# 2017 oral health in Peel

## A Taste of Risk Factors and Oral Health Outcomes

Region of Peel
Working for you

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# introduction

Good oral health is an important component of overall health and quality of life. Poor oral health is associated with both acute and chronic conditions. Acute conditions such as tooth decay are preventable, and while most are usually not life threatening, they can cause pain; have physical, social and psychological impacts; and result in costly treatment. Chronic conditions associated with poor oral health such as diabetes, heart conditions and respiratory disease can be more debilitating.[1-3]

The maintenance of good oral health is supported at the community level through social interventions such as community water fluoridation and fluoridated toothpaste. At the individual level, nutrition, oral hygiene practices such as daily brushing and flossing, and regular visits to an oral health care professional for preventive and remedial care all contribute to good oral health. Apart from certain in-hospital surgical-dental services covered under the Canada Health Act, universal oral health care does not exist in Canada. As a result, not all individuals have easy access to oral health care professionals particularly when it comes to affordability and insurance. To fill this gap, Public Health Units have the mandate to offer oral health programs which serve certain segments of the population, such as children. In addition to provincial mandates, Peel Public Health also has directives from Regional Council to serve the low income senior population.

Public health's ability to implement programs to improve the oral health of the community relies on available and good quality data about oral health.

As a public health organization, one component of Peel Public Health's mission is to improve the health status of the population, including oral health. Assessing the current state of oral health diseases and behaviours helps to identify data gaps and indicators for future monitoring. Current programming is focused on children aged zero to 17 years with limited publicly funded programs for adults and seniors. This report will use existing data from local, provincial and national data sources to describe the burden of oral health and identify future oral health priorities for Peel.

The intended audience for this report are Peel Public Health staff. However, Region of Peel Councillors, community partners and the broader public health system may also benefit from the analyses described in this report.

## How to Read this Report

While Peel data are the preferred source, 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.

### Interpreting Confidence Intervals

In some tables, ninety-five per cent confidence intervals (presented as "95% CI" in the report) are provided for many of the estimates (e.g., percentages). The confidence interval presents a lower and upper range of values, which we are confident, contains the true value of the estimate for the whole population 95% of the time, or 19 times out of 20.

For example, in Peel 88% of the population aged 12 years and older brush their teeth twice per day with a confidence interval for that estimate of 86% and 90%. This means that if we repeated the study twenty times using different samples from the same population; on nineteen occasions the estimate would be somewhere between 86% and 90%, while on one occasion the estimate would be below 86% or above 90%. We could say that we are 95% sure the actual percentage of tooth brushing at two times per day in the population is between 86% and 90% and in this particular study, the sample estimate is 88%.

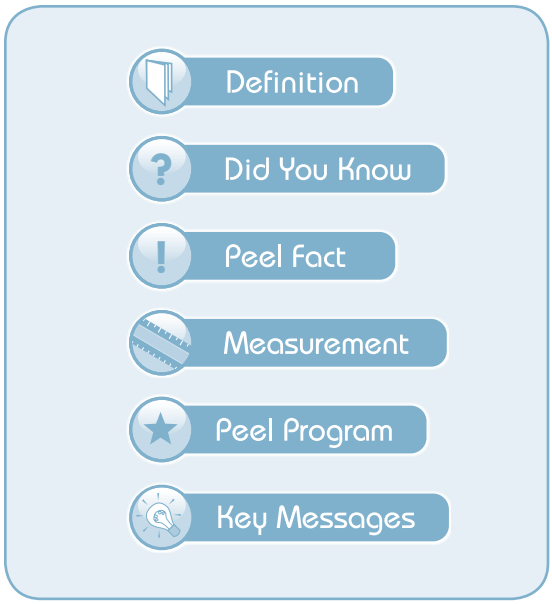
- In this report, 95% confidence intervals were used as a conservative method to determine statistical significance regarding differences between groups (e.g., age groups, immigrant status categories).
- When the 95% confidence interval of the estimate for one group does not overlap with that of the estimate for another group, the difference between the estimates is considered statistically significant (i.e., unlikely to be due to chance).
- 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 of 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.

## References

There are two types of references used in this report: text references and data references.

- Text references refer to references from articles, books or other documents and are defined by a superscript number. For example, 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. For example: 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.




Much of the data used in this report were provided to us by 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

Sources of data, data limitations and methods of analysis used in this report are described in *Chapter 8 - Data Sources and Limitations* and *Chapter 9 - Data Methods*. For additional details or information, please contact *HealthStatusData@peelregion.ca*.

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

This report has been produced in two formats: a detailed report and a summary version. Both are available in hard copy and electronically. The web version of these reports can be found at *peelregion.ca/health/resources*.


# about the region of peel and ontario

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 2011 Census, 1.3 million people lived in Peel (approximately 10% of Ontario's population), making it one of the largest municipalities in Canada and second largest in Ontario.

Peel has experienced rapid growth with the population increasing by 12% (137,400 people) between 2006 and 2011. In comparison, Ontario's population increased by 4.8% over the same time period.[A] By 2031, Peel's population is expected to exceed 1.6 million people whereas the province is projected to be home to over 16.2 million residents.[B]

Peel Fact

***Demographic Facts about Peel***

**Population**

- Compared to Ontario, Peel has a high proportion of children, as well as adults of reproductive age (i.e., between the ages of 15 and 49 years).[A]

**Education**

- Fifty-six per cent of Peel residents aged 15 years and older have some post-secondary education. This is similar to Ontario (55%).[C]
- Thirty-eight per cent of Peel residents aged 25 to 64 years received their post-secondary qualifications outside of Canada compared to 21% for Ontario residents.[C]

**Income**

- The median after-tax income among individuals aged 15 years and older was $27,241 in 2010 (similar to the median of $28,118 in Ontario as a whole).[C]
- Prevalence of low income by age group:
  - Children less than six years of age: 18% in Peel compared to 19% in Ontario
  - Age 18 to 64 years: 12% in Peel compared to 13% in Ontario
  - Age 65 years and older: 6% in Peel and Ontario.[C]

**Immigrant Status and Ethnicity**

- Half (51%) of Peel residents are immigrants compared to 29% in Ontario.
- Sixteen per cent of Peel's population are recent immigrants (arrived in Canada in the past five years). This is similar to Ontario (14%).[C]
- One out of every five residents (21%) report "East Indian" as their ethnic origin. This is the most commonly reported ethnic origin in Peel.[C]

chapter 1

# ORAL HEALTH AND THE NEED FOR POPULATION DATA

## Key Messages

- Oral diseases are prevalent in the Canadian population.
- Oral health is an essential component of overall health.
- Oral health services are not covered under the national healthcare framework leaving vulnerable populations with oral health needs without access to care.
- Provinces generally fund a very small proportion of all oral health care services.
- Peel Public Health addresses the oral health needs of the population through promotion of oral health, disease prevention and facilitating access to care for vulnerable populations.
- Local data on oral health status of the population is critical to support the planning, implementation and evaluation of public health programs.

## Oral Health and Physical Health

The Canadian Dental Association defines oral health as "a state of the oral and related tissues and structures that contribute positively to physical, mental and social well-being and the enjoyment of life's possibilities, by allowing the individual to speak, eat and socialize unhindered by pain, discomfort or embarrassment."[4] Good oral health is an important component of overall health, allowing individuals to function at their full capacity and to have better quality of life.

Common oral diseases such as dental caries (tooth decay) and periodontal disease (gum disease) affect a large number of Canadian children, adults and seniors.[5] Although the number of dental cavities in developed countries has declined over time, the proportion of people experiencing dental decay is still high. Based on a national Canadian survey, approximately two out of every three children and youth aged six to 19 has or has had a cavity.[5] Amongst adults, nearly all (96%) have had a history of cavities. In addition, almost one in every five adults has or has had moderate or severe gum disease.

Associations between oral health and systemic conditions such as diabetes, respiratory diseases, heart disease and premature low birth weight babies have been demonstrated in the literature.[6] Furthermore, there has been much discussion on prevention of oral diseases with other common chronic conditions using an efficient common risk factor approach that addresses important health determinants such as a poor diet, smoking, alcohol and stress.[7]

Although the oral health of the population has improved over the years, these statistics suggest that there is still much room for improvement. Importantly, 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.

These connections highlight the critical position of oral health services within the general health care system. Oral diseases must be managed because of their impact on the population and the high costs of treating disease once it occurs.

## Dental Care System in Canada

The Canada Health Act (CHA), which was passed in 1984, aims "to protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other barriers".[8] Under the CHA, hospital and physician care is covered in Ontario and financed by the federal and provincial/territorial governments. However, dental care, apart from some hospital-based surgical-dental services, has been omitted from the national health insurance system. Oral health services were excluded from Medicare for a variety of reasons during the development of health care policy in Canada.[9] Previous developments have shaped the way dental care services are financed and delivered today.

Dental care in Canada is mostly delivered privately through dental offices, although a small proportion of services are delivered through public infrastructure. Services are delivered by a variety of dental professionals including dentists, dental hygienists, denturists and dental assistants. The majority of expenditures are financed through employment-based insurance and out-of-pocket expenses which account for approximately 95% of all dental expenditures.[10] The remainder (approximately 5%) is attributed to publicly-financed dental care. Provinces vary in the amount of funding allotted to public dental spending. Ontario currently has the lowest rate of public funding for dental expenses as a percentage of all provincial dental expenditures at approximately 1.3%. In comparison, the rate of funding in Quebec and Alberta are 7% and 8.7% respectively.[11]

Although privately financed dental care enables a large segment of the population to access high quality dental care, other segments of the population continue to face significant barriers. Based on a recent report from the Canadian Academy of Health Science, vulnerable groups with limited access to care include individuals earning low incomes (e.g. children and seniors), individuals without dental insurance, seniors living on low incomes and in institutions, the aboriginal population, refugees, immigrants, people with disabilities and those living in remote areas.[10] National data from the Canadian Health Measures Survey demonstrates major inequalities in oral health and access to care among these groups.[5] These populations are more likely to have poorer oral health, greater treatment needs and more likely to avoid a dental visit because of costs.

Poor oral health also has significant impacts on the broader health care system. There is evidence that individuals who cannot afford the cost of private dental care tend to visit emergency departments for their dental needs.[12] These visits are highly inefficient as they do not resolve the underlying condition and tend to stretch the overburdened health care system further. There has also been recent emphasis on the use of day surgeries to manage children suffering from early childhood tooth decay.[13] Such visits are costly and can be avoided through timely prevention and intervention.

Public dental programming in Peel includes strategies to enhance and protect the oral health of the population by prioritizing disease prevention and oral health promotion as well as improving access to oral health services for vulnerable populations. Peel Public Health offers dental programs using a variety of funding structures and mandates to address the oral health needs of low-income children, youth and seniors.

For children, public health programs include school/community based dental screening and preventive oral health services as well as facilitating access to the Healthy Smiles Ontario (HSO) program for low-income children. The HSO program allows children from low income families to have regular visits with a dental provider and to receive access to preventive services and emergency and essential treatment. In addition to services provided through Regional clinics, Peel has developed partnerships with community health centers and community agencies providing greater access to care for families. The Region of Peel also launched a clinical program for low income seniors in 2008 to provide the population with access to basic oral health services.

Community water fluoridation is a population-wide approach to help prevent cavities. The level of naturally occurring fluoride in Peel's lake-based municipal water supply is adjusted to an optimal concentration range (0.5 mg/L to 0.8 mg/L) to protect against tooth decay.[14] Community water fluoridation is safe and effective.[15, 16] Several national and international organizations support community water fluoridation including Health Canada, the Canadian Dental Association and the Centers for Disease Control and Prevention.[17–19]

A clear picture of the population's oral health status is critical to public health practice. The purpose of this report is to examine the oral health status of children, adults and seniors in Peel and to identify disease trends and oral health inequalities in the population. In addition, this report will examine the availability of dental care professionals and oral health services to meet the needs of Peel's population. This data will be used to support the planning, implementation and evaluation of local programs and services.

**Peel Program**

**Peel Public Health has administered several dental programs over the past 30 years. The most recent change in 2016 involved the amalgamation of six low income children's dental programs into one, known as Healthy Smiles Ontario.**

**This program allows children from low income families to have regular visits with a dental provider and to receive access to preventive, emergency and essential treatment.**

**In addition to services provided through Regional clinics, Peel has developed partnerships with community health centres and community agencies providing greater access to care for families. Peel Public Health also provides oral health services to low income seniors living in the Region.**

chapter 2

## ORAL HEALTH STATUS AND SYMPTOMS

### Key Messages

- Peel residents generally rate their level of oral health as high. However, residents who are older and those in lower income categories report poorer oral health.
- Most Peel residents have good oral functioning such as the ability to chew their food. However, there are individuals who do report having some type of social limitation or who avoid having conversations with people, laughing or smiling because of their oral health.
- Just under half of Peel residents report having some type of oral health symptom in the past month. The most common oral health symptom is sensitivity to heat and cold. This is a common symptom associated with dental cavities, gum disease and tooth fractures.
- Approximately 9% of Peel residents have experienced toothache in the past month.
- Indicators of oral health status are similar in Peel and Ontario.

A person's oral health is related to overall health, emotional well-being and quality of life.[20, 21] Oral health status can be determined by assessing and analyzing the oral health of individuals in a population through clinical and self-reported oral health measures.

This section of the report will describe self-reported:

- oral health status;
- oral function; and
- oral health symptoms.

## Oral Health Status

Oral health status is described in this chapter using the following measures:

- Self-reported oral health
- Per cent who have one or more of their own teeth
- Per cent who have had their teeth removed by a dentist
- Per cent who wear dentures

Clinical measures of oral health are described in *Chapter 4 – Oral Diseases and Associated Conditions*.

## Self-Reported Oral Health

**Measurement**

Self-reported oral health was measured in the Canadian Community Health Survey through the respondent's answer to the following question:

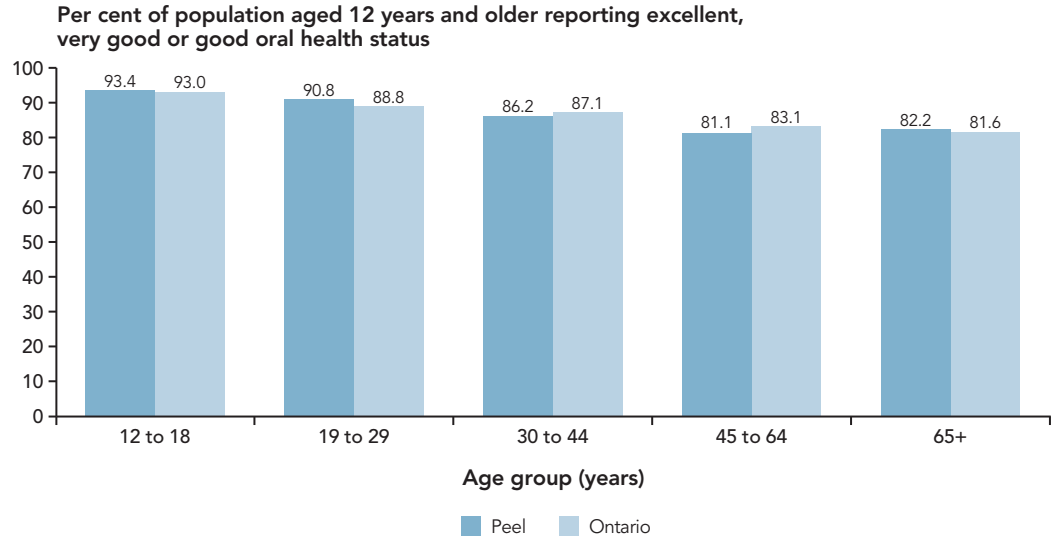
"In general, would you say that the health of your teeth and mouth is: excellent, very good, good, fair or poor?"

