GDM). [Internet] June 29, 2017 [cited October 17, 2017].

98. U.S. Department of Health and Human Services. How tobacco smoke causes disease: The biology and behavioral bases for smoking attributable disease: A report of the Surgeon General. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2010.

99. Snapshots: Toronto Public Health: Parent or partner with mental illness 2016 [Internet].: Public Health Ontario [updated September 29, 2017; cited April 20, 2018]. Available from: *https://www.publichealthontario.ca/en/DataAndAnalytics/Snapshots/Pages/Risk-factors-healthy-child-development.aspx.*

100. Public Health Agency of Canada. Canadian guidelines on sexually transmitted infections - 2008 edition. Ottawa, Ontario: Public Health Agency of Canada; 2008.

101. Money D, Allen VM, Infectious Diseases Committee. The prevention of early-onset neonatal group B streptococcal disease. J Obstet Gynaecol Can. 2013 Oct;35(10):939-48.

102. Castillo E, Poliquin V. No. 357-immunization in pregnancy. J Obstet Gynaecol Can. 2018 Apr;40(4):478-89.

103. Ontario perinatal record user guide [Internet].: Provincial Council for Maternal and Child Health (PCMCH) and The Better Outcomes Registry & Network (BORN) Ontario Perinatal Record Working Group; [August 2018; cited September 26, 2018]. Available from: *http://www.pcmch.on.ca/wp-content/uploads/2018/08/OPR_UserGuide_2018Update_Final_18-08-22.pdf.*

104. Ontario Ministry of Health and Long-Term Care. Infectious disease protocol. appendix A: Disease-specific chapters. chapter: Group B streptococcal disease, neonatal. Revised January 2014. Ontario Ministry of Health and Long-Term Care; 2014.

105. Group B strep in newborns: Symptoms and complications [Internet]. Atlanta, Georgia: Centers for Disease Control and Prevention [updated May 29, 2018; cited July 19, 2018]. Available from: *https://www.cdc.gov/groupbstrep/about/symptoms.html.*

106. Patient cost estimator [Internet].: Canadian Institute for Health Information; [cited February 26, 2018]. Available from: *https://www.cihi.ca/en/patient-cost-estimator.*

107. Pregnancy: Summary of recommendations and evidence in: Practice-based evidence in nutrition (PEN) [Internet].: Dietitians of Canada [updated February 17, 2017; cited August 1, 2018]. Available from: *http://www.pennutrition.com/KnowledgePathway.aspx?kpid=3043&trid=3104&trcatid=42.*

108. Ramuscak NL, Jiang D, Dooling KL, Mowat DL. A population-level analysis of birth weight indices in Peel Region, Ontario: The impact of ethnic diversity. Can J Public Health. 2012 Jul 18;103(5):e368-72.

109. Hughes MM, Black RE, Katz J. 2500-g low birth weight cutoff: History and implications for future research and policy. Matern Child Health J. 2017 Feb;21(2):283-9.

110. Ray JG, Jiang D, Sgro M, Shah R, Singh G, Mamdani MM. Thresholds for small for gestational age among newborns of east asian and south asian ancestry. J Obstet Gynaecol Can. 2009 Apr;31(4):322-30.

111. Kramer MS, Platt RW, Wen SW, Joseph KS, Allen A, Abrahamowicz M, et al. A new and improved population-based Canadian reference for birth weight for gestational age. Pediatrics. 2001 Aug;108(2):E35.

112. Peel Public Health. Low birth weight and stillbirth investigation, A Peel health status report. 2010.

113. World Health Organization. The WHO application of ICO-10 to deaths during pregnancy and the puerperium: ICO-MM. World Health Organization; 2012.

114. BORN Ontario data dictionary [Internet]. Ottawa, Ontario: BORN Ontario; [cited October 4, 2018]. Available from: *http://datadictionary.bornontario.ca.*

115. Newborn hearing screening: Parents are important partners [Internet].: Ontario Ministry of Health and Long-Term Care; 2014; [cited July 20, 2018]. Available from: *http://www.children.gov.on.ca/htdocs/English/documents/earlychildhood/hearing/screening-parents/Screening-Parents-EN.pdf.*

116. Your child's enhanced 18-month well-baby visit (brochure) [Internet]. Toronto, Ontario: Ontario Ministry of Children, Community and Social Services [updated April 24, 2017; cited July 20, 2018]. Available from: *http://www.children.gov.on.ca/htdocs/English/earlychildhood/health/your_enhanced_18-month.aspx.*

117. Colley RC, Michaud I, Garriguet D. Reallocating time between sleep, sedentary and active behaviours: Associations with obesity and health in Canadian adults. Health Rep. 2018 Apr 18;29(4):3-13.

118. Luyster FS, Strollo PJ,Jr, Zee PC, Walsh JK, Boards of Directors of the American Academy of Sleep Medicine and the Sleep Research Society. Sleep: A health imperative. Sleep. 2012 Jun 1;35(6):727-34.

119. Manuel DG, Perez R, Bennett C, Rosella L, Talijaard M, Roberts M, et al. Seven more years: The impact of smoking, alcohol, diet, physical activity and stress on health and life expectancy in Ontario. An ICES/PHO report. Toronto: Institute for Clinical Evaluative Sciences and Public Health Ontario; 2012.

120. Chokshi DA, El-Sayed AM, Stine NW. J-shaped curves and public health. JAMA. 2015 Oct 6;314(13):1339-40.

121. Obesity and overweight [Internet].: World Health Organization [updated February 16, 2018; cited August 27, 2018]. Available from: *http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.*

122. World Health Organization. Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Cosultation. Geneva, Switzerland: World Health Organization; 2000.

123. Waist circumference [Internet].: Diabetes Canada; cited August 21, 2018]. Available from: *https://www.diabetes.ca/diabetes-and-you/healthy-living-resources/weight-management/waist-circumference.*

124. Waist circumference and waist-height ratio charts [Internet].: Canadian Pediatric Endocrine Group; [2018; cited October 18, 2019]. Available from: *https://cpeg-gcep.net/content/waist-circumference-and-waist-height-ratio-charts.*

125. Obesity: Fact sheet N311 [Internet].: World Health Organization; [2014; cited August 27 2018]. Available from: *http://www.wpro.who.int/mediacentre/factsheets/obesity/en/.*

126. Global database on body weight classification - BMI classification [Internet].: World Health Organization; [2012; cited September 14, 2018]. Available from: *http://apps.who.int/bmi/index.jsp?introPage=intro_3.html.*

127. Table 13-10-0319-01 - Anthropometry measures of the household population, Canada, Canadian Health Measures Survey [Internet]. Ottawa, ON: Statistics Canada; [2018; cited August 21, 2018]. Available from: *https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310031901.*

128. Connor Gorber S, Tremblay M, Moher D, Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: A systematic review. Obes Rev. 2007 Jul;8(4):307-26.

129. Table 13-10-0795-01 - Measured children and youth body mass index (BMI) (world health organization classification), by age group and sex, Canada and provinces, Canadian Community Health Survey - Nutrition [Internet]. Ottawa, ON: Statistics Canada; [2018; cited August 21, 2018]. Available from: *https://www.150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310079501.*

130. About child & teen BMI [Internet].: Centers for Disease Control and Prevention [updated May 15, 2015; cited August 21, 2018]. Available from: *https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html.*

131. BMI for Children/Teens [Internet].: Dietitians of Canada; [cited August 21, 2018]. Available from: *https://www.dietitians.ca/Your-Health/Assess-Yourself/Assess-Your-BMI/BMI-Children.aspx.*

132. Public Health Agency of Canada, Canadian Institute for Health Information. Obesity in Canada. A joint report from the Public Health Agency of Canada and the Canadian Institute for Health Information. 2018.