Positive oral health status was defined as any survey respondent who replied excellent, very good or good.

In Peel in 2007/2008, 86% of the population aged 12 years and older reported having excellent, very good or good oral health, henceforth described as positive oral health status. This is the same as Ontario (86%). There have been no changes in self-reported oral health status between 2003 and 2007/2008 in Peel and Ontario (data not shown).[D,E]

The proportion of the population reporting positive oral health status declines as age increases (Figure 2.1). The proportion of the population reporting positive oral health is significantly lower among those aged 45 years and older compared to those aged 12 to 18 years.

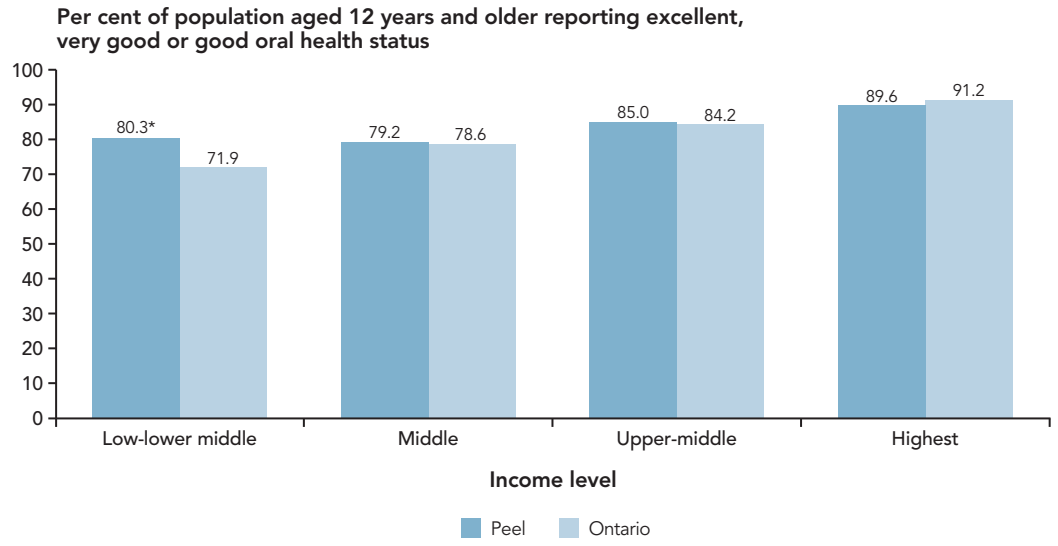
**Figure 2.1**
**Self Reported Oral Health Status by Age Group, Peel and Ontario, 2007/2008**




Source: Canadian Community Health Survey Share File, 2007/2008, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

Self-reported oral health increases by income level in both Peel and Ontario. In Peel, the differences by income level are not significant, while in Ontario, the proportion of the population reporting positive self-reported oral health increases significantly by income level (Figure 2.2).

**Figure 2.2**
**Self Reported Oral Health Status by Income Level, Peel and Ontario, 2007/2008**




* Use estimate with caution.
Definitions of income level can be found in Table 11.2.
Source: Canadian Community Health Survey Share File, 2007/2008, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## One or More of Own Teeth

**Measurement**

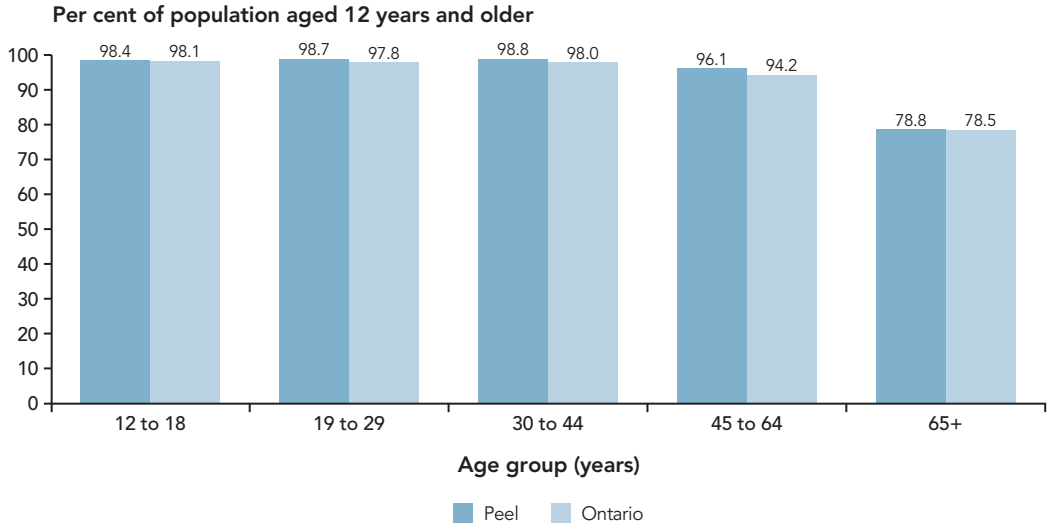
The indicator, **"one or more of own teeth"** was measured in the Canadian Community Health Survey through the respondent's answer to the following question:

"Do you have one or more of your own teeth?"

The respondent could answer yes or no.

Most of Peel's residents have one or more of their own teeth (96%). This is similar to Ontario (94%). In Peel and Ontario, a significantly lower proportion of those aged 65 years and older have one or more of their own teeth compared to all other age groups (Figure 2.3).

**Figure 2.3**
**Per cent of the Population who have One or More of their own Teeth by Age Group, Peel and Ontario, 2009/2010**




Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Teeth Removed by Dentist

**Measurement**

The indicator, **"teeth removed by dentist"** was measured in the Canadian Community Health Survey through the respondent's answer to the following question:

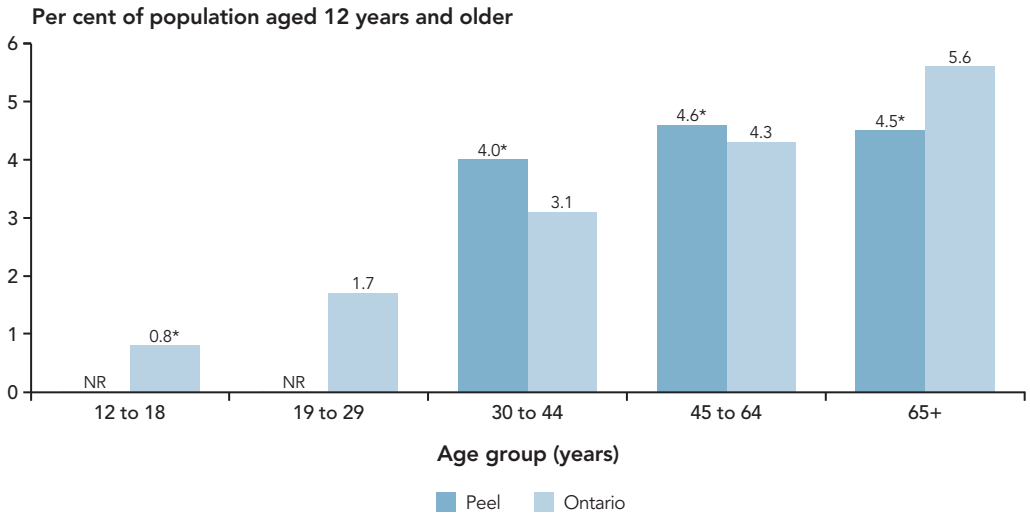
"In the past 12 months, have you had any teeth removed by a dentist?"

The respondent could answer yes or no.

In Peel, 7% of the population aged 12 and older have had teeth removed by a dentist in the past 12 months. This is similar to Ontario (7%).[F]

In Peel, approximately 3% of residents aged 12 years and older had their teeth removed because of decay or gum disease, representing about 34,000 individuals.[F] This is similar to Ontario (3%). A higher proportion of those aged 30 years and older have had teeth removed because of decay or gum disease than those age 12 to 29 years (Figure 2.4).

**Figure 2.4**
**Per cent of Population who have had Teeth Removed because of Decay or Gum Disease by Age Group, Peel and Ontario, 2009/2010**




* Use estimate with caution.
NR – Not releasable due to small numbers.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Use of Dentures

**Measurement**

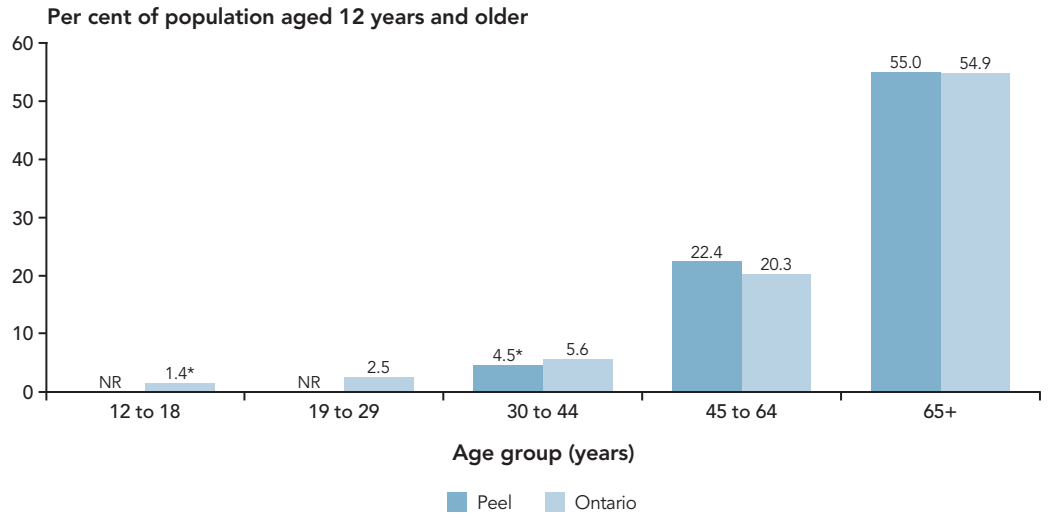
**Wearing dentures** was measured in the Canadian Community Health Survey through the respondent's answer to the following question:

"Do you wear dentures or false teeth?"

The respondent could answer yes or no.

In Peel, 15% of the population wears dentures. This is similar to Ontario (16%). The proportion of those who wear dentures increases with age (Figure 2.5). In Peel, long-term immigrants (25%) are more likely to wear dentures than recent (12%) or non-immigrants (14%).[F]

**Figure 2.5**
**Per cent of the Population that Wears Dentures by Age Group, Peel and Ontario, 2009/2010**




* Use estimate with caution.
NR – Not releasable due to small numbers.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Oral Function

In addition to a person's general health status, the inability to chew food, avoidance of food because of mouth problems and limitation in social functioning as a result of oral health have an impact on overall health. This section will describe the data available on indicators of oral functioning.

## Inability to Chew Food

**Measurement**

**The inability to chew food was measured in the Canadian Community Health Survey through a respondent's answer to three questions:**

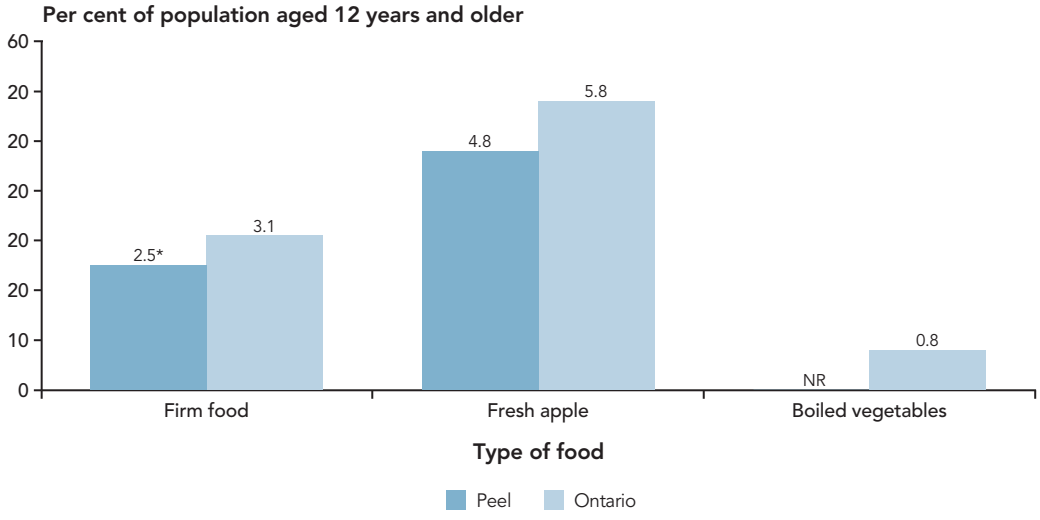
- **"Can you chew firm foods (e.g., meat)?"**
- **"Can you bite off and chew a piece of fresh apple?"**
- **"Can you chew boiled vegetables?"**

**If a respondent who replied yes to any of these three questions, they were considered to have an "inability to chew food".**

In Peel, 6% of individuals aged 12 years and older have an inability to chew foods. This is similar to Ontario (7%).[E] The inability to chew foods is significantly higher among those aged 65 years and older compared to all other age groups (data not shown).[E] While we were unable to conduct a more thorough analysis of the data due to small numbers, it is likely that the inability to chew foods is correlated with being edentulous and/or wearing dentures.

A larger proportion of Peel and Ontario residents appear to have difficulty chewing crunchy foods such as a fresh apple (Figure 2.6).

**Figure 2.6**
**Inability to Chew Food by Type of Food, Peel and Ontario, 2007/2008**




* Use estimate with caution.
NR – Not releasable due to small numbers.
Source: Canadian Community Health Survey Share File 2007/2008, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Inability to Pronounce Words or Speak

**Measurement**

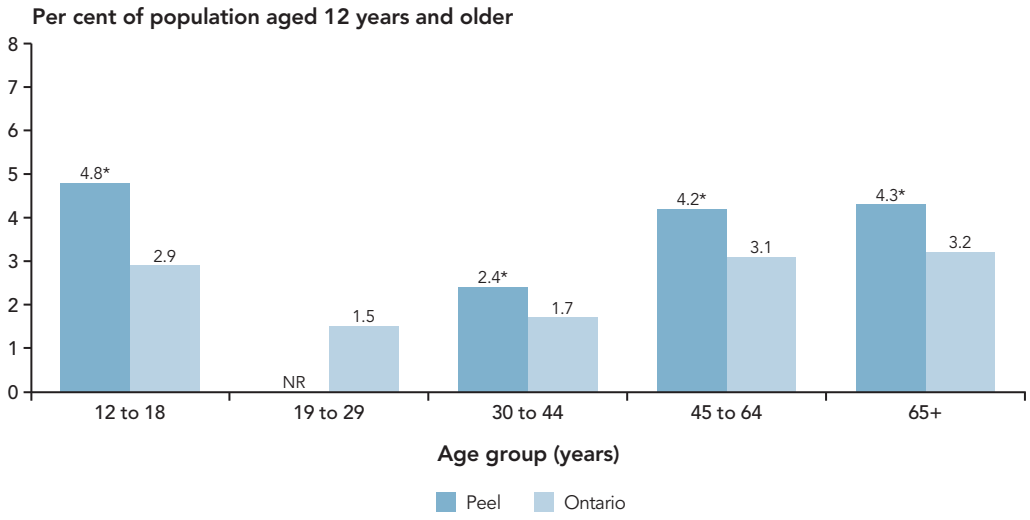
**The inability to pronounce words or speak was measured in the Canadian Community Health Survey through a respondent's answer to the following question:**

**"Because of the condition of your teeth, mouth or dentures/teeth, do you have difficulty pronouncing any words or speaking clearly?"**

**Response options were yes or no.**

In Peel 3% of residents aged 12 years and older indicate that they have difficulty pronouncing words or speaking clearly because of the conditions of their teeth, mouth or dentures, representing about 36,000 people. This is similar to Ontario (3%).[F] There are no significant differences in the proportion of individuals reporting difficulty speaking by age group (Figure 2.7).

**Figure 2.7**
**Per cent of Population who have Difficulty Speaking Clearly by Age Group, Peel and Ontario, 2005 and 2009/2010 Combined**




* Use estimate with caution.
NR – Not releasable due to small numbers.
Source: Canadian Community Health Survey Share File 2005, 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Social Limitation due to the Condition of the Teeth or Mouth

**Measurement**

Having a **social limitation** is measured in the Canadian Community Health Survey through a respondent's answer to two questions:

"In the past 12 months how often have you avoided:

- Conversation or contact with other people, because of the condition of your teeth, mouth or dentures/teeth or mouth
- Laughing or smiling because of the condition of your teeth, mouth or dentures/teeth or mouth"

Response options included: often, sometimes, rarely or never.

A respondent who answered often or sometimes to either question was classified as having a **social limitation** because of the condition of their teeth or mouth.

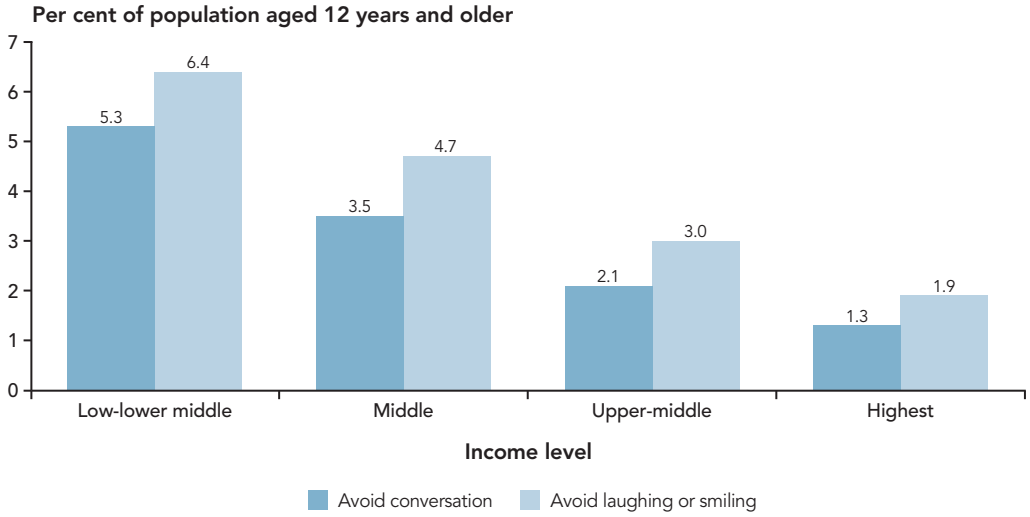
Avoiding conversation or contact with others, and avoiding laughing and smiling can sometimes be attributed to the condition of a person's teeth or mouth. In Peel and Ontario, 4% of residents reported experiencing one of these factors (also referred to as having a social limitation) as a result of their oral health status. In Peel, this represents approximately 47,000 residents.[F]

In Peel, females (5%*) are more likely than males (4%*) to experience a social limitation due to their oral health (* use estimate with caution). This is similar to Ontario.[F]

Similar proportions of Peel residents avoided conversation or contact with people (4%) or avoided smiling or laughing (4%) because of the condition of their teeth or mouth in the past 12 months. This is similar to Ontario.

In Ontario, the proportion of the population avoiding conversation or contact with people, or avoiding laughing or smiling because of their oral health status is significantly higher in the lowest income level compared to all other income levels (Figure 2.8). Data are not releasable for Peel due to small numbers.

**Figure 2.8**
**Proportion of Population who Avoid Conversation or Laughing or Smiling† due to Oral Health Status by Income Level, Ontario, 2009/2010**




† Reported as sometimes or often in the past 12 months.
Definitions of income level can be found in Table 11.2.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Oral Health Symptoms

Measurement

**Oral health symptoms** are measured in the Canadian Community Health Survey through a respondent's answer to the following questions:

"In the past month, have you had:

- A toothache
- Pain in or around the jaw joint
- Other pain in the mouth or face
- Bleeding gums
- Dry mouth
- Bad breath"

"In the past month were your teeth:

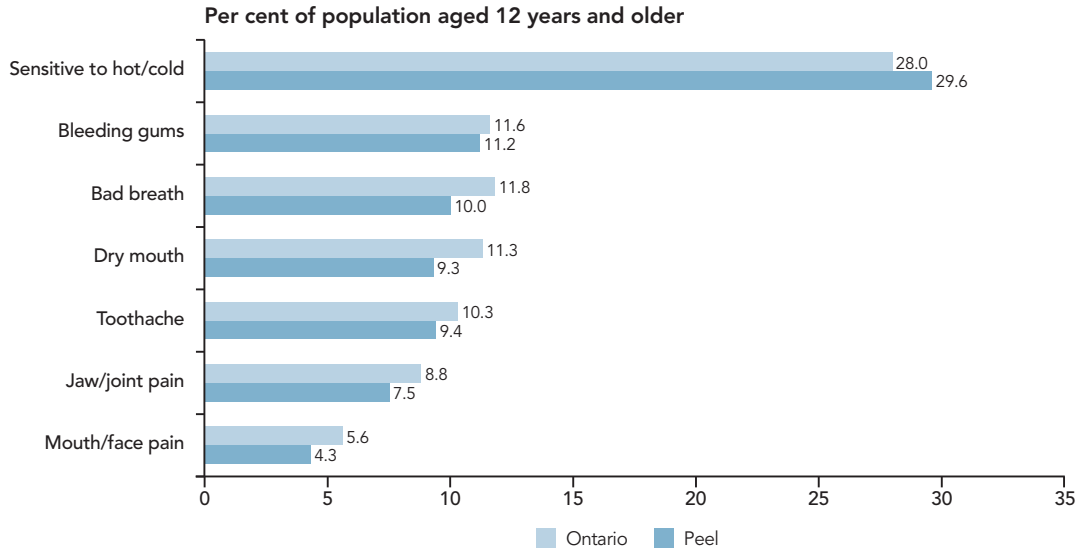
- Sensitive to hot or cold food or drinks?"

Response options were yes or no. Respondents who answered yes to any of the questions above were classified as having oral health symptoms.

The causes of oral health symptoms are often difficult to pinpoint. However, dental pain and sensitivity, temporomandibular joint disorder, neurological disorders, burning mouth syndrome and referred pain from other sites can result in oral or facial pain.

In Peel, 43% of residents aged 12 years and older experienced some type of oral health symptom in the past month. This is significantly lower than Ontario (47%).[F] The most common type of oral health symptom is sensitivity to heat or cold (30%), followed by bleeding gums (11%) and bad breath (10%) (Figure 2.9). The proportion of the population in Peel reporting each symptom is similar to Ontario.

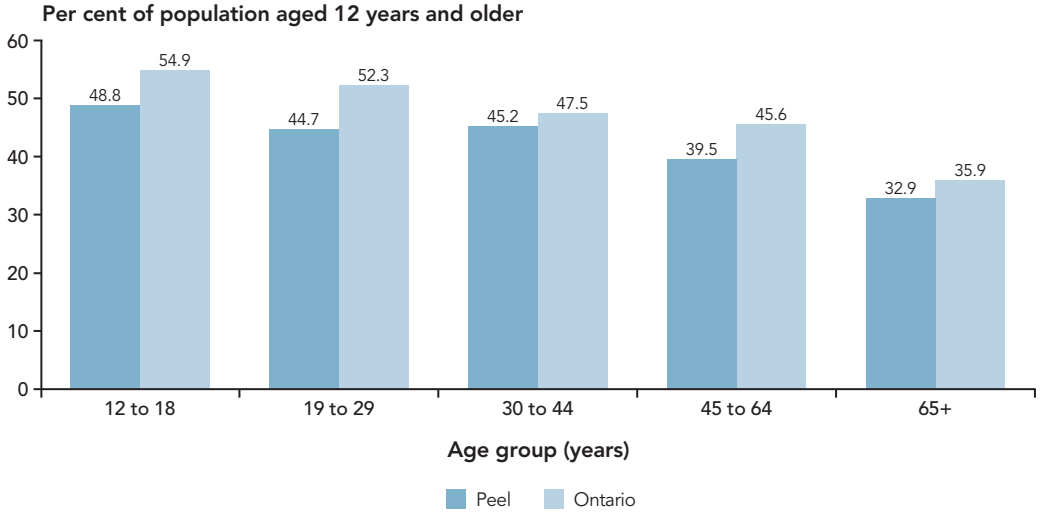
**Figure 2.9**
**Type of Oral Health Symptom, Peel and Ontario, 2009/2010**




Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

The presence of oral health symptoms in the past month is most frequently reported by those under 19 years of age (49%) (Figure 2.10).

**Figure 2.10**
**Oral Health Symptom† by Age Group, Peel and Ontario, 2009/2010**




† Oral health symptoms is a composite indicator of the following: toothache, tooth sensitivity to hot or cold, jaw or joint pain, mouth or face pain, bleeding gums, dry mouth or bad breath.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Sensitivity to Heat or Cold

Dental caries, exposed root surfaces, and tooth fractures can lead to dental sensitivity to heat or cold.

Approximately 30% of Peel's population experienced sensitivity to hot or cold in the past month. This is similar to Ontario (28%). The proportion of Peel residents who experience sensitivity to heat or cold is significantly lower among those aged 65 years and older compared to all other age groups (Table 2.1). There is no difference by sex. Peel data by age group and sex are similar to Ontario.

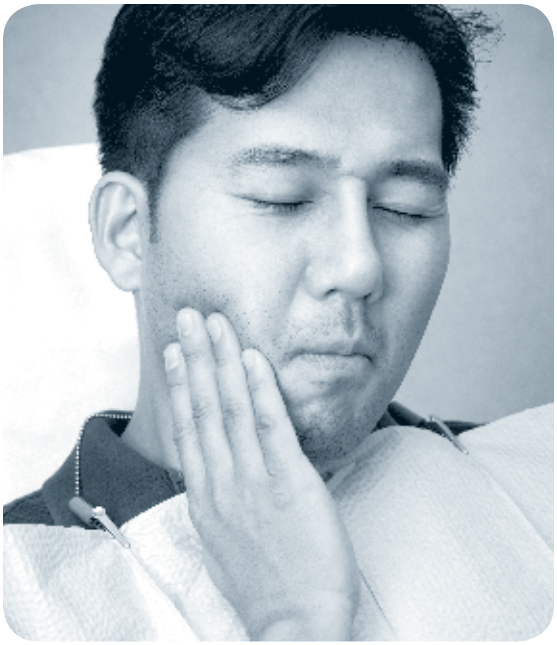


**Table 2.1**
**Proportion and Number of People† who Experienced Sensitivities to Hot or Cold in the Past Month by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| Sex | Male | 26.6 (23.2 – 30.4) | 145,000 | 24.7 (23.6 – 25.9) | 1,326,600 |
| | Female | 32.5 (28.3 – 36.9) | 180,200 | 31.1 (29.9 – 32.3) | 1,732,000 |
| Age group (years) | 12–18 | 37.2 (30.3 – 44.6) | 46,700 | 34.4 (32.3 – 36.6) | 396,800 |
| | 19–29 | 28.9 (23.6 – 34.8) | 61,000 | 32.1 (30.3 – 34.1) | 618,000 |
| | 30–44 | 36.0 (30.1 – 42.3) | 110,200 | 30.5 (28.8 – 32.3) | 835,500 |
| | 45–64 | 27.0 (22.1 – 32.6) | 91,500 | 28.0 (26.3 – 29.6) | 993,500 |
| | 65+ | 13.5 (9.4 – 18.9) | 15,800 | 13.7 (12.6 – 14.9) | 214,800 |
| **Total** | | **29.6 (26.8 – 32.5)** | **325,200** | **28.0 (27.2 – 28.8)** | **3,058,700** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Bleeding Gums

Improper hygiene and subsequent plaque buildup, periodontal disease, medications, trauma and ill-fitting dentures can lead to bleeding gums, and may indicate oral infection or systemic disorders.

Eleven per cent of Peel's population had bleeding gums in the past month. This is similar to Ontario (12%). There are no differences by sex or age group (Table 2.2).

**Table 2.2**
**Proportion and Number of People† who Experienced Bleeding Gums in the Past Month, by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| Sex | Male | 11.0 (8.8 – 13.6) | 59,700 | 11.0 (10.2 – 11.9) | 590,400 |
| | Female | 11.3 (9.1 – 13.9) | 63,000 | 12.1 (11.3 – 13.0) | 675,800 |
| Age group (years) | 12–18 | 16.5* (11.6 – 22.8) | 20,800 | 13.9 (12.3 – 15.7) | 160,700 |
| | 19–29 | 11.6* (8.4 – 16.0) | 24,600 | 14.3 (12.9 – 16.0) | 275,700 |
| | 30–44 | 13.1 (10.1 – 16.9) | 40,300 | 14.0 (12.8 – 15.3) | 383,200 |
| | 45–64 | 8.7* (6.1 – 12.1) | 29,300 | 10.3 (9.3 – 11.5) | 367,100 |
| | 65+ | 6.6* (3.7 – 11.3) | 7,700 | 5.1 (4.3 – 5.9) | 79,400 |
| **Total** | | **11.3 (9.6 – 12.9)** | **122,700** | **11.6 (11.0 – 12.2)** | **1,266,200** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Bad Breath or Halitosis

Food, tobacco products, poor dental hygiene, periodontal disease, dry mouth, oral infections; mouth, nose, and throat disorders; and metabolic disorders can result in bad breath or halitosis. Importantly, oral malodor can be a symptom of underlying systemic conditions, reflecting the importance of the connection between the mouth and the rest of the body.