133. Canadian 24-hour movement guidelines for the early years (0-4 years) [Internet].: Canadian Society for Exercise Physiology; [2016; cited August 22, 2018]. Available from: *http://www.csep.ca/guidelines.early-years-0-4/.*

134. Canadian 24-hour movement guidelines for children and youth (ages 5-17) [Internet]. Ottawa, ON: Canadian Society for Exercise Physiology; [cited August 22, 2018]. Available from: *http://www.csep.guidelines.ca/CMFiles/Guidelines/24hrGlines/children-and-youth-5-17/.Canadian24HourMovementGuidelines2016.*

135. Canadian physical activity guidelines for adults (18-64 years) [Internet]. Ottawa, ON: Canadian Society for Exercise Physiology; [cited August 22, 2018]. Available from: *http://www.csep.ca/CMFiles/Guidelines/CSEP_PAGuidelines_adults_en.pdf.*

136. Canadian physical activity guidelines for older adults 65 years & older [Internet]. Ottawa, ON: Canadian Society for Exercise Physiology; [cited August 22, 2018]. Available from: *http://www.csep.ca/CMFiles/Guidelines/CSEP_PAGuidelines_older-adults_en.pdf.*

137. Phyiscal activity basics - the benefits of physical activity [Internet]. Atlanta, GA: Centers for Disease Control and Prevention [updated February 13, 2018; cited October 4, 2018]. Available from: *https://www.cdc.gov/physicalactivity/basics/pa-health/index.htm.*

138. Canadian 24-hour movement guidelines: Glossary of terms [Internet].: Canadian Society for Exercise Physiology; [cited September 14, 2018]. Available from: *http://www.csep.ca/en/guidelines/glossary-2017.*

139. Sylvia LG, Bernstein EE, Hubbard JL, Keating L, Anderson EJ. Practical guide to measuring physical activity. J Acad Nutr Diet. 2014 Feb;114(2):199-208.

140. Shields M, Tremblay MS, Laviolette M, Craig CL, Janssen I, Connor Gorber S. Fitness of Canadian adults: Results from the 2007-2009 Canadian Health Measures Survey. Health Rep. 2010 Mar;21(1):21-35.

141. Larouche R, Garriguet D, Gunnell KE, Goldfield GS, Tremblay MS. Outdoor time, physical activity, sedentary time, and health indicators at ages 7 to 14: 2012/2013 Canadian Health Measures Survey. Health Rep. 2016 Sep 21;27(9):3-13.

142. Table 13-10-0337-01 Household population meeting/not meeting the Canadian physical activity guidelines [Internet].: Statistics Canada [updated October 10, 2018; cited October 10, 2018]. Available from: *https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310033701.*

143. van der Ploeg HP, Hillsdon M. Is sedentary behaviour just physical inactivity by another name? Int J Behav Nutr Phys Act. 2017 Oct 23;14(1):142,017-0601-0.

144. Biswas A, Oh PI, Faulkner GE, Bajaj RR, Silver MA, Mitchell MS, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: A systematic review and meta-analysis. Ann Intern Med. 2015 Jan 20;162(2):123-32.

145. Sleep deprivation and deficiency [Internet]. Bethesda, MD: National Heart, Lung, and Blood Institute; [cited October 18, 2018]. Available from: *https://www.nhlbi.nih.gov/health-topics/sleep-deprivation-and-deficiency.*

146. Chaput JP, Wong SL, Michaud I. Duration and quality of sleep among Canadians aged 18 to 79. Health Rep. 2017 Sep 20;28(9):28-33.

147. Dietary reference intake tables [Internet].: Health Canada [updated August 3, 2006; cited September 14, 2018]. Available from: *https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/dietary-reference-intakes/tables.html.*

148. Table 13-10-0336-01 Nutritional status of the household population [Internet].: Statistics Canada [updated October 11, 2018; cited October 11, 2018]. Available from: *https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310033601.*

149. Ross AC, Taylor CL, Yaktine AL, Del Valle HB, editors. Dietary reference intakes for calcium and vitamin D. Washington, DC: National Academies Press (US); 2011.

150. World Health Organization, Centers for Disease Control and Prevention. Assessing the iron status of populations. Geneva, Switzerland: World Health Organizations; 2007.

151. World Health Organization. Serum and red blood cell folate concentrations for assessing folate status in populations. Geneva, Switzerland: World Health Organization; 2012.

152. Table 13-10-0770-01 - Percentage of total energy intake from carbohydrates, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - nutrition, Canada and provinces [Internet].: Statistics Canada; [2018; cited June 13, 2018]. Available from: *https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310077001.*

153. Table 13-10-0771-01 - Percentage of total energy intake from protein, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - nutrition, Canada and provinces [Internet].: Statistics Canada; [2018; cited September 14, 2018]. Available from: *https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310077101.*

154. Table 13-10-0769-01 - Percentage of total energy intake from fat, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - nutrition, Canada and provinces [Internet].: Statistics Canada; [2018; cited September 14, 2018]. Available from: *https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310076901.*

155. Canadian Community Health Survey - nutrition: Nutrient intakes from food and nutritional supplements [Internet].: Statistics Canada [updated June 20, 2017; cited September 14, 2018]. Available from: *https://www150.statcan.gc.ca/n1/daily-quotidien/170620/dq170620b-eng.htm.*

156. Naska A, Lagiou A, Lagiou P. Dietary assessment methods in epidemiological research: Current state of the art and future prospects. F1000Res. 2017 Jun 16;6:926.

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

158. Infographic: Let's eat healthy Canada! [Internet].: Health Canada; [2017;cited November 8, 2017]. Available from: *https://www.canada.ca/content/dam/hc-sc/documents/services/publications/food-nutrition/infographic-lets-eat-healthy-canada/infographic-lets-eat-healthy-canada.pdf.*

159. How many food guide servings of vegetables and fruit do I need? [Internet].: Government of Canada [updated January 14, 2008; cited October 16, 2018]. Available from: *https://www.canada.ca/en/health-canada/services/food-nutrition/canada-food-guide/choosing-foods/vegetables-fruit/many-food-guide-servings-fruits-vegetables-need-canada-food-guide.html.*

160. Vanderlee L, Reid JL, White CM, Hobin EP, Acton RB, Jones AC, et al. Evaluation of the online beverage frequency questionnaire (BFQ). Nutrition Journal. 2018;17(73).

161. World Health Organization. Guideline: Sugars intake for adults and children. Geneva: World Health Organization; 2015.

162. Health Canada is advising Canadians about safe levels of caffeine consumption [Internet].: Government of Canada [updated May 25, 2017; cited October 16, 2018]. Available from: *http://healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2017/63362a-eng.php.*

163. Dietitians of Canada. Taxation and sugar-sweetened beverages. Toronto, ON: Dietitians of Canada; 2016.

164. Ruanpeng D, Thongprayoon C, Cheungpasitporn W, Harindhanavudhi T. Sugar and artificially sweetened beverages linked to obesity: A systematic review and meta-analysis. QJM. 2017 Aug 1;110(8):513-20.

165. Peel Public Health. Peel infant feeding survey 2016: Annual summary report, A Peel Health technical report. 2017.

166. Tarasuk V, Mitchell A, Dachner N. Household food insecurity in Canada, 2014. Toronto: Research to Identify Policy Options to Reduce Food Insecurity (PROOF); 2016.

167. Tobacco information monitoring system [Internet]. Toronto, Ontario: Ontario Tobacco Research Unit; [2018; cited September 17, 2018]. Available from: *http://tims.otru.org/#results.*

168. World Health Organization. Waterpipe tobacco smoking: health effects, research needs and recommended actions by regulators. Geneva, Switzerland: World Health Organization; 2005.

169. Region of Peel - Public Health. Peel Living smoking and tobacco survey, 2017. Mississauga, ON: Region of Peel - Public Health; February, 2018.

170. Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: Systematic review. BMJ. 2002 Jul 27;325(7357):188.

171. Babor TF, Higgins-Biddle JC. Brief intervention: For hazardous and harmful drinking - A manual for use in primary care. World Health Organization - Department of Mental Health and Substance Dependence; 2001.

172. Alcohol-use disorders: Prevention [Internet].: National Institute for Health Care and Excellence (NICE); [June 2, 2010; cited September 14, 2018]. Available from: *https://www.nice.org.uk/guidance/ph24.*

173. Ialomiteanu A, Hamilton H, Adlaf E, & Mann R. CAMH monitor e-report: Substance use, mental health and well-being among ontario adults, 1977-2015 (CAMH research document series no. 45). Toronto, Ontario: Centre for Addiction and Mental Health; 2016.

174. Grant CN, Belanger RE. Cannabis and Canada's children and youth. Paediatr Child Health. 2017 May;22(2):98-102.

175. Fischer B, Russell C, Sabioni P, van den Brink W, Le Foll B, Hall W, et al. Lower-risk cannabis use guidelines: A comprehensive update of evidence and recommendations. Am J Public Health. 2017 Aug;107(8):e1-e12.