Ten per cent of Peel residents experienced bad breath in the past month. This is similar to Ontario (12%). There are no differences by sex or age group (Table 2.3). Peel data by age group and sex are similar to Ontario.

**Table 2.3**
**Proportion and Number of People† who Experienced Bad Breath (Halitosis) in the Past Month by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| Sex | Male | 11.2 (9.0 – 14.0) | 60,800 | 13.0 (12.2 – 13.9) | 691,300 |
| | Female | 8.8 (6.8 – 11.4) | 48,800 | 10.7 (10.0 – 11.4) | 588,900 |
| Age group (years) | 12–18 | 12.7* (8.5 – 18.6) | 16,000 | 14.6 (13.2 – 16.2) | 168,300 |
| | 19–29 | 9.1* (6.3 – 13.0) | 19,300 | 13.3 (12.1 – 14.6) | 254,400 |
| | 30–44 | 11.4* (8.2 – 15.8) | 35,000 | 12.2 (11.2 – 13.3) | 331,500 |
| | 45–64 | 8.4* (5.9 – 11.9) | 28,200 | 11.4 (10.4 – 12.5) | 400,500 |
| | 65+ | 9.7* (6.3 – 14.8) | 11,000 | 8.2 (7.6 – 9.1) | 125,500 |
| **Total** | | **10.0 (8.5 – 11.9)** | **109,600** | **11.8 (11.3 – 12.4)** | **1,280,200** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Dry Mouth

Medications, cancer therapy, tobacco and methamphetamine use, aging, and nerve damage are some factors that can lead to dry mouth.

Nine per cent of Peel residents experienced dry mouth in the past month. This is similar to Ontario (11%). There are no differences by sex or age group in Peel (Table 2.4). In Ontario, seniors are more likely to report experiencing dry mouth compared to all other age groups.

**Table 2.4**

**Proportion and Number of People† who Experienced Dry Mouth in the Past Month by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| Sex | Male | 9.0 (7.1 – 11.2) | 48,700 | 10.5 (9.8 – 11.3) | 562,900 |
| | Female | 9.7 (7.6 – 12.3) | 53,900 | 12.0 (11.3 – 12.7) | 667,000 |
| Age group (years) | 12–18 | 11.5* (7.7 – 16.7) | 14,500 | 9.6 (8.4 – 10.9) | 110,600 |
| | 19–29 | 6.2* (3.8 – 10.0) | 13,000 | 9.1 (8.0 – 10.3) | 174,200 |
| | 30–44 | 8.8* (6.1 – 12.6) | 27,000 | 8.7 (7.8 – 9.8) | 239,000 |
| | 45–64 | 8.6 (6.2 – 11.7) | 29,000 | 11.8 (10.8 – 12.8) | 419,700 |
| | 65+ | 16.3 (12.0 – 21.7) | 19,100 | 18.3 (17.1 – 19.5) | 286,400 |
| **Total** | | **9.3 (7.9 – 11.0)** | **102,600** | **11.3 (10.8 – 11.8)** | **1,229,900** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Toothache

Tooth decay, abscess, tooth fracture, damaged fillings and infected gums can result in pain that could be described as a toothache.

Nine per cent of Peel residents experienced a toothache in the past month. This is similar to Ontario (10%). There are no significant differences by sex or age group (Table 2.5). Peel data by age group and sex are similar to Ontario.

**Table 2.5**

**Proportion and Number of People† who Experienced Toothache in the Past Month by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| Sex | Male | 8.8 (6.9 – 11.3) | 48,000 | 9.3 (8.6 – 10.1) | 501,100 |
| | Female | 10.0 (8.0 – 12.5) | 55,800 | 11.3 (10.5 – 12.2) | 631,000 |
| Age group (years) | 12–18 | 10.1* (6.9 – 14.7) | 12,800 | 13.6 (12.1 – 15.2) | 157,000 |
| | 19–29 | 13.9 (10.2 – 18.7) | 29,500 | 15.0 (13.5 – 16.5) | 287,700 |
| | 30–44 | 8.5 (6.1 – 11.7) | 26,000 | 9.9 (8.9 – 11.1) | 272,200 |
| | 45–64 | 8.0* (5.4 – 11.7) | 27,100 | 9.7 (8.6 – 11.0) | 345,800 |
| | 65+ | 7.2* (4.4 – 11.6) | 8,400 | 4.4 (3.8 – 5.1) | 69,400 |
| **Total** | | **9.4 (8.0 – 11.1)** | **103,800** | **10.3 (9.8 – 10.9)** | **1,132,100** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Pain in Jaw or Jaw Joints

Trauma to the jaw area, osteomyelitis (inflammation of the bone or bone marrow), tumors, muscle problems or joint dysfunction can lead to pain in the jaw or jaw joints.

Eight per cent of Peel residents experienced jaw or joint pain in the past month. This is similar to Ontario (9%). Females (10%) are more likely to experience pain in the jaw or jaw joints than males (5%). There are no significant differences by age group (Table 2.6). Peel data by age group and sex are similar to Ontario.

**Table 2.6**

**Proportion and Number of People† who Experienced Jaw or Jaw Joint Pain in the Past Month by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| **Sex** | **Male** | 4.8 (3.5 – 6.6) | 26,100 | 6.6 (6.0 – 7.3) | 354,600 |
| | **Female** | 10.1(7.8 – 12.9) | 55,900 | 10.9 (10.2 – 11.7) | 608,600 |
| **Age group (years)** | **12–18** | 6.4* (3.9 – 10.5) | 8,100 | 10.4 (9.0 – 11.9) | 119,900 |
| | **19–29** | 9.8* (6.7 – 14.2) | 20,700 | 12.2 (11.0 – 13.6) | 235,100 |
| | **30–44** | 7.6* (5.1 – 11.4) | 23,400 | 9.1 (8.1 – 10.2) | 248,800 |
| | **45–64** | 6.7* (4.4 – 9.9) | 22,500 | 7.7 (6.8 – 8.8) | 274,800 |
| | **65+** | 6.2* (3.8 – 10.0) | 7,300 | 5.4 (4.7 – 6.2) | 84,600 |
| **Total** | | **7.5 (6.1 – 9.1)** | **82,000** | **8.8 (8.3 – 9.3)** | **963,200** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Mouth or Face Pain

Similar to oral or facial pain, causes of mouth or face pain are often difficult to pinpoint. Four per cent of Peel residents experienced mouth or facial pain in the past month. This is similar to Ontario (6%). Females (6%) are more likely to experience mouth or facial pain than males (3%). There are no significant differences by age group. Peel males and adults aged 19 to 29 years are significantly less likely to have experienced mouth or face pain in the past month compared to Ontario (Table 2.7).

**Table 2.7**
**Proportion and Number of People† who Experienced Mouth or Face Pain in the Past Month by Sex and Age Group, Peel and Ontario, 2009/2010**

| | | Peel | | Ontario | |
|---|---|---|---|---|---|
| | | Per cent (95% CI) | Number of people | Per cent (95% CI) | Number of people |
| Sex | Male | 2.6* (1.8 – 3.8) | 14,100 | 4.7 (4.2 – 5.3) | 253,300 |
| | Female | 6.0* (4.2 – 8.4) | 33,200 | 6.5 (6.0 – 7.1) | 362,800 |
| Age group (years) | 12–18 | 4.5* (2.4 – 8.1) | 5,600 | 7.9 (6.7 – 9.4) | 91,500 |
| | 19–29 | 2.4* (1.3 – 4.3) | 5,100 | 6.8 (5.8 – 7.9) | 130,500 |
| | 30–44 | 4.6* (2.6 – 8.0) | 14,100 | 5.0 (4.3 – 5.8) | 136,700 |
| | 45–64 | 5.1* (3.1 – 8.3) | 17,300 | 5.5 (4.8 – 6.2) | 194,100 |
| | 65+ | 4.4* (2.4 – 8.0) | 5,200 | 4.0 (3.5 – 4.6) | 63,300 |
| **Total** | | **4.3 (3.3 – 5.6)** | **47,300** | **5.6 (5.3 – 6.0)** | **616,100** |

† Reflects respondents aged 12 years and older.
95% CI reflects the 95% confidence interval of the estimate.
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

chapter 3

# ORAL HEALTH RISK AND PROTECTIVE FACTORS

## Key Messages

- There are limited data available about biological (e.g., tooth morphology, salivary function), behavioural (e.g., nutrition, medication use, drug use) and personal (e.g., sexual health practices, oral body art) risk factors among Peel and Ontario residents.
- A large proportion of students in grades 7–12 report consuming high sugar foods and beverages at least once per day or more. Adult data about oral health and nutrition are not available.
- Data about certain personal tooth brushing practices suggest that the majority of Peel residents brush their teeth twice a day or more.
- Approximately one in ten Peel residents are current smokers. One in three Peel residents consume alcohol daily. Tobacco and alcohol use are associated with the development of a variety of poor oral health outcomes.

At every stage of life, health is determined by complex interactions between biological, social and economic factors; the physical and social environment; and individual behaviours. Access to and use of health services is also important, but often has less of an impact on health status. All of these factors are referred to as the determinants of health.

There is no definitive set of determinants. The Public Health Agency of Canada, for example lists the following: genetic endowment (age and sex), income and social status, culture, social support networks, education and literacy, employment and working conditions, physical and social environment, personal health behaviours and coping skills, healthy child development, and health services.

The commonalities between these determinants are that they have an association with health outcomes or behaviours and influence a wide range of diseases; positively and negatively and in occurrence and outcome. Although each of these determinants is important in its own right, they are also inter-related. It is the combined influence of the determinants that drives the overall status of health, burden of illness and preventable loss of life of the population.

Determinants of health are often categorized as risk factors or protective factors. Risk factors are characteristics or exposures that an individual might have that increase their chances of developing a poor health outcome. Protective factors on the other hand reduce the potential of developing poor outcomes. This chapter will focus on the risk and protective factors that contribute to or improve poor oral health. When relevant, social and economic factors such as income or immigrant status will also be presented.

## Risk Factors

### Salivary Function

Saliva plays an essential role in maintaining the integrity of the oral structures.[22] The main functions of the saliva include:

- lubricating food for swallowing and digestion;
- restricting the amount of harmful bacteria in the mouth;
- controlling the pH balance;
- washing away food debris; and
- re-mineralizing teeth to help prevent cavities and maintain healthy gums.[23]

The rate at which saliva flows in the mouth is a risk factor for developing dental caries and periodontal diseases. When the rate at which the saliva flows is substantially reduced ("dry mouth"), it can lead to tooth decay or other oral health problems such as speech impediments and difficulty with eating and swallowing which can affect overall health.[24] There are several causes which may disrupt the flow of saliva:

- medications such as those used in the treatment of blood pressure
- certain disease or damage to the salivary glands[23]

The elderly are more susceptible to dental caries and periodontal diseases, and are more likely to take medications that may interfere with saliva. People who are on medication or experiencing dry mouth need to be assessed regularly by a dental professional.

### Occlusion

Occlusion refers to the way in which the teeth of the upper jaw fit together with the teeth of the lower jaw. When the upper teeth are protruded relative to the lower teeth, there is a higher risk of trauma through sport and bullying/fighting.[25]

## Behavioural Practices

There are many types of behavioural practices that affect the health of the gums and teeth. Poor nutrition, medication use, tobacco, alcohol and drug use, oral health care (e.g., tooth brushing, flossing, and use of protective equipment such as mouth guards), sexual health, and oral cosmetics are some of the factors that will be described in this section.

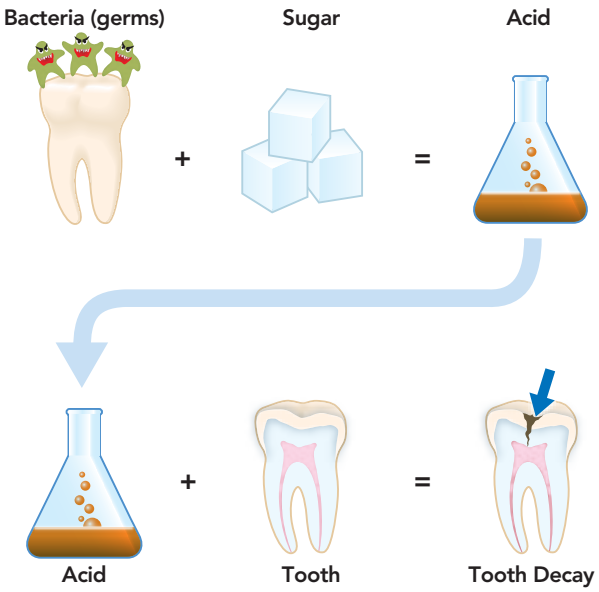
### Nutrition

Nutrition affects oral health in many ways. Dental diseases related to nutrition include dental caries, developmental defects of enamel, dental erosion and periodontal disease.[26]

#### *High Sugar Foods and Beverages*

Individuals who consume foods and beverages containing high levels of added or natural sugar are at higher risk of caries. Sugars from foods or drinks mix with bacteria in the mouth to form a mild acid. This acid attacks the hard outer layer of teeth (also called enamel) causing cavities (Figure 3.1). The damage caused by sugars depends on the quantity of sugar consumed and how long it stays in the mouth.[27]

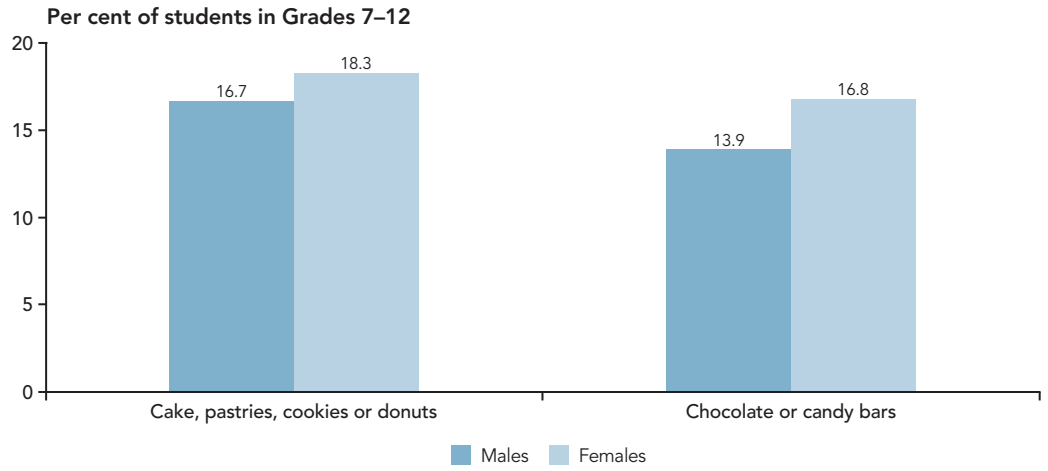
**Figure 3.1**
**Tooth Decay**




Source: Peel Public Health, 2015.