176. Cooper RJ. Over-the-counter medicine abuse - a review of the literature. J Subst Use. 2013 Apr;18(2):82-107.

177. What is fentanyl? [Internet].: Royal Canadian Mounted Police [updated January 31, 2017; cited September 18, 2018]. Available from: *http://www.rcmp-grc.gc.ca/en/what-is-fentanyl.*

178. Boak A, Hamilton H, Adlaf E, Mann R. Drug use among Ontario students, 1977-2017: Detailed findings from the Ontario Student Drug Use and Health Survey (OSDUHS) (CAMH research document series no. 46). Toronto, ON: Centre for Addiction and Mental Health; 2017.

179. Martin G, Copeland J, Gates P, Gilmour S. The severity of dependence scale (SDS) in an adolescent population of cannabis users: Reliability, validity and diagnostic cut-off. Drug Alcohol Depend. 2006 Jun 9;83(1):90-3.

180. Management of substance abuse. the ASSIST project - alcohol, smoking and substance involvement screening test [Internet].: World Health Organization; [2018; cited September 18, 2018]. Available from: *https://www.who.int/substance_abuse/activities/assist/en/.*

181. World Health Organization. ASSIST. the alcohol, smoking and substance involvement screening test. Manual for use in primary care. France: World Health Organization; 2010.

182. Knight JR, Sherritt L, Shrier LA, Harris SK, Chang G. Validity of the CRAFFT substance abuse screening test among adolescent clinic patients. Arch Pediatr Adolesc Med. 2002 Jun;156(6):607-14.

183. Motor vehicle safety: Distracted driving [Internet].: Centers for Disease Control and Prevention [updated June 9, 2017; cited September 13, 2018]. Available from: *https://www.cdc.gov/motorvehiclesafety/distracted_driving/index.html.*

184. Traffic Injury Research Foundation. Distracted driving and behaviour change. Ottawa, ON: Traffic Injury Research Foundation; December, 2017.

185. Transport Canada. Road safety in Canada. Government of Canada; 2011.

186. World Health Organization. Promoting mental health: Concepts, emerging evidence, practice. summary report. Geneva, Switzerland: World Health Organization; 2004.

187. Public Health Agency of Canada. The human face of mental health and mental illness in Canada 2006. Public Health Agency of Canada; 2006.

188. Goel V, Rosella LC, Fu L, Alberga A. The relationship between life satisfaction and healthcare utilization: A longitudinal study. Am J Prev Med. 2018 Aug;55(2):142-50.

189. Machado L, Tavares H, Petribu K, Zilberman M, Torres R, Cantilino A. Happiness and health in psychiatry: What are their implications? Arch Clin Psychiatry. 2015;42(4):100-10.

190. Orpana H, Vachon J, Dykxhoorn J, Jayaraman G. Measuring positive mental health in Canada: Construct validation of the mental health continuum-short form. Health Promot Chronic Dis Prev Can. 2017 Apr;37(4):123-30.

191. Parkinson J. Establishing a core set of national, sustainable mental health indicators for children and young people in Scotland: Final report. NHS Health Scotland; 2012.

192. Orpana H, Vachon J, Dykxhoorn J, McRae L, Jayaraman G. Monitoring positive mental health and its determinants in Canada: The development of the positive mental health surveillance indicator framework. Health Promot Chronic Dis Prev Can. 2016 Jan;36(1):1-10.

193. National Collaborating Centre for Determinants of Health. Foundations: Definitions and concepts to frame population mental health promotion for children and youth. Canada: National Collaborating Centres for Public Health; 2017.

194. Afifi TO, MacMillan HL, Boyle M, Taillieu T, Cheung K, Sareen J. Child abuse and mental disorders in Canada. CMAJ. 2014 Jun 10;186(9):E324-32.

195. Schuch FB, Vancampfort D, Firth J, Rosenbaum S, Ward PB, Silva ES, et al. Physical activity and incident depression: A meta-analysis of prospective cohort studies. Am J Psychiatry. 2018 Jul 1;175(7):631-48.

196. Zhang Z, Chen W. A systematic review of the relationship between physical activity and happiness. J Happiness Studies; Mar 2018 24:1-18.

197. Chronic disease and injury indicator framework: 2016 edition [Internet]. Ottawa (ON): Centre for Chronic Disease Prevention, Public Health Agency of Canada; 2016. Available from: *https://infobase.phac-aspc.gc.ca/positive-mental-health/data-tool/.*

198. Shields M. Stress and depression in the employed population. Health Rep. 2006 Oct;17(4):11-29.

199. National Collaborating Centre for Environmental Health and National Collaborating Centre for Determinants of Health. Environmental influences on population mental health promotion for children and youth. Canada: National Collaborating Centres for Public Health; 2017.

200. Ratnasingham S, Cairney J, Rehm J, Manson H, Kurdyak P. Opening eyes, opening minds: The Ontario burden of mental illness and addictions report. An ICES/PHO report. Toronto: Institute for Clinical Evaluative Sciences and Public Health Ontario; 2012.

201. Liu NH, Daumit GL, Dua T, Aquila R, Charlson F, Cuijpers P, et al. Excess mortality in persons with severe mental disorders: A multilevel intervention framework and priorities for clinical practice, policy and research agendas. World Psychiatry. 2017 Feb;16(1):30-40.

202. Colton CW, Manderscheid RW. Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. Prev Chronic Dis. 2006 Apr;3(2):A42.

203. Saxena S. Excess mortality among people with mental disorders: A public health priority. Lancet Public Health. 2018 Jun;3(6):e264-5.

204. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: ; 2013.

205. Zaheer J, Jacob B, de Oliveira C, Rudoler D, Juda A, Kurdyak P. Service utilization and suicide among people with schizophrenia spectrum disorders. Schizophr Res. 2018 Jun 20.

206. Brien S, Grenier L, Kapral M, Kurdyak P, Vigod S. Taking stock: A report on the quality of mental health and addictions services in Ontario. an HQO/ICES report. Toronto: Health Quality Ontario and Institute for Clinical Evaluative Sciences; 2015.

207. Jakkimainen RL, Bronskill SE, Tierney MC, Herrmann N, Green D, Young J. et al. Identification of physician-diagnosed Alzheimer's disease and related dementias in population-based administrative data: a validation study using family physicians' electronic medical records. Journal of Alzheimer's Disease. 2016; 54(1):337-49.

208. What is gambling disorder? [Internet].: American Psychiatric Association; [cited July 13, 2018]. Available from: *https://www.psychiatry.org/patients-families/gambling-disorder/what-is-gambling-disorder.*

209. Skegg K. Self-harm. Lancet. 2005 Oct 22-28;366(9495):1471-83.

210. Suicide [Internet].: Centre for Addiction and Mental Health; [cited April 30, 2018]. Available from: *https://www.camh.ca/en/health-info/mental-illness-and-addiction-index/conditions-and-disorders/suicide.*

211. Franklin JC, Ribeiro JD, Fox KR, Bentley KH, Kleiman EM, Huang X, et al. Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. Psychol Bull. 2017 Feb;143(2):187-232.

212. Telepsychiatry [Internet]. Washington, DC: American Psychiatric Association; [2018; cited September 13, 2018]. Available from: *https://www.psychiatry.org/psychiatrists/practice/telepsychiatry.*

213. Office of the Auditor General of Ontario. Annual report 2017 - volume 1 of 2. Office of the Auditor General of Ontario; 2017.

214. Public Health Agency of Canada. Health status of Canadians 2016: A report of the chief public health officer. Ottawa, Ontario: Public Health Agency of Canada; 2016.

215. Cardiovascular diseases (CVDs): Fact sheet [Internet].: World Health Organization [updated May 17, 2017; cited July 13, 2018]. Available from: *http://www.who.int/mediacentre/factsheets/fs317/en/.*

216. Public Health Agency of Canada. Tracking heart disease and stroke in Canada. 2009. Ottawa, Ontario: Public Health Agency of Canada; 2009.

217. Bonita R, Beaglehole R, Kjellstrom T. Basic Epidemiology. 2nd ed. Geneva, Switzerland: World Health Organization; 2006.

218. Public Health Agency of Canada. Stroke in Canada: Highlights from the Canadian chronic disease surveillance system. Public Health Agency of Canada; 2017.

219. Phan HT, Blizzard CL, Reeves MJ, Thrift AG, Cadilhac D, Sturm J, et al. Sex differences in long-term mortality after stroke in the INSTRUCT (INternational STRoke oUtComes sTudy): A meta-analysis of individual participant data. Circ Cardiovasc Qual Outcomes. 2017 Feb;10(2).

220. Canadian Cancer Society's Advisory Committee on Cancer Statistics. Canadian cancer statistics 2015. Toronto, Ontario: Canadian Cancer Society; 2015.