In Peel, female students in grades 7 to 12 are more likely to report consumption of cakes, pastries, cookies and donuts, and chocolate bars or candy bars one or more times per day compared to male students (Figure 3.2). There are no data describing sugar consumption for adults.

**Figure 3.2**
**Consumption of High Sugar Foods at Least One or More Times per Day by Sex, Peel, 2011**




Source: Student Health Survey 2011, Peel Public Health.

### *Sugar-Sweetened Beverages*

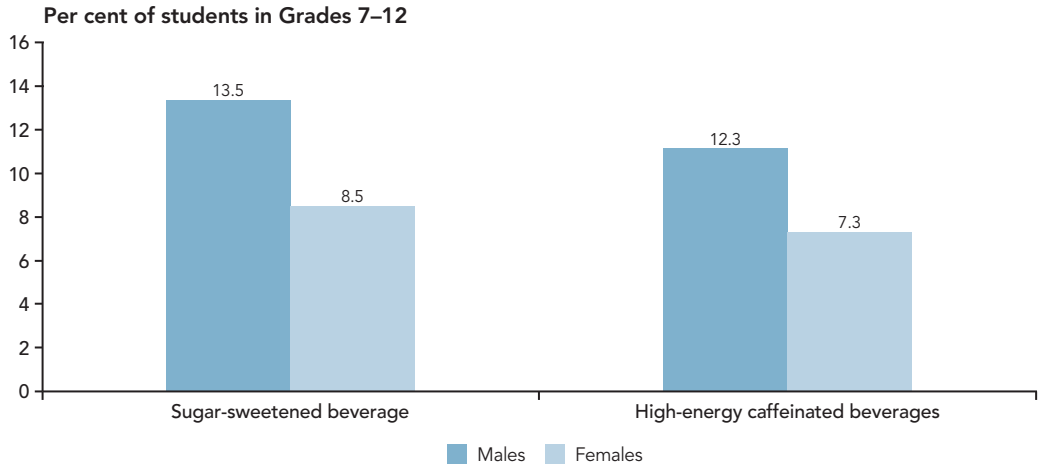
Fruit drinks, regular soft drinks, sports drinks and high energy beverages are often referred to as sugar-sweetened beverages. Sugar-sweetened beverages provide very little nutritional benefits and their consumption is associated with an increase in the risk of developing a variety of health conditions such as diabetes, bone fractures and dental caries.[28,29]

In addition to sugar-sweetened beverages, sports and energy drinks are a large and growing industry that now markets to children and adolescents.[30,31] Energy drinks and sports drinks contain high levels of sugar, which is associated with an increased risk of dental caries.[32] In addition to the sugar, most sports and energy drinks have a pH in the acidic range (pH 3–5), which is associated with dental erosion.[33]

In Peel, 11% of Grade 7 –12 students reported consuming sugar-sweetened beverages once or more per day in the week before the survey and 10% consumed energy drinks once or more in the past week. Consumption patterns in Ontario for sugar-sweetened beverages (12%) and consumption of energy drinks (12%) are similar to Peel.[G]

Males are more likely than females to consume sugar-sweetened or high-energy caffeinated beverages at least once per day or more (Figure 3.3). Data are not available describing sugar-sweetened beverage consumption for adults.

**Figure 3.3**
**Consumption of Sugar-Sweetened Beverages Once per Day or More by Sex, Peel, 2013**




Source: Ontario Student Health and Drug Use Survey 2013, Centre for Addiction and Mental Health. Peel Public Health.

## Medication Use

A number of medications (e.g., prescription, over-the-counter, vitamins, minerals, and herbal) can affect oral health. Sugar is sometimes a major component of many liquid medications, cough drops, and chewable tablets. The high sugar content can lead to an increased risk of developing dental caries. This is a problem for children receiving long-term medication therapy.[34]

Many medications for anxiety, depression, diarrhea, high blood pressure, pain, muscle tension and more can reduce salivary flow causing dry mouth.[35] This is a concern because saliva plays a major role in protecting both the soft and hard tissues in the mouth.[36] Patients suffering from dry mouth have an increased risk of tooth decay and excess plaque formation. Older adults are at higher risk of developing dry mouth as they often take multiple medications of which some may lead to reduced salivary flow. In addition to being at risk of dental decay, older adults wearing dentures may have more difficulty with retaining dentures in the mouth as a consequence of decreased saliva flow.

Medications can also cause alterations in taste, bleeding gums, burning of the mouth/tongue, dental caries, difficulty chewing, infection, and more.[35] In addition, the use of medication can also lead to an enlargement of the gums and difficulty in maintaining good oral hygiene.

Data about medication use are not available for Peel and Ontario.

## Tobacco Use

Tobacco comes in a variety of forms as shown in Table 3.1 and use of these various forms of tobacco have an impact on general and oral health. In general, tobacco causes pre-cancer symptoms, cancer, increases the severity and extent of periodontal diseases, can result in tooth loss and poor post-operative wound-healing.[36]

**Table 3.1**
**Forms of Tobacco and Associated Disease,**

| Form of Tobacco | Type | Associated disease |
|---|---|---|
| **Smoking tobacco†** | Cigarettes<br>Cigars<br>Pipes<br>Bidis<br>Clove cigarettes<br>Shisha (smoked via waterpipe) | • Esophageal and laryngeal cancers<br>• Cancer of the lip, oral cavity and pharynx<br>• Periodontitis |
| **Smokeless tobacco‡** | Chew‡<br>Snuff‡<br>Snus | • Oral cancer<br>• Esophageal cancer‡<br>• Gingival recession<br>• Periodontal disease<br>• Oral leukoplakia (white patches or lesion of the oral mucosa) |
| | Gutkha and paan§ | • Oral cancer (especially in the inner lining of the cheeks and lips) |
| **Dissolvable tobacco** | Hard snuff | • Unknown |

Sources:
† Smoking tobacco: Thun MJ, Day-Lally C, Myers DG, Calle E, Flanders WD, ZHU BP et al. Trends in tobacco smoking and mortality from cigarette use in cancer prevention studies I (1959 through 1965) and II (1982 through 1988). Bethesda, MD: US Department of Health and Human Services, Public Health Service, National Institutes of Helath, National Cancer Institute; 1997.
‡ Chew and Snuff: Nathe CN. Dental public health: Contemporary practice for the dental hygienist. 3rd Edition ed. New Jersey: Upper Saddle River; 2011, and IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Smokeless tobacco and some tobacco-specific N-nitrosamines. IARC Monogr Eval Carcinog Risks Hum. 2007;89:1-592.
§ Gutka and paan: Warnakulasuriya S, Trivedy C, Peters TJ. Areca nut use: An independent risk factor for oral cancer. BMJ. 2002 Apr 6;324(7341):799-800; and Oral cancer: Risk factors for oral cavity cancer [Internet]. Ontario: Canadian Cancer Society; 2016; cited January 8, 2016]. Available from: cancer.ca/en/cancer-information/cancer-type/oral/risks/?region=on.
Key messages for health care providers and policy makers [Internet]. Toronto, Ontario: Centre for Addiction and Mental Health; cited July 3, 2015]. Available from: nicotinedependenceclinic.com/English/teach/SiteAssets/Pages/Smoking-Fact-Sheets2/Oral%20Health%20and%20Smoking%20Fact%20Sheet%20for%20Healthcare%20Providers.pdf

The proportion of the population who use each of these products varies as shown in Table 3.2. Oral health outcomes related to tobacco and alcohol use can be found in *Chapter 4 – Oral Health Conditions.*

**Table 3.2**
**Per Cent of Population by Type of Tobacco Product Used, Peel and Ontario**

| | Type of Tobacco | Population | Peel | | Ontario | |
|---|---|---|---|---|---|---|
| | | | Per cent | Number | Per cent | Number |
| Smoked tobacco | Cigarettes¥ | Ages 12+ | 10.9 | 129,000 | 16.5 | 1,911,800 |
| | Cigars¥ | Ages 12+ | 3.8* | 44,500* | 4.6 | 530,500 |
| | Pipes¥ | Ages 12+ | NR | NR | 0.86 | 92,200 |
| | Bidis§ | Grades 7–12 | – | – | 1.1 | 10,800 |
| | Clove cigarettes | | – | – | – | – |
| | Hookah (waterpipe) | Grades 7–12‡ | 10.6% | 12,500 | 8.3 | 76,200 |
| | | Ages 15+† | – | – | 9.8 | 1,093,800 |
| Smokeless tobacco | Chew¥ | Ages 12+ | NR | NR | 0.6 | 71,500 |
| | Snuff¥ | Ages 12+ | NR | NR | 0.2* | 18,000* |
| | Snus | – | – | – | – | – |
| | Gutkha and paan | – | – | – | – | – |
| Dissolvable tobacco | Hard snuff | – | – | – | – | – |

* Use estimate with caution
NR = Data not releasable due to small numbers
– Data not available
Sources:
¥ Past month use of cigarettes, cigars, pipes, chewing tobacco and snuff: Canadian Community Health Survey Share File 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
§ Ever used bidis (grades 7 to 12): Youth Smoking Survey 2012/2013, Health Canada. Available from: tims.otru.org. Tobacco Informatics Reporting System, Ontario Tobacco Research Unit. Cited: January 11, 2016
‡ Past year use of hookah among youth in grades 7 to 12: Ontario Student Drug Use and Health Survey 2015. Centre for Addition and Mental Health. Peel Public Health.
† Ever used hookah (age 15 years and older): Canadian Tobacco Use Monitoring Survey 2012, Health Canada. Available from: tims.otru.org. Tobacco Informatics Reporting System, Ontario Tobacco Research Unit. Cited: January 11, 2016.

## Alcohol Use

The risk of developing oral-related cancers begins to increase at the low level of one drink per day for both males and females. In Peel, the daily amount of alcohol consumed by males and females is shown in Table 3.3. Oral health outcomes related to alcohol can be found in *Chapter 4 – Oral Health Conditions.*

**Table 3.3**
**Per cent and Number of Drinks Consumed Daily† by Sex, Peel, 2009/2010, 2011/2012, 2013/2014 Combined**

| Number of drinks per day | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Per Cent | Average annual number | Per cent | Average annual number | Per cent | Average annual number |
| 0 | 63.5 | 248,600 | 79.5 | 263,200 | 70.8 | 511,800 |
| 1 | 23.3 | 91,100 | 16.9 | 56,100 | 20.4 | 147,300 |
| 2 | 7.0 | 27,200 | 2.6* | 8,500 | 4.9 | 35,700 |
| 3–4 | 5.1* | 20,000 | 0.8* | 2,600 | 3.1* | 22,700* |
| 5–6 | 0.7* | 2,700 | NR | NR | 0.4* | 3,200* |
| >6 | NR | NR | NR | NR | NR | NR |

† Reflects population aged 15 years and older.
* Use estimate with caution.
NR – Not releasable due to small numbers.
Source: Canadian Community Health Survey Share File, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Drug Use

Use of drugs for recreational purposes often leads to physiological and psychological dependence resulting in personal neglect of oral hygiene, nutrition and systemic health, which are directly related to dental and periodontal disease.[37] Data are not available describing the health outcomes of drug use practices in Peel.

## Oral Sexual Health Practices

Oral sex refers to the sexual activities involving the stimulation of the genitalia by the use of the mouth, tongue, teeth or throat. Oral sex is common in all age groups. People may falsely perceive oral sex as a safer alternative of sexual activity than intercourse.[38] Oral sex is associated with several sexually transmitted infections (STIs) including herpes, syphilis, gonorrhea, and human papillomavirus (HPV).[38] HPV is another cause of oral cavity cancer that is not linked with tobacco or alcohol use.[39] Use of a physical barrier during oral sex like condoms or dental dams will help reduce the risk of STI transmission.

Data on oral sexual health practices for Peel and Ontario are not available.

## Oral Body Art

### *Oral Piercing and Tongue Splitting*

Oral piercing and tongue splitting are forms of body art and self-expression in today's culture. However, oral piercings, which involve the tongue (the most common site), lips, cheeks, uvula or a combination of sites, and tongue splitting can be associated with a number of adverse oral and systemic conditions.[40] Wounds originating from the insertion of the jewelry can cause microorganisms that normally occupy the oral cavity to enter the bloodstream and cause metastatic infections in vital organs such as the heart.[41]

Jewelry can also serve as a site or reservoir for periodonto-pathogenic bacteria and overtime the friction produced by oral piercing can cause gingival recession (receding gums), loss of periodontal attachment (damage to or loss of the supporting structures of the tooth), tooth mobility (movement of the tooth) and tooth loss.[41] Oral ornaments may hide changes in the structures of the oral cavity on x-rays making it difficult to diagnose (or confirm the presence of) oral conditions. Additionally, there have been reports of the jewelry becoming embedded in surrounding tissue, requiring surgical removal.[40]

The long-term adverse effects of oral piercing include traumatic injury to the teeth (e.g., chipping, fracturing or teeth, restorations and pulpal damage).[41]

A comprehensive report concerning the adverse effects of oral and/or peri-oral piercing suggest that, gingival recession was the most frequent complication of oral piercings and tongue splitting, followed by tooth fracture and periodontitis.[42]

Peel and Ontario data that measure the practice of oral piercing or tongue splitting are not available.

### *Dental Grills*

Dental grills are emerging forms of oral jewellery and are "decorative covers often made of gold, silver or jewel-encrusted precious metals that snap over one or more teeth".[43] The term "grills" comes from the use of these ornaments by celebrities where "under the spotlight, the glint from their mouths comes from "grills" or "grillz".[43]

Dental grills can be purchased online or from local vendors such as jewelers. Some of these vendors also offer fitting services where they take an impression of the teeth in order to make the grills. However; in some US states, taking an impression of someone's mouth is considered dentistry, which requires a license.[43] This type of activity may also cross the boundaries of professional dentistry in Canada.

There are currently no studies that indicate whether grills are harmful to the mouth or have long-term health consequences. However, grills made from nonprecious (base) metals may cause irritation or allergic reactions, and food and other debris may become trapped between the teeth and the grill, allowing bacteria to collect causing tooth decay and harm gums.[43]

Peel and Ontario data about the use of grills are not available.

## Protective Oral Health Care Factors

There are different behavioral practices that may protect and improve oral health such as tooth brushing or flossing. Professional interventions such as sealants or mouth guards are also shown to be effective in maintaining the integrity of oral structures. These protective factors are described further in this section.

### Tooth Brushing

**Measurement**

**Toothbrushing was assessed in the Canadian Community Health Survey through a respondent's answer to the following question:**

**"How often do brush your teeth?"**

**Response options included:**

- **More than twice a day**
- **Twice a day**
- **Once a day**
- **Less than once a day but not more than once a week**
- **Once a week**
- **Less than once a week**

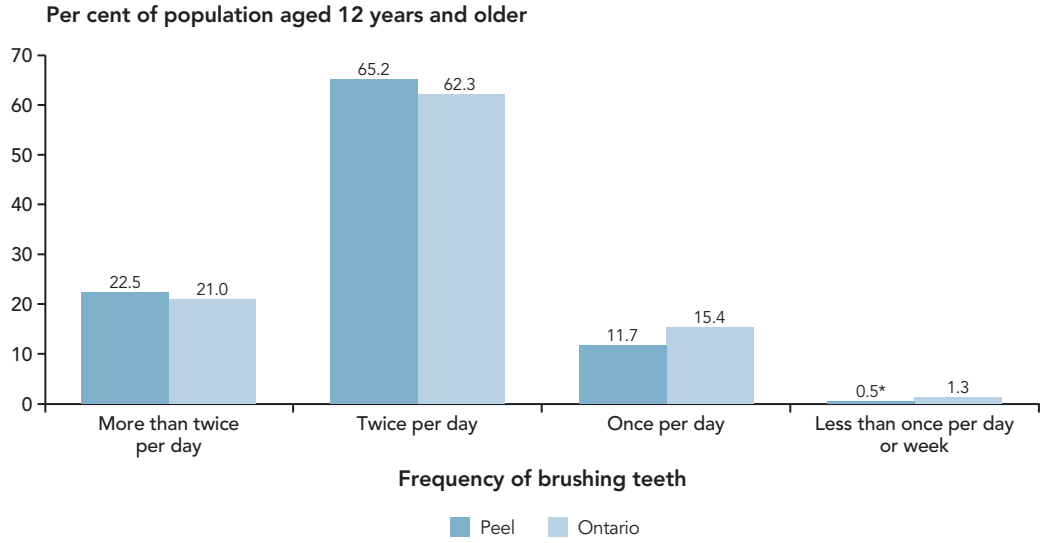
Tooth brushing with fluoride toothpaste reduces the risk of caries. It is recommended that teeth be brushed at least twice a day for two minutes each time.[44]

Caregivers of babies should wipe baby's gums and tongue after every feeding with a clean washcloth moistened only with water. Children's teeth should be brushed as soon as teeth begin to appear in order to reduce their risk for caries.[45] Supervision of tooth brushing by a caregiver for young children helps further reduce the risk of cavities. Children aged three to six years should have their teeth brushed under supervision using a small soft toothbrush and only a pea-sized amount of fluoride toothpaste. Supervised tooth brushing helps to regulate the amount of toothpaste applied to the toothbrush and reduces the amount of toothpaste swallowed which in turn decreases the risk of a child developing fluorosis.[45]

In Peel, 88% of residents brush their teeth twice per day or more as recommended by the Canadian Dental Association (Figure 3.4). This is similar to Ontario (83%).

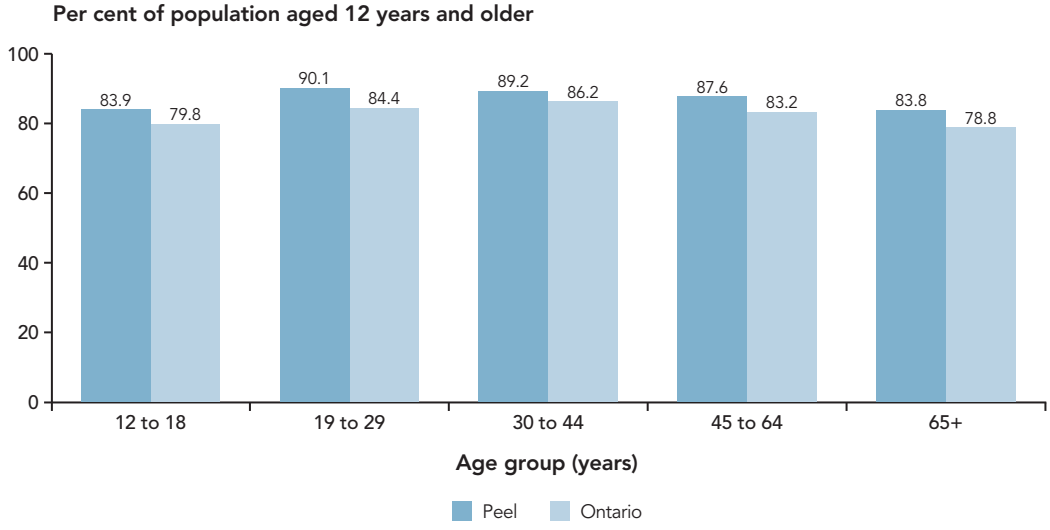
The frequency of brushing varies by sex in Peel where females (92%) are more likely to brush their teeth twice or more each day compared to males (84%). While there is also variability by age group (Figure 3.5), these differences are not statistically significant.

**Figure 3.4**
**Frequency of Brushing Teeth, Peel and Ontario, 2009/2010**




* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

**Figure 3.5**
**Per cent of Population who Brush their Teeth Two Times or More per Day by Age Group, Peel and Ontario, 2009/2010**




Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Flossing

There is some evidence to suggest that flossing in addition to toothbrushing reduces gingivitis (or gum inflammation), the most common type of periodontal disease.[46]

In Peel, only 8% of students floss every day. Almost one-quarter (22%) never floss.[H] Data are not available for the adult population in Peel.

## Sugar-free Chewing Gum

Chewing gum is a soft, cohesive substance intended for chewing but not swallowing. Sugar-free chewing gum does not contain any sugar but has added sweeteners like Xylitol and Sorbitol for taste. Unlike products containing sugar, sugar-free gum does not cause tooth decay, but may in fact reduce dental caries. Two factors contribute to the oral health benefits of sugar-free chewing gum. The first factor is the saliva stimulation through the chewing process, which may contribute to oral health through cleansing of the tooth surface and removing dietary sugars and plaque acids.[47] The second factor is that there is no sugar and the bacteria are unable to produce acid from Xylitol and Sorbitol.[47]

## Sealant Use

Dental caries do not occur equally on all teeth surfaces because teeth vary in size and shape. This can affect the ease at which teeth can be reached for cleaning. Hard to reach surfaces such as spaces between the teeth, deep grooves and fissures are at higher risk for tooth decay. Because of this, dental caries occur more frequently on molars than front teeth because of deeper grooves and fissures.

There is strong evidence to suggest that sealant application is beneficial in preventing or controlling dental caries in permanent teeth.[48] A sealant is a plastic coating applied to the pits and fissures of molar teeth (Figure 3.6). Its purpose is to prevent food and bacteria from entering these areas and to provide a smooth surface that is more accessible for cleaning. The placement of dental sealants, also called pit and fissure sealants, is a preventive treatment to avoid or arrest tooth demineralization before it reaches the end stage of the disease, called dental caries or decay.

**Figure 3.6**
**Image of Teeth with and without Sealants**

A tooth without sealants | A tooth with sealants

Source: Peel Public Health, 2015.

In Canada, the proportion of children and youth with sealants varies by age group from 32% among children aged 6 to 11 years to 51% among youth aged 12 to 19 years (Table 3.4). This is an expected finding, as older children are more likely to have molars to put sealants on.

**Table 3.4**
**Per cent of Population Aged 6–19 years with Sealants on Permanent Teeth by Age Group, Canada, 2007–2009**

| | Age group (years) | |
|---|---|---|
| **Indicator** | **6–11** | **12–19** |
| **Per cent with >1 sealant on permanent molar teeth** | 31.6 | 50.6 |
| **Mean number of sealants** | 2.88 | 3.51 |

Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007–2009. Minister of Health, Ottawa, 2010.

In Peel, the proportion of students with sealants is significantly higher among students in grades 4 and 8 compared to students in Grade 2 (Table 3.5). Data are not available for Peel adults.

**Table 3.5**
**Per cent of Grade 2, 4 and 8 Students with Sealants, Peel, 2015/2016**

| Grade | Per cent with one or more sealants on permanent molar teeth (95% CI) | Mean number of sealants (95% CI) |
|---|---|---|
| **Grade 2** | 8.3 (7.1 - 9.5) | 3.1 (2.9 – 3.3) |
| **Grade 4** | 14.8 (12.7 - 16.9) | 3.1 (2.9 – 3.2) |
| **Grade 8** | 14.7 (13.0 – 16.4) | 3.7 (3.4 – 3.9) |

Source: Ontario Health Information Support System (OHISS) 2015/2016, Peel Public Health.

## Contact Sports

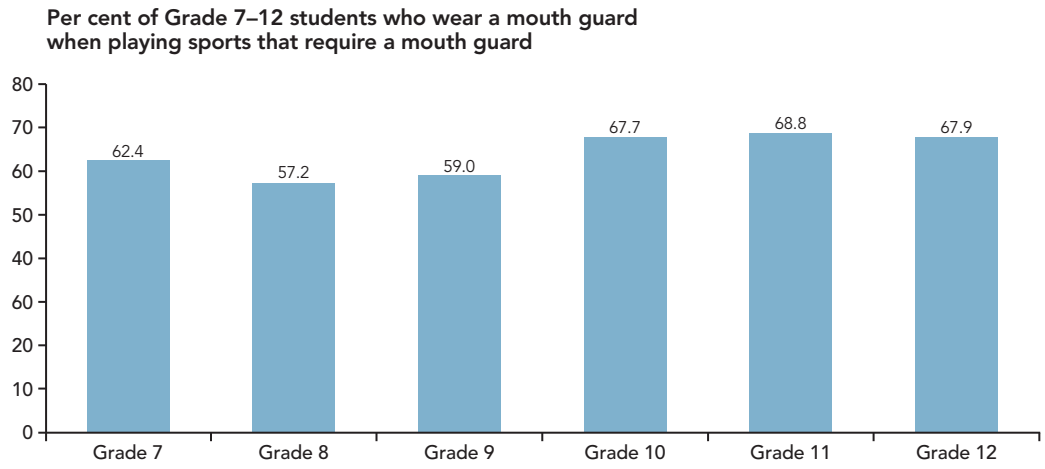
Sporting activities increase the risk for dental and orofacial trauma.[49] Most oral-related traumatic injuries can be prevented with the use of properly fitting faceguards and mouth guards.

### *Face and Mouth Guards*

Faceguards are helmet attachments used to shield the face and have been shown to reduce orofacial injury in many sports.[50] Mouth guards are a protective device that covers the teeth and gums to prevent orofacial injuries and to reduce injury to the teeth, lips and gums. Mouth guards often are used in contact sports such as football, boxing, soccer, ice hockey, basketball, lacrosse and field hockey.[51]

In Peel, only 64% of students report wearing a mouth guard when playing sports that require them. There are no significant differences by sex or grade (Figure 3.7). Data are not available for adults in Peel and Ontario.

**Figure 3.7**
**Per cent of Students who Wear a Mouth Guard by Grade, Peel, 2011**




Source: Student Health Survey 2011, Peel Public Health.

chapter 4

# ORAL DISEASES AND ASSOCIATED CONDITIONS

## Key Messages

- Routine data about the oral health status of Peel's population is limited to children in junior kindergarten (JK), senior kindergarten (SK) and Grade 2. Peel does not have any data describing rates of periodontal disease, calculus or gingivitis for older children and adults.
- One in three Peel children in JK, SK and Grade 2 have experienced caries.
- Rates of congenital anomalies in Peel are similar to Ontario rates. Ontario rates have declined between 1990 and 2013. Trends for Peel have fluctuated due to small numbers.
- Rates of oral cancer incidence and mortality in Peel are declining and are below Ontario rates.
- In Peel, smoking and alcohol use can be attributed to the following oral-related cancer outcomes per year:
  - 56 incident cases
  - 110 patient hospitalizations
  - 53 deaths

## Dental and Periodontal Infections

### Dental Caries (Tooth Decay)

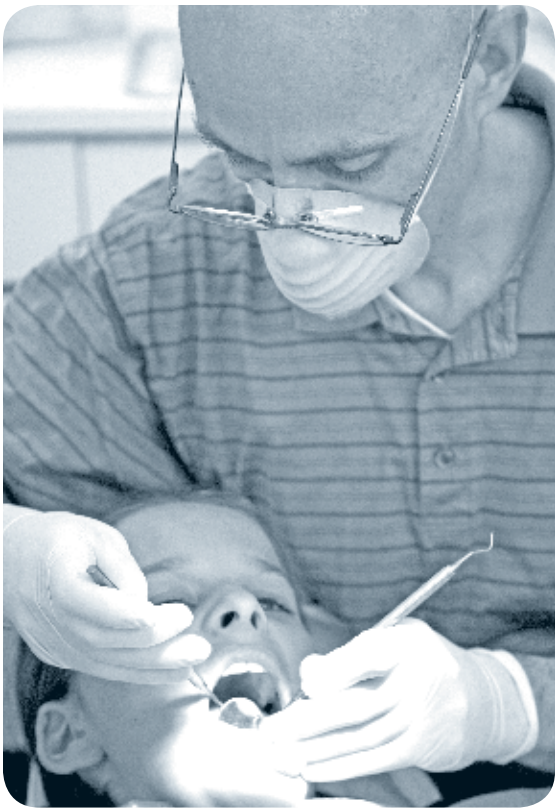
Decayed, missing and filled teeth (DMFT) summaries can help to describe the prevalence and severity of caries, and can be reflective of disease history (e.g., treated and untreated caries) up to the time of assessment.

**Definition**

**The DMFT measure is a count of the number of decayed, missing and filled teeth at the time of assessment.**

**The result of this assessment is reported as the dmft for children and reflects the number of decayed, missing and filled teeth among primary or baby teeth.**

**In adolescents and adults with permanent teeth, the result of this assessment is reported as the DMFT, for the number of decayed, missing and filled teeth among adult teeth.**



In Canada, the proportion of the population with a clinically measured dmft or DMFT >0 increases with age as does the mean number of DMF teeth (Table 4.1).

**Table 4.1**
**Decayed, Missing and Filled Teeth (within Primary and Permanent Teeth), Canada, 2007–2009**

| | Age group (years) | | |
|---|---|---|---|
| **Indicator** | **6–11** | **12–19** | **20–79** |
| **Per cent with dmft + DMFT >0** | 56.8% | 58.8% | 95.9% |
| **Mean number DMFT** | 2.48 | 2.49 | 10.67 |
| **Prevalence of untreated decay†** | – | – | Coronal††: 19.7%<br>Root†††: 6.8% |

† Defined as one or more untreated coronal caries or one or more untreated root caries
†† Decay associated with the crown of the tooth
††† Decay associated with the root of the tooth
– Data not available.
Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007–2009. Minister of Health, Ottawa, 2010.