221. Cancer Care Ontario. Ontario cancer statistics 2018. Toronto: Cancer Care Ontario; 2018.

222. Ellison L, Pogany L, Mery L. Canadian cancer statistics at a glance: cancer in children. CMAJ 2009; 180C4: 422–24.

223. Prithwish D, Ellison LF, Barr RD, Semenciw R, Marrett LD, Weir HK, Dryer D, Grunfeld E. Canadian adolescents and young adults with cancer: opportunity to improve coordination and level of care. CMAJ 2011; 183(3): 187–194.

224. Risk factors for lung cancer [Internet].: Canadian Cancer Society; [2018; cited October 17, 2018]. Available from: *http://www.cancer.ca/en/cancer-information/cancer-type/lung/risks/?region=on.*

225. Topstad D, Dickinson JA. Thyroid cancer incidence in canada: A national cancer registry analysis. CMAJ open. 2017 Aug 11;5(3):E612-6.

226. Cancer Care Ontario. Cancer fact: Colorectal cancer incidence among adolescents and young adults. Cancer Care Onario; August 2009.

227. Austin H, Henley SJ, King J, Richardson LC, Eheman C. Changes in colorectal cancer incidence rates in young and older adults in the United States: What does it tell us about screening. Cancer Causes Control. 2014 Feb;25(2):191-201.

228. Risk factors for uterine cancer [Internet].: Canadian Cancer Society; [2018; cited July 31, 2018]. Available from: *http://www.cancer.ca/en/cancer-information/cancer-type/uterine/risks/?region=on.*

229. Cancer Care Ontario. Ontario cancer screening performance report 2016. Toronto: Cancer Care Ontario; 2016.

230. Chronic respiratory diseases [Internet].: Public Health Agency of Canada [updated December 16, 2014; cited July 13, 2018]. Available from: *https://www.canada.ca/en/public-health/services/chronic-diseases/chronic-respiratory-diseases.html.*

231. O'Donnell DE, Hernandez P, Kaplan A, Aaron S, Bourbeau J, Marciniuk D, et al. Canadian thoracic society recommendations for management of chronic obstructive pulmonary disease - 2008 update - highlights for primary care. Can Respir J. 2008 Jan-Feb;15 Suppl A:1A-8A.

232. Statistics Canada. Chronic obstructive pulmonary disease under-diagnosed in Canadian adults - results from cycles 3 and 4 (2012 to 2015) of the Canadian Health Measures Survey. Health Fact Sheets. 2017;82-625-x(2017001).

233. Yohannes AM, Kaplan A, Hanania NA. Anxiety and depression in chronic obstructive pulmonary disease: Recognition and management. Cleve Clin J Med. 2018 Feb;85(2 Suppl 1):S11-8.

234. Maurer J, Rebbapragada V, Borson S, Goldstein R, Kunik ME, Yohannes AM, et al. Anxiety and depression in COPD: Current understanding, unanswered questions, and research needs. Chest. 2008 Oct;134(4 Suppl):43S-56S.

235. Bock K, Bendstrup E, Hilberg O, Lokke A. Screening tools for evaluation of depression in chronic obstructive pulmonary disease (COPD). A systematic review. Eur Clin Respir J. 2017 Jan 1;4(1):doi:10.1080/20018525.2017.1332931.

236. Panagioti M, Scott C, Blakemore A, Coventry PA. Overview of the prevalence, impact, and management of depression and anxiety in chronic obstructive pulmonary disease. Int J Chron Obstruct Pulmon Dis. 2014 Nov 13;9:1289-306.

237. Cavailles A, Brinchault-Rabin G, Dixmier A, Goupil F, Gut-Gobert C, Marchand-Adam S, et al. Comorbidities of COPD. Eur Respir Rev. 2013 Dec;22(130):454-75.

238. To T, Gershon A, Tassoudji M, Guan J, Wang C, Estrabillo E, et al. The burden of asthma in Ontario. ICES investigative report. Toronto: Institute for Clinical Evaluative Sciences; 2006.

239. Fast facts about asthma: Data compiled from the 2011 survey on living with chronic diseases in Canada [Internet].: Public Health Agency of Canada [updated July 23, 2015; cited July 16, 2018]. Available from: *https://www.canada.ca/en/public-health/services/chronic-diseases/chronic-respiratory-diseases/fast-facts-about-asthma-data-compiled-2011-survey-on-living-chronic-diseases-canada.html.*

240. Type 2 diabetes [Internet].: Government of Canada [updated July 5, 2018; cited July 16, 2018]. Available from: *https://www.canada.ca/en/public-health/services/diseases/type-2-diabetes.html.*

241. Canadian Diabetes Association. 2016 Report on diabetes in Ontario. Toronto, Ontario: Canadian Diabetes Association; 2016.

242. Diabetes in Canada: Highlights from the Canadian Chronic Disease Surveillance System [Internet]. Ottawa, Ontario: Public Health Agency of Canada [updated November 14, 2017; cited July 17, 2018]. Available from: *https://www.canada.ca/en/public-health/services/publications/diseases-conditions/diabetes-canada-highlights-chronic-disease-surveillance-system.html.*

243. Houlden R. 2018 clinical practice guidelines: Introduction. Can J Diabetes. 2018;42(1):1-5.

244. Ekoe J, Godenberg R, Katz P. 2018 clinical practice guidelines: Screening for diabetes in adults. Canadian journal of diabetes. 2018;42(1):16-9.

245. Prebtani A, Bajaj H, Goldenberg R, Mullan Y. 2018 clinical practice guidelines: Reducing the risk of developing diabetes. Can J Diabetes. 2018;42(1):20-6.

246. Panagiotopoulos C, Riddell M, Sellers EAC. Clinical practice guidelines: Type 2 diabetes in children and adolescents. Can J Diabetes April 2013;37(Supplement 1):S163-S167.

247. Statistics Canada. Diabetes, 2016. Health Fact Sheets. 2017;82-625-x(2017001).

248. Canadian Diabetes Association. The cost of diabetes in Ontario. 2009.

249. Region of Peel - Public Health. Diabetes in Peel: Looking forward. Using the diabetes population risk tool (DPoRT) to predict diabetes in Peel Region using 2013/2014 CCHS data. Mississauga, ON: Region of Peel - Public Health; June 2017.

250. Hux.J.E., Booth GL, Slaughter PM, Laupacis A, editors. Diabetes in Ontario: An ICES practice atlas. Institute for Clinical Evaluative Sciences; 2003.

251. Poirier P, Bertrand O, Leipsic J, Mancini J, Raggi P, Roussin A. 2018 clinical practice guidelines: Screening for the presence of cardiovascular disease. Can J Diabetes. 2018;42(1):170-7.

252. Park J, Peters P. Mortality from diabetes mellitus, 2004 to 2008: A multiple-cause-of-death analysis. Health Rep. 2014 Mar;25(3):12-6.

253. Medical certificate of death - form 16 [Internet].: Office of the Registrar General, Ministry of Consumer and Business Services; [cited October 11, 2018]. Available from: *http://s245089275.onlinehome.us/images/Medical_Certificate_of_Death_Form_16.d4cbe05c.pdf.*

254. Musculoskeletal diseases [Internet].: Statistics Canada [updated April 4, 2006; cited July 17, 2018]. Available from: *http://www.statcan.gc.ca/pub/82-619-m/82-619-m2006003-eng.htm.*

255. Introduction to pains and strains / musculoskeletal disorders (MSDs) [Internet].: Ontario Ministry of Labour [updated February 19, 2016; cited July 17, 2018]. Available from: *https://www.labour.gov.on.ca/english/hs/pubs/pains/intro.php.*

256. Chapter 1: Life with arthritis in canada: A personal and public health challenge - what is arthritis and how common is it? [Internet].: Public Health Agency of Canada [updated November 10, 2011; cited July 17, 2018]. Available from: *https://www.canada.ca/en/public-health/services/chronic-diseases/arthritis/life-arthritis-canada-a-personal-public-health-challenge/chapter-one-what-is-arthritis-and-how-common-is-it.html.*

257. Arthritis risk factors [Internet].: Public Health Agency of Canada [updated August 20, 2010; cited July 17, 2018]. Available from: *https://www.canada.ca/en/public-health/services/chronic-diseases/arthritis/arthritis-risk-factors.html.*

258. What is the impact of osteoporosis in Canada and what are canadians doing to maintain healthy bones? [Internet].: Public Health Agency of Canada [updated November 30, 2010; cited July 23, 2018]. Available from: *https://www.canada.ca/en/public-health/services/chronic-diseases/osteoporosis/what-impact-osteoporosis-what-canadians-doing-maintain-healthy-bones.html.*

259. Osteoporosis [Internet].: Public Health Agency of Canada [updated January 12, 2018; cited July 17, 2018]. Available from: *https://www.canada.ca/en/public-health/services/chronic-diseases/osteoporosis.html.*

260. Papaioannou A, Morin S, Cheung AM, Atkinson S, Brown JP, Feldman S, et al. 2010 clinical practice guidelines for the diagnosis and management of osteoporosis in Canada: Summary. CMAJ. 2010 Nov 23;182(17):1864-73.