### *dfmt/DMFT among Peel Children*

In Peel, 33% of screened students in junior kindergarten (JK), senior kindergarten (SK) and Grade 2 have a dmft score of one or greater as measured by a health professional.[I] The prevalence of dmft>0 varies by grade (Table 4.2).

Seventeen per cent of Peel-screened JK, SK and Grade 2 students have active tooth decay, meaning decay that has not yet been treated. There is no difference by grade (Table 4.2).

Twenty per cent of screened JK, SK and Grade 2 students have filled teeth. Students in Grade 2 (30%) have the highest proportion of filled teeth compared to those in JK or SK (Table 4.2).

**Table 4.2**

**Per cent of Screened Students with a dmft >0 by Grade, Peel, 2013/2014 School Year**

| dmft Indicator | Grade | | | |
|---|---|---|---|---|
| | Per cent junior kindergarten | Per cent senior kindergarten | Per cent Grade 2 | Per cent Total |
| dmft >0 % | 26 | 31 | 41 | 33 |
| Decayed % | 18 | 18 | 17 | 17 |
| Decay as a % of dmft >0 | 69 | 57 | 40 | 53 |
| Missing | 3 | 5 | 9 | 6 |
| Filled | 10 | 17 | 30 | 20 |

Notes: dmft > 0 summarizes the total experience of dental caries up to the time of assessment and represents the sum of decayed, missing and filled due to decay (dmft) in an individual.
Due to the methods of collection, data presented in this table cannot be generalized to the whole JK, SK and Grade 2 population of Peel.
Source: Oral Health Information Support System (OHISS) 2013/2014, Ontario Ministry of Health and Long-Term Care. Peel Public Health.

**Did You Know**

In some instances, early childhood tooth decay is caused by frequent and prolonged exposure of the teeth to sugar (e.g., child going to bed with a bottle of sweetened drink or drinking at will from a bottle during the day).[26]

**Peel Program**

Dental screening in elementary schools and community clinics are the primary settings where registered dental hygienists in public health identify children with oral health needs and obtain data related to caries/tooth decay.

### *DMFT among Peel Youth and Adults*

In Peel, 52% of students in grades 10 and 12 have a DMFT >0 as measured by a health professional.[H] Additionally, 12% have untreated dental caries and 12% have urgent dental conditions.

Data are not available for Peel adults.

## Periodontal Disease

Periodontal disease is a set of inflammatory diseases affecting the periodontium (the tissues that surround and support the teeth). Gingivitis and periodontitis are two forms of periodontal disease. Gingivitis involves inflammation of the gums and is a non-destructive form of periodontal disease. Periodontitis involves progressive loss of the alveolar bone around the teeth. Left untreated, periodontitis can lead to the loosening and subsequent loss of teeth. Periodontal disease status can be evaluated using a variety of indicators:

- Presence of gingivitis
- Depth of periodontal pockets and
- Gum (gingival) recession
- Loss of attachment

Pocket depth, gum recession and loss of attachment are all indicators of past periodontitis. There are no indicators of current periodontitis.

A periodontal examination is used to assess the health of the gingiva (gum tissue) and to measure sulcus depths (the distance between the top of the sulcus and the bottom of the sulcus) around each tooth. These sulcus depths are relatively shallow in healthy tissue and deeper in unhealthy tissue, at which time they are referred to as periodontal pockets. The sulcus deepens as a result of the migration of gum tissue away from its normal position in the direction of the tooth root resulting in a 'loss of attachment'. This examination helps the dentist or dental hygienist to diagnose gingivitis and periodontitis.

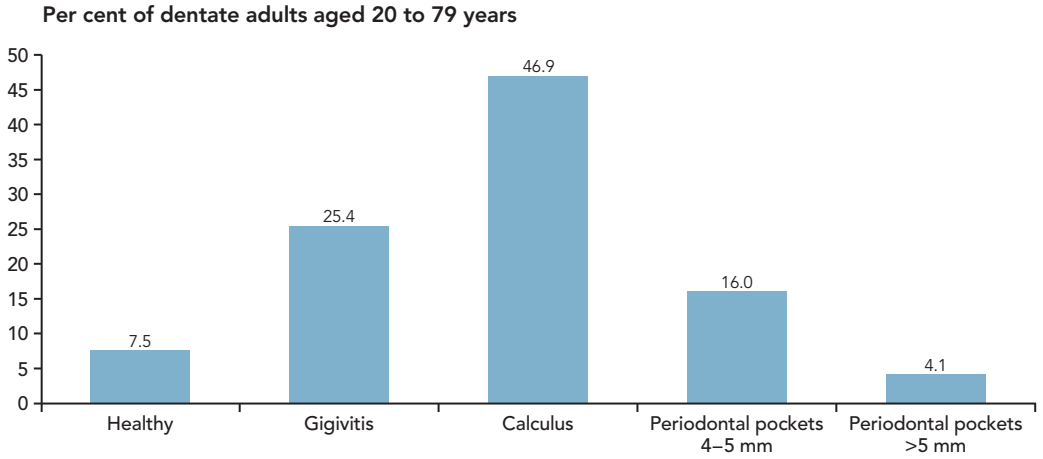
Periodontal disease may be the result of poor oral hygiene which can be captured using calculus and debris (plaque) scores. These are recorded separately using an oral hygiene index.

Periodontal disease has been found to be more prevalent among individuals of lower socioeconomic status. These individuals have the added disadvantage of decreased access to dental care.[52]

In Canada, 92.5% of the population have had some periodontal disease experience as measured by a health professional. However, this does not represent their current periodontal disease status. Although a large proportion of the Canadian population is seen to have gingivitis and calculus, indicators of more serious periodontal pathology (such as pockets greater than 5mm in depth) experienced at some point in the past are less common (Figure 4.1).[5]

Data about periodontal disease is not available for Peel or Ontario adults.

**Figure 4.1**
**Prevalence of Periodontal Conditions†, Canada, 2007–2009**




† Based on Community Periodontal Index of Treatment Needs scores.
Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007-2009. Minister of Health, Ottawa, 2010.

### *Soft Deposits or Debris*

Soft deposits can consist of food debris or dental plaque. Dental plaque is a soft, slimy deposit which builds up in the mouth in the absence of good oral hygiene practices. It is primarily made of bacteria and gelatinous materials including food debris. In its early stages of formation, it is unorganized and the deposit is easily removed by tooth brushing alone. In later stages when it is fully formed, plaque is well organized and requires the services of a dental professional to perform proper tooth cleaning using specialized instruments. The presence of plaque is seen as a predisposing factor to dental caries and gingivitis and is an indicator of the daily oral cleaning practices of children.

Table 4.3 summarizes how debris is classified during an oral examination.

**Table 4.3**
**Debris Classification Criteria**

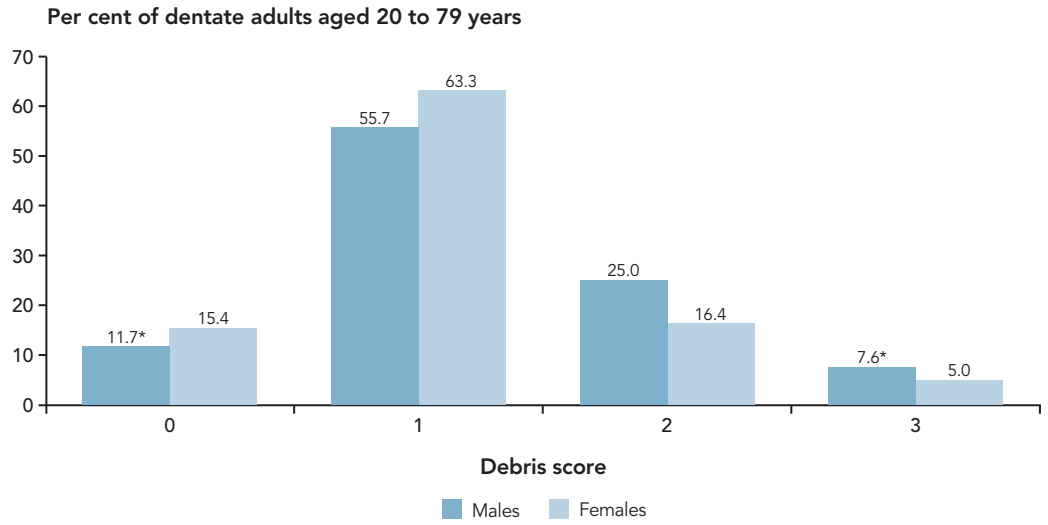
| Scores | Criteria description |
|---|---|
| 0 | No debris or stain present |
| 1 | Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered |
| 2 | Soft debris covering more than one third, but not more than two thirds of the exposed tooth surface |
| 3 | Soft debris covering more than two thirds of the exposed tooth surface. |

Source: Oral Health Database: Simplified Oral Hygiene Index OHI-S. [Internet].: Malmö, Sweden: Malmö University; cited January 8, 2016. Available from: mah.se/CAPP/Methods-and-Indices/Oral-Hygiene-Indices/Simplified-Oral-Hygiene-Index--OHI-S/

In Canada, the majority of dentate adults have a debris score of one or less as measured by a health professional. There are no significant differences in debris scores by sex (Figure 4.2) or age group (data not shown).

Data are not available for Peel or Ontario.

**Figure 4.2**
**Debris† Scores by Sex, Canada, 2007–2009**




† Oral debris consists of soft foreign matter on the tooth surface containing bacteria, material alba, and food.
* Use estimate with caution.
Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007-2009. Minister of Health, Ottawa, 2010.

### *Hard Deposits (Calculus)*

Dental calculus, also referred to as tartar, is a hard deposit on the tooth that may lie above and/or below the gum margin. This deposit results from calcification (hardening) of plaque. It is removable only by professional scaling. Whereas calculus deposits do not cause disease, their presence offers further surfaces for growth of plaque which also acts as mechanical interference in daily tooth cleaning activities. When calculus forms, it may increase the risk of developing periodontal disease.

Table 4.4 describes how calculus is classified during an oral examination.

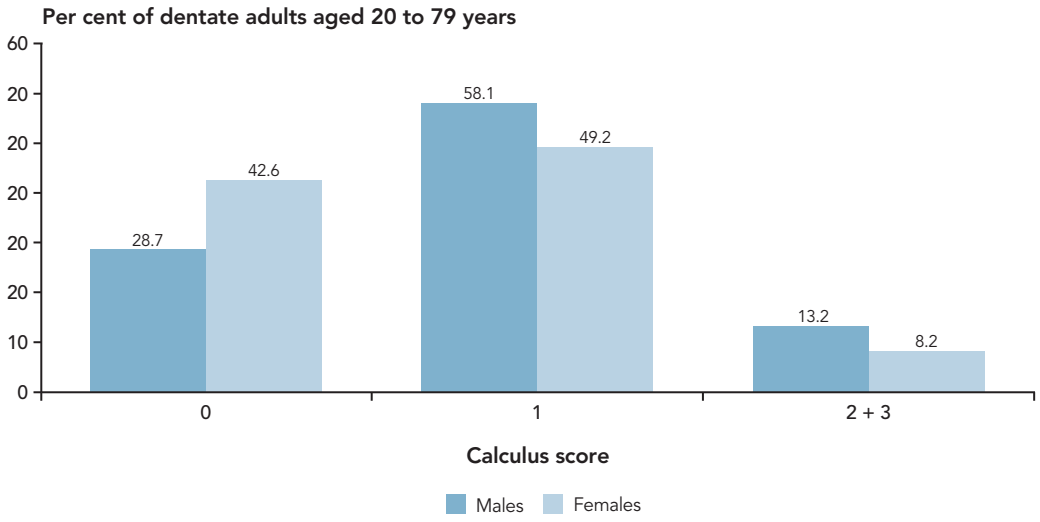
In Canada, approximately one in three dentate adults (35.7%) aged 20 to 79 years have a calculus score of zero as measured by a health professional. There is no significant difference in calculus scores by sex (Figure 4.3).

## Table 4.4
**Calculus Classification Criteria**

| Scores | Criteria description |
|---|---|
| 0 | No calculus present |
| 1 | Supragingival calculus covering not more than one third of the exposed tooth surface. |
| 2 | Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface |
| 3 | Supragingival calculus covering more than two thirds of the exposed tooth surface and/or a continuous heavy band of subgingival calculus. |

Source: Oral Health Database: Simplified Oral Hygiene Index OHI-S. [Internet].: Malmö, Sweden: Malmö University; cited January 8, 2016. Available from: mah.se/CAPP/Methods-and-Indices/Oral-Hygiene-Indices/Simplified-Oral-Hygiene-Index--OHI-S/

## Figure 4.3
**Calculus Scores by Sex, Canada, 2007–2009**




Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007-2009. Minister of Health, Ottawa, 2010.

### *Gingivitis*

Gingivitis is inflammation of the gingivae that is commonly seen and is characterised by bleeding gums. Symptoms include inflammation, irritation, redness and swelling of the gums.

**Did You Know**

**Some chronic general health conditions may also affect clinical oral health. For example, studies have shown that diabetes may have a negative impact on oral health.[53]**

### *Gingivitis among Children*

Overall, 18% of Peel JK, SK and Grade 2 students have signs of gingivitis as measured by a health professional. The proportion of students with gingivitis is much higher among Grade 2 students (28%) compared to JK (11%) or SK students (13%).[I]

### *Gingivitis among Youth*

The proportion of gingivitis among Peel students in grades 10 and 12 is 63%. Males (72%) are more likely than females (55%) to have gingivitis.[H]

The prevalence of gingivitis among Grade 10 and 12 students was significantly lower among those who brushed their teeth more than once per day (57%) compared to those who brushed less than once per day (81%). There were no differences in the prevalence of gingivitis by frequency of flossing.[H]

### *Gingivitis among Adults*

Table 4.5 describes how gingivitis is classified during an oral examination.

In Canada, the proportion of dentate adults with moderate to severe gingivitis is similar by age group (Table 4.6). Data are not available for Peel or Ontario adults.

**Table 4.5**
**Gingivitis Classification Criteria**

| Scores | Criteria description |
|---|---|
| 0 | Normal gingiva |
| 1 | Mild inflammation: Slight change in color and slight edema but no bleeding on probing |
| 2 | Moderate inflammation: Redness, edema and glazing, bleeding on probing |
| 3 | Severe inflammation: Marked redness and edema, ulceration with tendency to spontaneous bleeding |

Löe, H., & Silness, J. (1963). Periodontal disease in pregnancy I. Prevalence and severity. Acta odontologica scandinavica, 21(6), 533-551.

**Table 4.6**
**Per cent of Gingivitis by Score, Canada, 2007–2009**

| Age group (years) | Gingivitis score (%) | | |
|---|---|---|---|
| | None 0 | Mild 1 | Moderate to severe 2+3 |
| 20–39 | 15.8 | 50.1 | 34.1 |
| 40–59 | 9.4 | 60.6 | 29.9 |
| 60–69 | 6.9* | 59.4 | 33.7 |

* Use estimate with caution.
Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007–2009. Minister of Health, Ottawa, 2010.