261. Osteoporosis: Assessing the risk of fragility fracture. National Institute for Health and Care Excellence [Internet]. 2017. Available from: *https://www.nice.org.uk/guidance/cg146/chapter/1-Guidance.*

262. Qaseem A, Forciea MA, McLean RM, Denberg TD, Clinical Guidelines Committee of the American College of Physicians. Treatment of low bone density or osteoporosis to prevent fractures in men and women: A clinical practice guideline update from the American College of Physicians. Ann Intern Med. 2017 Jun 6;166(11):818-39.

263. Centre for osteoporosis & bone health [Internet].: Women's College Hospital; cited July 31, 2018]. Available from: *http://www.womenscollegehospital.ca/programs-and-services/centre-for-osteoporosis-and-bone-health/.*

264. Quinonez C, Gibson D, Jokovic A, Locker D. Emergency department visits for dental care of nontraumatic origin. Community Dent Oral Epidemiol. 2009 Aug;37(4):366-71.

265. Liver disease [Internet].: BC Centre for Disease Control [updated March 15, 2012; cited July 17, 2018]. Available from: http://www.bccdc.ca/health-info/diseases-conditions/liver-disease.

266. Liver disease [Internet].: National Institute of Diabetes and Digestive and Kidney Diseases [updated May 2017; cited July 17, 2018]. Available from: https://www.niddk.nih.gov/health-information/liver-disease/.

267. Deaths and causes of death, 2015 [Internet].: Statistics Canada [updated February 23, 2018; cited October 17, 2018]. Available from: https://www150.statcan.gc.ca/n1/daily-quotidien/180223/dq180223c-eng.htm.
268. Sherman M, Bilodeau M, Cooper C, Mackie D, Depew W, Villeneuve J, et al. Liver disease in Canada: A crisis in the making. Canadian Liver Foundation; 2013.
269. Alcoholic liver disease [Internet].: BMJ Publishing Group [updated May 2018; cited July 17, 2018]. Available from: http://bestpractice.bmj.com/topics/en-us/1116.
270. Marcellin P, Kutala BK. Liver diseases: A major, neglected global public health problem requiring urgent actions and large-scale screening. Liver Int. 2018 Feb;38 Suppl 1:2-6.
271. Non-alcoholic fatty liver disease (NAFLD) [Internet].: National Health Service [updated January 27, 2016; cited July 17, 2018]. Available from: https://www.nhs.uk/conditions/non-alcoholic-fatty-liver-disease.
272. Anyane-Yeboa A, Stewart C. A review of non-alcoholic fatty liver disease: From obesity to liver transplant. Canadian Journal of General Internal Medicine. 2015;10(3):23-8.
273. Singal AK, Bataller R, Ahn J, Kamath PS, Shah VH. ACG clinical guideline: Alcoholic liver disease. Am J Gastroenterol. 2018 Feb;113(2):175-94.
274. Health fact sheets: The 10 leading causes of death, 2013 [Internet].: Statistics Canada [updated March 9, 2017; cited September 19, 2018]. Available from: *https://www150.statcan.gc.ca/n1/pub/82-625-x/2017001/article/14776-eng.htm.*
275. Parachute and Injury Prevention Centre. The cost of injury in Canada - Summary report: Analysis of injury trends 2004 and 2010. Toronto, Ontario: Parachute; 2015.
276. Peel Regional Police. Statistical report: Five year summary (2013-2017). Mississauga, ON: Peel Regional Police; 2018.
277. Office of the Chief Coroner for Ontario. Pedestrian death review. Ontario Ministry of Community Safety & Correctional Services; 2012.
278. Report builder - by the numbers [Internet]:WSIB Ontario [updated 2010-2018;cited September 13, 2018]. Available from: http://www.divxy123.ca/ReportBuilder2017/Pages/report_builder.php#lost_time_claims.
279. Injuries [Internet].: World Health Organization; cited July 16, 2018]. Available from: *http://www.who.int/ceh/risks/cehinjuries2/en/.*
280. Burczycka M, Conroy S. Family violence in Canada: A statistical profile, 2016. Juristat. 2018;38(1).

281. Perreault S. Criminal victimization in Canada, 2014. Juristat. 2015;November23.

282. Conroy S, Cotter A. Self-reported sexual assault in Canada, 2014. Juristat. 2017;July11.

283. Criminal code [Internet].: Government of Canada [updated June 28, 2018; cited July 16, 2018]. Available from: *http://laws-lois.justice.gc.ca/eng/acts/c-46/section-265.html.*

284. General Social Survey Cycle 28 victimization [Internet].: Statistics Canada [updated June 3, 2016; cited July 16, 2018]. Available from: *http://www23.statcan.gc.ca/imdb-bmdi/instrument/4504_Q1_V6-eng.htm.*

285. World Health Organization. Global status report on violence prevention 2014. Geneva, Switzerland: World Health Organization; 2014.

286. Kwong JC, Crowcroft NS, Campitelli MA, Ratnasingham S, Daneman N, Deeks SL, et al. Ontario burden of infectious disease study (ONBOIDS): An OAHPP/ICES report. 2010.

287. Mathers C, Vos T, Stevenson C. The burden of disease and injury in australia. Canberra: Australian Institute of Health and Welfare; 1999.

288. Murray CJ, Lopez AD, Jamison DT. The global burden of disease in 1990: Summary results, sensitivity analysis and future directions. Bull World Health Organ. 1994;72(3):495-509.

289. Stevens G, Dias RH, Thomas KJ, Rivera JA, Carvalho N, Barquera S, et al. Characterizing the epidemiological transition in Mexico: National and subnational burden of diseases, injuries, and risk factors. PLoS Med. 2008 Jun 17;5(6):e125.

290. van Lier EA, Havelaar AH, Nanda A. The burden of infectious diseases in Europe: A pilot study. Euro Surveill. 2007 Dec 1;12(12):E3-4.

291. Public Health Agency of Canada. Canadian immunization guide. Ottawa, Ontario: Public Health Agency of Canada; 2016.

292. Public Health Agency of Canada. Vaccination coverage goals and vaccine preventable disease targets by 2025. Ottawa, Ontario: Public Health Agency of Canada; 2018.

293. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Immunization coverage report for school pupils in Ontario: 2013/14,2014/15,2015/16 school year. Toronto, ON: Queen's Printer for Ontario; 2017.

294. Desai S, Policarpio ME, Wong K, Gubbay J, Fediurek J, Deeks S. The epidemiology of invasive pneumococcal disease in older adults from 2007 to 2014 in Ontario, Canada: A population-based study. CMAJ Open. 2016 Sep 29;4(3):E545-50.

295. Vaudry W. Zhao L, Stirling R on behalf of the National Advisory Committee on Immunization (NACI). Summary of the NACI Seasonal Influenza vaccine statement for 2018-2019. Can Commun Dis Rep. 2018; 44(6): 123-8.

296. World Health Organization. Global tuberculosis report 2017. Geneva: 2017.

297. Public Health Agency of Canada. Canadian tuberculosis standards - 7th edition. Ottawa, Ontario: Public Health Agency of Canada; 2014. Report No.: 140196.

298. Majowicz SE, Edge VL, Fazil A, McNab WB, Dore KA, Sockett PN, et al. Estimating the under-reporting rate for infectious gastrointestinal illness in Ontario. Can J Public Health. 2005 May-Jun;96(3):178-81.

299. Desai R, Hembree CD, Handel A, Matthews JE, Dickey BW, McDonald S, et al. Severe outcomes are associated with genogroup 2 genotype 4 norovirus outbreaks: A systematic literature review. Clin Infect Dis. 2012 Jul;55(2):189-93.

300. Verhoef L, Koopmans M, VAN Pelt W, Duizer E, Haagsma J, Werber D, et al. The estimated disease burden of norovirus in the Netherlands. Epidemiol Infect. 2013 Mar;141(3):496-506.

301. Wikswo ME, Hall AJ, Centers for Disease Control and Prevention. Outbreaks of acute gastroenteritis transmitted by person-to-person contact--United States, 2009-2010. MMWR Surveill Summ. 2012 Dec 14;61(SS09):1-12.

302. Boggild AK, Geduld J, Libman M, Ward BJ, McCarthy AE, Doyle PW, et al. Travel-acquired infections and illnesses in Canadians: Surveillance report from CanTravNet surveillance data, 2009-2011. Open Med. 2014 Feb 11;8(1):e20-32.

303. Freedman DO, Weld LH, Kozarsky PE, Fisk T, Robins R, von Sonnenburg F, et al. Spectrum of disease and relation to place of exposure among ill returned travelers. N Engl J Med. 2006 Jan 12;354(2):119-30.

304. Leder K, Tong S, Weld L, Kain KC, Wilder-Smith A, von Sonnenburg F, et al. Illness in travelers visiting friends and relatives: A review of the GeoSentinel surveillance network. Clin Infect Dis. 2006 Nov 1;43(9):1185-93.

305. Leder K, Torresi J, Libman MD, Cramer JP, Castelli F, Schlagenhauf P, et al. GeoSentinel surveillance of illness in returned travelers, 2007-2011. Ann Intern Med. 2013 Mar 19;158(6):456-68.

306. Choudhri Y, Miller J, Sandhu J, Leon A, Aho J. Chlamydia in Canada, 2010-2015. Can Commun Dis Rep. 2018 Feb 1;44(2):49-54.

307. Choudhri Y, Miller J, Sandhu J, Leon A, Aho J. Gonorrhea in Canada, 2010-2015. Can Commun Dis Rep. 2018;44(2):37-42.

308. Wong T, Latham-Carmanico C. Expert working group for the Canadian guidelines on sexually transmitted diseases. gonococcal infections. In: Wong T, Latham-Carmanico C, editors. Canadian Guidelines on Sexually Transmitted Infections, 2013. Ottawa: Public Health Agency of Canada; 2013.

309. Public Health Ontario. Monthly infectious diseases surveillance report. September 2015;4(9):1-2.

310. Eickhoff CA, Decker CF. Syphilis. Dis Mon. 2016 Aug;62(8):280-6.

311. Patterson S, Cescon A, Samji H, Chan K, Zhang W, Raboud J, et al. Life expectancy of HIV-positive individuals on combination antiretroviral therapy in Canada. BMC Infect Dis. 2015 Jul 17;15:274.

312. Payne E, Totten S, Archibald C. Hepatitis C surveillance in Canada. Can Commun Dis Rep. 2014 Dec 18;40(19):421-8.

313. World Health Organization. Global hepatitis report 2017. Geneva: World Health Organization; 2017.

314. Improved access to hepatitis C treatment coming from B.C. and Ontario [Internet]. 2017 (updated March 6, 2017]. Available from: https;//www.catie.ca/en/catienews/2017-03-06 Improved-accdss-hepatitis-c-treatment-coming-bc-and-ontario.

315. Wertheim HFL, Horby PH, Woodall JP, editors. Atlas of human infectious diseases. Hoboken, New Jersey: Wiley-BlackWell; 2012.

316. Heymann DL, editor. Control of communicable diseases manual. 20th ed. Washington, D.C.: American Public Health Association Press; 2015.

317. de Martel C, Ferlay J, Franceschi S, Vignat J, Bray F, Forman D, et al. Global burden of cancers attributable to infections in 2008: A review and synthetic analysis. Lancet Oncol. 2012 Jun;13(6):607-15.

318. Plummer M, de Martel C, Vignat J, Ferlay J, Bray F, Franceschi S. Global burden of cancers attributable to infections in 2012: A synthetic analysis. Lancet Glob Health. 2016 Sep;4(9):e609-16.

319. International Agency for Research on Cancer Working Group. Biological agents volume 100 B - a review of human carcinogens. Lyon, France: International Agency for Research on Cancer; 2012.

320. Nichols AC, Dhaliwal SS, Palma DA, Basmaji J, Chapeskie C, Dowthwaite S, et al. Does HPV type affect outcome in oropharyngeal cancer? J Otolaryngol Head Neck Surg. 2013 Feb 1;42:9.

321. Walboomers JM, Jacobs MV, Manos MM, Bosch FX, Kummer JA, Shah KV, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. J Pathol. 1999 Sep;189(1):12-9.

322. Drolet M, Benard E, Boily MC, Ali H, Baandrup L, Bauer H, et al. Population-level impact and herd effects following human papillomavirus vaccination programmes: A systematic review and meta-analysis. Lancet Infect Dis. 2015 May;15(5):565-80.

323. Guerra FM, Rosella LC, Dunn S, Wilson SE, Chen C, Deeks SL. Early impact of Ontario's human papillomavirus (HPV) vaccination program on anogenital warts (AGWs): A population-based assessment. Vaccine. 2016 Sep 7;34(39):4678-83.

324. Moore RA, Ogilvie G, Fornika D, Moravan V, Brisson M, Amirabbasi-Beik M, et al. Prevalence and type distribution of human papillomavirus in 5,000 British Columbia women--implications for vaccination. Cancer Causes Control. 2009 Oct;20(8): 1387-96.

325. Candido E, Chin Cheong S, Cotterchio M, Haque M, Kirby P, Klein-Geltink JK, et al. Burden of cancer caused by infections in Ontario. Toronto: Cancer Care Ontario; 2018.

326. Cho LY, Yang JJ, Ko KP, Park B, Shin A, Lim MK, et al. Coinfection of hepatitis B and C viruses and risk of hepatocellular carcinoma: Systematic review and meta-analysis. Int J Cancer. 2011 Jan 1;128(1):176-84.

327. MacInnes CD, Smith SM, Tinline RR, Ayers NR, Bachmann P, Ball DG, et al. Elimination of rabies from red foxes in eastern Ontario. J Wildl Dis. 2001 Jan;37(1):119-32.

328. Middleton D, Johnson KO, Rosatte RC, Hobbs JL, Moore SR, Rosella L, et al. Human rabies post-exposure prophylaxis and animal rabies in Ontario, Canada, 2001-2012. Zoonoses Public Health. 2015 Aug;62(5):356-64.

329. Nunan CP, Tinline RR, Honig JM, Ball DG, Hauschildt P, LeBer CA. Postexposure treatment and animal rabies, Ontario, 1958-2000. Emerg Infect Dis. 2002 Feb;8(2):214-7.

330. Lobo D, DeBenedet C, Fehlner-Gardiner C, Nadin-Davis S, Anderson M, Buchanan T, et al. Raccoon rabies outbreak in Hamilton, Ontario: A progress report. Can Commun Dis Rep. 2018;44(5):116-21.

331. Trewby H, Nadin-Davis SA, Real LA, Biek R. Processes underlying rabies virus incursions across U.S.-Canada border as revealed by whole-genome phylogeography. Emerg Infect Dis. 2017 Sep;23(9):1454-61.

332. Gubler DJ. The continuing spread of west nile virus in the western hemisphere. Clin Infect Dis. 2007 Oct 15;45(8):1039-46.

333. Hayes EB, Gubler DJ. West nile virus: Epidemiology and clinical features of an emerging epidemic in the United States. Annu Rev Med. 2006;57:181-94.

334. Giordano BV, Kaur S, Hunter FF. West nile virus in Ontario, Canada: A twelve-year analysis of human case prevalence, mosquito surveillance, and climate data. PLoS One. 2017 Aug 22;12(8):e0183568.

335. Gasmi S, Ogden N, Lindsay L, Burns S, Fleming S, Babcock J, et al. Surveillance for lyme disease in Canada: 2009-2015. Can Commun Dis Rep. 2017 Oct 5;43(10):194-9.

336. Barker IK, Surgeoner GA, Artsob H, McEwen SA, Elliott LA, Campbell GD, et al. Distribution of the lyme disease vector, ixodes dammini (acari: Ixodidae) and isolation of borrelia burgdorferi in Ontario, Canada. J Med Entomol. 1992 Nov;29(6):1011-22.

337. Nelder MP, Russell C, Lindsay LR, Dhar B, Patel SN, Johnson S, et al. Population-based passive tick surveillance and detection of expanding foci of blacklegged ticks ixodes scapularis and the lyme disease agent borrelia burgdorferi in Ontario, Canada. PLoS One. 2014 Aug 29;9(8):e105358.

338. Ogden N, Lindsay L, Leighton P. Predicting the rate of invasion of the agent of lyme disease borrelia burgdorferi. J Appl Ecol. 2013 Feb;50(2):510-8.

339. Ogden NH, St-Onge L, Barker IK, Brazeau S, Bigras-Poulin M, Charron DF, et al. Risk maps for range expansion of the lyme disease vector, ixodes scapularis, in Canada now and with climate change. Int J Health Geogr. 2008 May 22;7:24,072X-7-24.

340. Thomas SM, Obermayr U, Fischer D, Kreyling J, Beierkuhnlein C. Low-temperature threshold for egg survival of a post-diapause and non-diapause european aedine strain, aedes albopictus (diptera: Culicidae). Parasit Vectors. 2012 May 23;5:100. doi:10.1186/1756-3305-5-180.

341. Berrang-Ford L, Maclean JD, Gyorkos TW, Ford JD, Ogden NH. Climate change and malaria in canada: A systems approach. Interdiscip Perspect Infect Dis. 2009 doi: 10.1155/2009/385487.

342. Iranpour M, Turell MJ, Lindsay LR. Potential for Canadian mosquitoes to transmit rift valley fever virus. J Am Mosq Control Assoc. 2011 Dec;27(4):363-9.

343. Fallis AM. Malaria in the 18th and 19th centuries in Ontario. Bull Can Hist Med. 1984 Winter;1(2):25-38.

344. O'Rourke FJ. Anopheles and the problem of malaria in Canada. Can Entomol. 1959 Jun;91(6):346-52.

345. Wylie WNT. Poverty, distress, and disease: Labour and the construction of the rideau canal, 1826-32. Labour. 1983 Spring;11:7-29.

346. MacLean JD, Ward BJ. The return of swamp fever: Malaria in Canadians. CMAJ. 1999 Jan 26;160(2):211-2.

347. Watson KW. Malaria - A Rideau mythconception. Rideau Reflections. 2017(Winter/Spring).

348. Zucker JR. Changing patterns of autochthonous malaria transmission in the United States: A review of recent outbreaks. Emerg Infect Dis. 1996 Jan-Mar;2(1):37-43.

349. Fisk GH. Malaria and the anopheles mosquito in Canada. Can Med Assoc J. 1931 Dec;25(6):679-83.

350. Health efffects of air pollution [Internet].: Government of Canada [updated November 16, 2017; cited October 16, 2018]. Available from: *https://www.canada.ca/en/health-canada/services/air-quality/health-effects-indoor-air-pollution.html.*

351. Air quality Ontario - frequently asked questions [Internet].: Ontario Ministry of the Environment, Conservation and Parks; 2010; [cited October 16, 2018]. Available from: *http://www.airqualityontario.com/press/faq.php.*

352. Air quality in Ontario [Internet].: Ministry of the Environment, Conservation and Parks; [2018; cited October 16, 2018]. Available from: *https://www.ontario.ca/page/air-quality-ontario#section-1.*

353. Health Effects Institute. Traffic-related air pollution: A critical review of the literature on emissions, exposure, and health effects. Boston, MA: Health Effects Institute; January, 2010. Report No.: Special Report 17.

354. Mowat DL, Gardner C, McKeown D, Tran N. Improving health by design in the greater Toronto-Hamilton area: A report of medical officers of health in the GTHA. Highlights Report, 2nd Edition. Peel Public Health; 2014.

355. Goods movement planning in Peel [Internet].: Region of Peel; [cited April 1, 2018]. Available from: *http://www.peelregion.ca/pw/transportation/goodsmovement/.*

356. intrinsik. Air quality study at Toronto Pearson International Airport: Human health risk assessment (HHRA) report. Final report. Mississauga, ON: intrinksik; August 2015.

357. Ontario Ministry of the Environment and Climate Change. Air quality in Ontario 2016 report. Queen's Printer for Ontario; 2018.

358. Environmental Commissioner of Ontario. Getting to K(no)w: Annual report 2007-2008. Toronto, Ontario: Environmental Commissioner of Ontario; 2008.

359. Seinfeld JH, Pandis SN. Atmospheric chemistry and physics: From air pollution to climate change. 2nd ed. New Jersey: John Wiley & Sons Inc.; 2006.

360. Steib D. Health impacts of air pollution in Canada. April 16, 2018;Health Canada, 2017.

361. Health Canada. Health impacts of air pollution in Canada: An estimate of premature mortalities. Ottawa, Ontario: Health Canada; 2017.

362. Environment and Climate Change Canada. 1990-2016 air pollutant emission inventory report. Government of Canada; 2018.

363. Cancer Care Ontario, Ontario Agency for Health Protection and Promotion (Public Health Ontario). Environmental burden of cancer in Ontario. Toronto: Queen's Printer for Ontario; 2016.

364. Ontario Ministry of the Environment and Climate Change. Air quality in Ontario: 2015 report. Queen's Printer for Ontario; 2017.

365. Hartmann DL, Klein Tank AMG, Rusticucci M, Alexander L.V., Brönnimann S, Charabi Y, et al. Observations: Atmosphere and surface. In: Stoker TF, Qin , D., Plattner GK, Tignor M, Allen SK, Boschung J, et al, editors. The Physical Science Basis. Controbution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press; 2013.

366. Ebi K, Vidya A, Berry J, Yusa A. Ontario climate change and health toolkit. Ontario, Canada: Queen's Printer for Ontario; 2016.

367. SENES Consultants Limited. 2006 community greenhouse gas and criteria air containment inventory for the geographic Region of Peel. Richmond Hill, Ontario: 2014.

368. MANOBS chapter 3 - atmospheric phenomena [Internet].: Environment and Climate Change Canada [updated June 7, 2016; cited November 1, 2018]. Available from: *http://www.ec.gc.ca/manobs/default.asp?xml:lang=En&n=4174EBE7-1#ch0307*.

369. Hurricane hazel: 60 years later [Internet].: Toronto and Region Conservation and ThinData; [cited April 12, 2018]. Available from: *http://www.hurricanehazel.ca/*.

370. Credit Valley Conservation. Water infrastructure systems vulnerability to climate change in the Region of Peel, Final technical report. 2017.

371. Buse C. Report on health vulnerability to climate change: Assessing exposure, sensitivity, and adaptive capacity in the Region of Peel. 2012.

372. Berry P, Clarke K, Fleury MD, Parker S. Human health; in Canada in a changing climate: Sector perspectives on impacts and adaptation. Ottawa, ON: Government of Canada; 2014.

373. Region of Peel, cartographer. Peel urban tree canopy 2015 – existing tree canopy cover [map]. ; 2018.

374. Green Infrastructure Ontario Coalition. State of the urban forest in the Greater Toronto Area. 2016.

375. B.A. Blackwell & Associates Ltd. An assessment of the urban tree canopy cover in Peel Region, 2015. 2017.

376. Drinking water advisory reporting system [Internet].: Ministry of Health and Long-Term Care; [2018; cited 2017]. Available from: *https://dwa.* moh.gov.on.ca/.

377. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Public health inspector's guide to environmental microbiology laboratory testing, 5th ed. Toronto, ON: Queen's Printer for Ontario; 2017.

378. Statistics Canada. Census of agriculture, 2006-2016. 2017.

379. Golden Horseshoe Food and Farming Alliance. Analysis of food and farming assets in the golden horseshoe. Ontario, Canada: Golden Horseshoe Food and Farming Alliance; September 10, 2015.

380. Canadian Food Inspection Agency. National chemical residue monitoring program: 2013-2014 report. Canadian Food Inspection Agency; 2014.

381. Chemical residues in food [Internet].: Canadian Food Inspection Agency [updated October 10, 2018; cited November 1, 2018]. Available from: *http://www.inspection.gc.ca/food/chemical-residues-microbiology/chemical-residues/eng/1324258929171/1324264923941.*

382. Complete listing of all recalls and allergy alerts [Internet].: Canadian Food Inspection Agency [updated September 24, 2013; cited November 1, 2018]. Available from: *http://inspection.gc.ca/about-the-cfia/newsroom/food-recall-warnings/complete-listing/eng/1351519587174/1351519588221.*

383. Kuh D, Ben-Shlomo Y, Lynch J, Hallqvist J, Power C. Life course epidemiology. J Epidemiol Community Health. 2003 Oct;57(10):778-83.

384. Mishra GD, Cooper R, Kuh D. A life course approach to reproductive health: Theory and methods. Maturitas. 2010 Feb;65(2):92-7.

385. National Institute on Drug Abuse. Preventing drug use among children and adolescents. A research-based guide for parents, educators, and community leaders. second edition. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health; 1997.

386. Glazier R, Booth GL, Dunn JR, Polsky JY, Weyman JT, Tynan AM, et al. Diabetes atlas for the Region of Peel. Peel Public Health; 2014.

387. Public Health Agency of Canada. Canadian perinatal health report, 2008 edition. Ottawa, ON: Minister of Health; 2008.

388. Chiang CL. The life table and its applications. Malabar, Florida: Robert E. Krieger Publ. Co.; 1984.

389. Manuel D, Goel V, Williams J. The derivation of life expectancy at the local level. CDIC. 1998;19(2):52-6.

390. Hsieh JJ. A general theory of life table construction and a precise abridged life table method. Biom J. 1991;33(2):143-62.

391. Indicator definition: Family practice sensitive conditions [Internet].: Government of Alberta, Health and Wellness [updated April 2011; cited November 2, 2018]. Available from: *https://www.albertahealthservices.ca/Publications/ahs-pub-pr-def-FPSC.pdf*.

392. Cancer system quality index - methodology 1.1a [Internet]. Toronto, Ontario: Cancer Quality Council of Ontario; [2018; cited October 30, 2018]. Available from: *https://www.csqi.on.ca/indicators/methodology-1-1-a.*

393. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario health profile technical appendix. Toronto, ON: Queen's Printer for Ontario; 2016.

Chapter 16

Data References

DATA REFERENCES

A1 Census 2016, Statistics Canada

A2 Census 2011, Statistics Canada

A3 Census 2006, Statistics Canada

A4 Census 1996, Statistics Canada

A5 Census 2016, Custom Census Profile of Parents with at Least One Child Aged 0 to 18 Years, Statistics Canada

A6 Census 2016, Custom Profile of Census Family Size by Number of Children Aged 0-18 Years and Persons 0-18 not in Census Families and Census Family Structure and Household Type for Census Families in Private Households with at Least One Child Aged 0 to 18 Years, Statistics Canada

B Hemson Consulting, Population Forecast, Region of Peel

C Park Dataset 2016, Region of Peel

D1 Transit Land – Brampton Transit Feed, May 9, 2016-September 5, 2016, City of Brampton

D2 Transit Land – Mississauga Transit Feed, June 30, 2016 – September 4, 2016, City of Mississauga

D3 Transit Land – GO Transit Feed, June 25, 2016-September 2, 2016, Metrolinx.

E Parcel Based Land Use 2016, Region of Peel - Peel Data Centre

F Network walking distance: Pedestrian network, Single Line Street Network (Non-Boulevard) 2016, Region of Peel - Peel Data Centre

G1 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2017

G2 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2016

G3 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2015

G4 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2014

G5 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2013

G6 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2012

G7 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2011

G8 Rapid Risk Factor Surveillance System, Region of Peel - Public Health 2010

H1 Canadian Community Health Survey, 2015/2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H2 Canadian Community Health Survey, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H3 Canadian Community Health Survey, 2011/2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H4 Canadian Community Health Survey, 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H5 Canadian Community Health Survey, 2007/2008, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H6 Canadian Community Health Survey, 2005, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H7 Canadian Community Health Survey, 2003, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H8 Canadian Community Health Survey, 2000/2001, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H9 Canadian Community Health Survey, 2016, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H10 Canadian Community Health Survey, 2015, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

H11 CCHS Mental Health 2012, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

I1 Population Projections 2026, Ministry of Finance. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

I2 Population Estimates, 1986-2016, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

J1 Early Development Instrument, 2015, Ontario Ministry of Education and Offord Centre for Child Studies. Region of Peel – Public Health

J2 Early Development Instrument, 2010, Ontario Ministry of Education and Offord Centre for Child Studies. Region of Peel – Public Health

J3 Early Development Instrument, 2007, Ontario Ministry of Education and Offord Centre for Child Studies. Region of Peel – Public Health

K1 Labour Force Survey 2017, Statistics Canada

K2 Labour Force Survey 2001 and 2015, Statistics Canada

L Medical Services (Ontario Health Insurance Plan) Database, 2001-2016, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

M National Ambulatory Care Reporting System, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

N Hospital In-Patient Discharges, 2003-2016, Canadian Institute for Health Information (CIHI). IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

O Ontario Mortality Database, 1986-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

P Ontario Livebirth Database, 1986-2012, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

Q1 Public Health Unit Analytic Reporting Tool (Cube), 2013-2016, BORN Information System (BIS), BORN Ontario

Q2 BORN Standard Report, BORN Information System (BIS), 2013-2016, BORN Ontario

R Ontario Stillbirth Database, 1986-2011, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

S Ontario Therapeutic Abortion Data, 1986-2011, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care

T Canadian Congenital Anomalies Surveillance System (CCASN), 1990-2015, Public Health Agency of Canada

U1 Ontario Student Drug Use and Health Survey, 2017, Centre for Addiction and Mental Health. Region of Peel – Public Health

U2 Ontario Student Drug Use and Health Survey, 2015, Centre for Addiction and Mental Health. Region of Peel – Public Health

U3 Ontario Student Drug Use and Health Survey, 2013, Centre for Addiction and Mental Health. Region of Peel – Public Health

V1 Peel Infant Feeding Survey, 2016. Region of Peel – Public Health

V2 Peel Infant Feeding Survey, 2015. Region of Peel – Public Health

W1 First Point of Contact for Mental Health Care, 2016, Institute for Clinical Evaluative Sciences

W2 Dementia Incidence and Prevalence, 2015, Institute for Clinical Evaluative Sciences

W3 Wait Time for Mental Health Specialist, 2016, Institute for Clinical Evaluative Sciences

W4 Telepsychiatry, 2008-2016, Institute for Clinical Evaluative Sciences

W5 Physician Visits for Mental Health, 2003-2016, Institute for Clinical Evaluative Sciences

W6 Physician Database, 2000-2015, Institute for Clinical Evaluative Sciences

W7 Ischaemic Heart Disease Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W8 Cerebrovascular Disease Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W9 Chronic Obstructive Pulmonary Disease Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W10 Asthma Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W11 Diabetes Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W12 Osteoarthritis Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W13 Rheumatoid Arthritis Incidence and Prevalence, 1996-2015, Institute for Clinical Evaluative Sciences

W14 Osteoporosis Incidence and Prevalence 1996-2015, Institute for Clinical Evaluative Sciences

W15 Diabetes Sequelae Incidence and Prevalence, 2015, Institute for Clinical Evaluative Sciences

X Ontario Registered Persons Database, 1996-2015, IntelliHealth Ontario, Ontario Ministry of Health and Long-Term Care

Y Uniform Crime Reporting Survey, 1998-2016, Statistics Canada

Z1 Ontario Cancer Incidence Database, 1986-2012, Cancer Care Ontario. SEER*Stat Package Release 10 – OCR (August 2015)

Z2 Ontario Cancer Mortality Database, 1986-2012, Cancer Care Ontario. SEER*Stat Package Release 10 – OCR (August 2015)

AA Digital Health Immunization Repository, 2016-2017, Ministry of Health and Long-Term Care

BB Integrated Public Health Information System (iPHIS), 1986-2017, Region of Peel – Public Health

CC Peel Enhanced Risk Factor Surveillance Data, 2012-2016, Region of Peel – Public Health

Appendix 1

Low-income Cut-Offs, After Tax (LICO-AT-1992 base), Economic Families and Persons not in Economic Families, 2015

Economic Family Size	Size of Area of Residence				
	Rural Area	Small Population Centres with Less than 30,000 Persons	Medium Population Centres with a Population Between 30,000 and 99,999 Persons	Large Urban Population Centres	
				Population Between 100,000 and 499,999 Persons	Population 500,000 Persons or More
Person not in an economic family	13,335	15,261	17,025	17,240	20,386
2 persons	16,230	18,576	20,722	20,982	24,811
3 persons	20,211	23,129	25,802	26,128	30,895
4 persons	25,213	28,856	32,191	32,596	38,544
5 persons	28,711	32,859	36,657	37,118	43,890
6 persons	31,841	36,441	40,654	41,165	48,675
7 or more persons	34,972	40,024	44,649	45,211	53,460

Source: Income Research Paper Series – Low Income Lines 2015-2016. Statistics Canada, Catalogue no. 75F0002MIE, 2017, no. 002. http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=75F0002M&ObjType=2&lang=en&limit=1

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