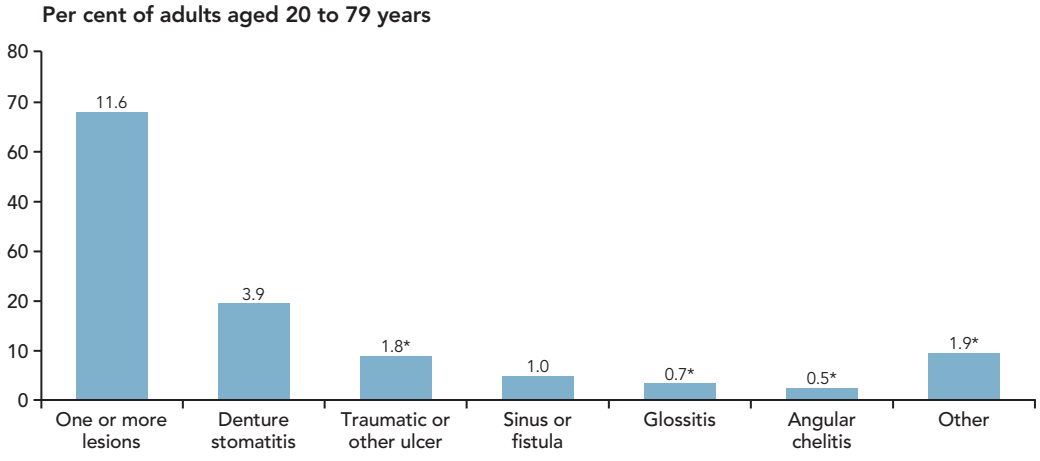
## Soft Tissue Lesions

The tissues of the oral cavity can undergo changes in shape and appearance due to a number of factors. Texture or colour changes in the tissue are important as they can be associated with more serious diseases of the mouth and jaw.

In Canada, approximately 12% of the adult population aged 20 years and older have one or more soft tissue lesions. The most prevalent is denture stomatitis, (also known as thrush) which is caused by yeast or fungus called candida (Figure 4.4). Denture stomatitis is more common among those who wear dentures.

Data are not available for Peel or Ontario.

**Figure 4.4**
**Prevalence of Soft Tissue Lesions by Type, Canada, 2007–2009**




* Use estimate with caution.
Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007-2009. Minister of Health, Ottawa, 2010.

## Oral Cancers

Oral cancers are malignant tumours of the mouth and make up about 2% of all cancers in Ontario. Changes to cells in the oral cavity can sometimes form these cancerous tumours. Tobacco and alcohol use are important risk factors related to the development of oral cancer.

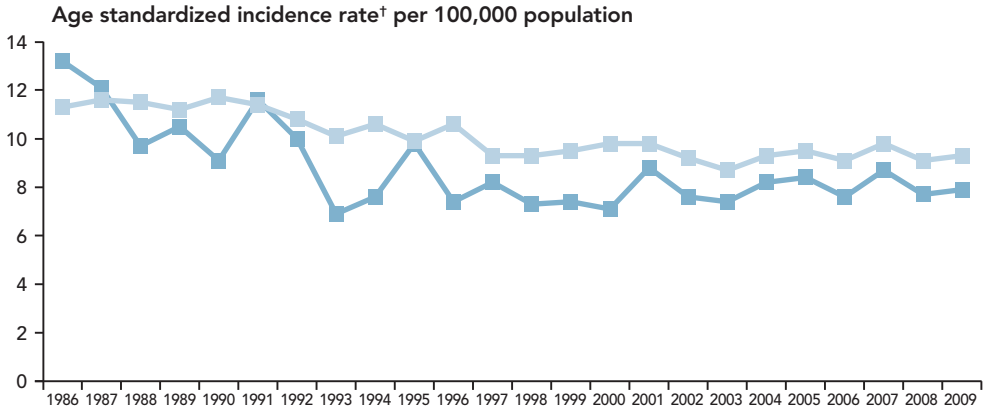

### Oral Cancer Incidence and Mortality

Oral cancer includes the following types of cancer found within the oral cavity and pharynx:

- Lip
- Tongue
- Salivary gland
- Floor of mouth
- Gum and other mouth
- Nasopharynx
- Tonsil
- Oropharynx
- Hypopharynx
- Other oral cavity and pharynx

In Peel, the age-standardized incidence rate of oral cancer has declined between 1986 and 2009. This is similar to Ontario. Oral cancer incidence rates in Peel are slightly lower compared to Ontario (Figure 4.5).

**Figure 4.5**
**Oral Cancer Incidence, Peel and Ontario, 1986–2009**

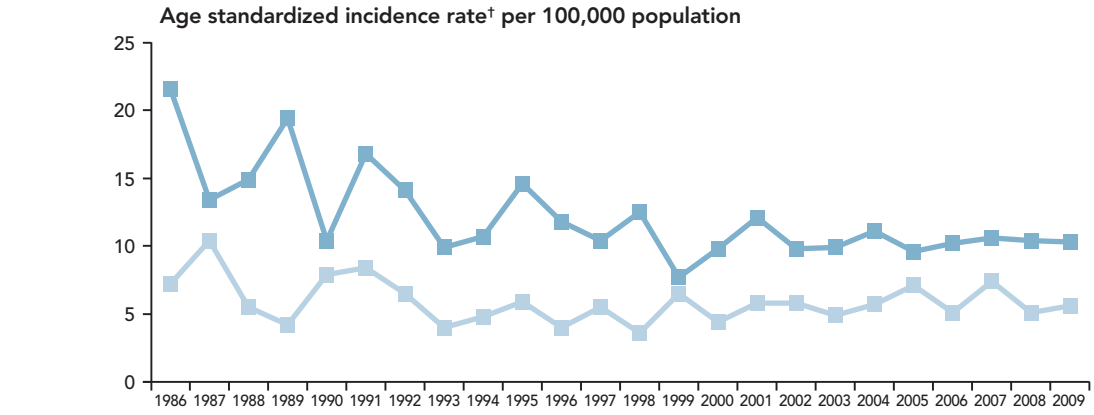



| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 13.2 | 12.1 | 9.7 | 10.9 | 9.1 | 11.6 | 10.0 | 6.9 | 7.6 | 9.8 | 7.4 | 8.2 | 7.3 | 7.4 | 7.1 | 8.8 | 7.6 | 7.4 | 8.2 | 8.4 | 7.6 | 8.7 | 7.7 | 7.9 |
| Ontario | 11.3 | 11.6 | 11.5 | 11.2 | 11.7 | 11.4 | 10.8 | 10.1 | 10.6 | 9.9 | 10.6 | 9.3 | 9.3 | 9.5 | 9.8 | 9.8 | 9.2 | 8.7 | 9.3 | 9.5 | 9.1 | 9.8 | 9.1 | 9.3 |

† Age-standardized to the 1991 Canadian population.
Source: Ontario Cancer Incidence Database 1986-2009, Cancer Care Ontario. SEER*stat Release 7 – OCRIS (February 2009) released March 2009.

Incidence rates of oral cancer have declined between 1986 and 2009 for males and have remained relatively stable for females. Males have a higher incidence rate of oral cancers than females (Figure 4.6).

**Figure 4.6**
**Oral Cancer Incidence by Sex, Peel, 1986–2009**

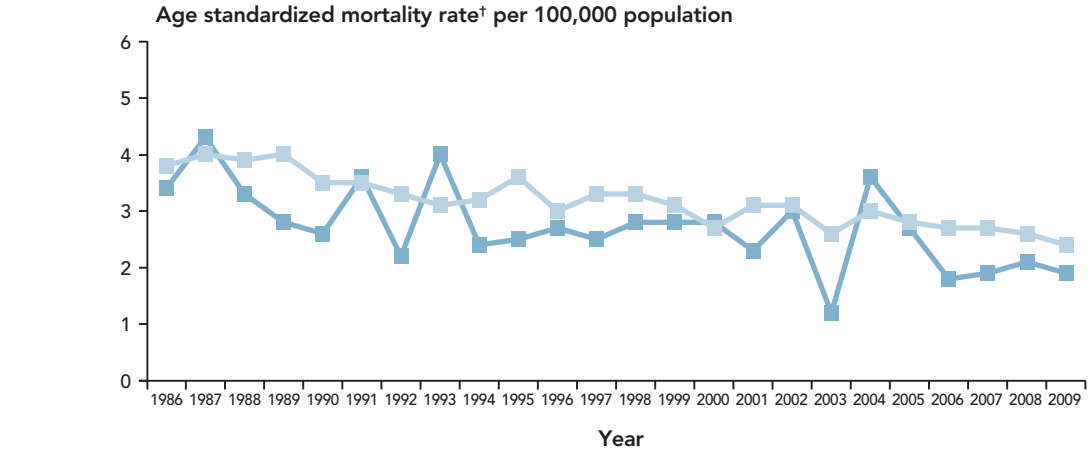



| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Males | 21.6 | 13.4 | 14.9 | 19.4 | 10.4 | 16.8 | 14.1 | 9.9 | 10.7 | 14.6 | 11.8 | 10.4 | 12.5 | 7.7 | 9.8 | 12.1 | 9.8 | 9.9 | 11.1 | 9.6 | 10.2 | 10.6 | 10.4 | 10.3 |
| Females | 7.2 | 10.4 | 5.5 | 4.2 | 7.9 | 8.4 | 6.5 | 4.0 | 4.8 | 5.9 | 4.0 | 5.5 | 3.6 | 6.5 | 4.4 | 5.8 | 5.8 | 4.9 | 5.7 | 7.1 | 5.1 | 7.4 | 5.1 | 5.6 |

† Age-standardized to the 1991 Canadian population.
Source: Ontario Cancer Incidence Database 1986-2009, Cancer Care Ontario. SEER*stat Release 7 – OCRIS (February 2009) released March 2009.

Mortality from oral cancer has decreased slightly in both Peel and Ontario between 1986 and 2009 (Figure 4.7). Males have a higher rate of mortality from oral cancer compared to females (data not shown).

**Figure 4.7**
**Oral Cancer Mortality Rate, Peel and Ontario, 1986–2009**




| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 3.4 | 4.3 | 3.3 | 2.8 | 2.6 | 3.6 | 2.2 | 4.0 | 2.4 | 2.5 | 2.7 | 2.5 | 2.8 | 2.8 | 2.8 | 2.3 | 3.0 | 1.2 | 3.6 | 2.7 | 1.8 | 1.9 | 2.0 | 1.9 |
| Ontario | 3.8 | 4.0 | 3.9 | 4.0 | 3.5 | 3.5 | 3.3 | 3.1 | 3.2 | 3.6 | 3.0 | 3.3 | 3.3 | 3.1 | 2.7 | 3.1 | 3.1 | 2.6 | 3.0 | 2.8 | 2.7 | 2.7 | 2.6 | 2.4 |

† Age-standardized to the 1991 Canadian population.
Source: Ontario Cancer Mortality Database 1986-2009, Cancer Care Ontario. SEER*stat Release 7 – OCRIS (February 2009) released March 2009.

## Association between Oral Cancer, Smoking and Alcohol Use

Smoking and alcohol consumption are two of the main risk factors for developing or dying from oral cancer. Tables 4.6 and 4.7 describe the relative risk associated with development of, or dying from, selected oral cancers from smoking (Table 4.6) and alcohol consumption (Table 4.7).

**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., esophageal cancer) compared to people without the exposure (e.g., non-smokers).**

- **If RR=1, the risk in exposed persons equals the risk in non-exposed persons.**
- **If RR>1, the risk in exposed persons is greater than the risk in non-exposed persons.**
- **If RR<1, the risk in exposed persons is less than the risk in non-exposed persons.**

We can interpret the meaning of the relative risk in Table 4.7 using esophageal cancer and smoking as an example:

*The relative risk for esophageal cancer for males who smoke is 6.76. This means that male smokers are almost seven times more likely to develop or die from esophageal cancer than those who have never been smokers.*

**Table 4.7**
**Relative Risk* for Oral Health Diseases by Smoking Status and Sex**

| Oral cancer | Male | | Female | |
|---|---|---|---|---|
| | Relative risk current smoker | Relative risk former smoker | Relative risk current smoker | Relative risk former smoker |
| Cancer of the lip, oral cavity and pharynx | 10.89 | 3.40 | 5.08 | 2.29 |
| Esophageal cancer | 6.76 | 4.46 | 7.75 | 2.79 |
| Laryngeal cancer | 14.60 | 6.34 | 13.02 | 5.16 |

* Relative risk associated with the outcome of mortality.
Source: Thun J, Day-Lally C, Myers DG, Calle EE, Flanders WD, Zhu BP et al. Trends in tobacco smoking and mortality from cigarette use in cancer prevention studies (1959 through 1965). Bethesda, MD. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1997.

We can interpret the meaning of the relative risk in Table 4.8 using cancer of the lip, oral cavity and pharynx and alcohol consumption as an example:

*The relative risk for cancer of the lip, oral cavity and pharynx is 2.97 for males and females who drink three to four drinks per day. This means that males and females who drink three to four drinks per day are about three times more likely to die from cancer of the lip, oral cavity and pharynx that those who have never been drinkers.*

**Table 4.8**
**Relative Risk* for Diseases by Alcohol Consumption Level**

| Oral cancer | Relative Risk by Number of Drinks per Day | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3–4 | 5–6 | >6 |
| Cancer of the lip, oral cavity and pharynx | 1.42 | 1.96 | 2.97 | 4.68 | 7.97 |
| Esophageal cancer | 1.20 | 1.43 | 1.87 | 2.64 | 4.67 |
| Laryngeal cancer | 1.21 | 1.47 | 1.95 | 2.81 | 4.99 |

* Relative risk associated with the outcome of mortality.
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.

By combining the relative risk for smoking or daily alcohol consumption with the prevalence of smoking or daily alcohol consumption, and applying this calculation to the to the number of incident cases, hospitalizations or deaths due to oral cancers, we can determine the population attributable fraction.

Definition

**The population-attributable fraction (PAF) in this report describes the proportion of incident cases of cancer, hospitalization or death due to selected oral cancers that are attributable to either smoking or alcohol consumption. It is a way of describing the proportion of the disease, hospitalization or death that could be prevented if the exposure (e.g., smoking or alcohol use) was removed.**

**Some of the relative risk numbers used to calculate the PAFs are specific to mortality only and some to morbidity only. In these instances, the relative risk has been used interchangeably, meaning we have used a mortality relative risk to estimate morbidity.**

While the number of incident cases, hospitalizations or deaths due to oral-related cancers will be presented in the following tables, these numbers should be interpreted as an estimate of the contribution of smoking or alcohol use to these conditions. For each of the tables, the average annual number of cases, hospitalizations or deaths are based on several years of data. The years used to calculate the average annual number also vary depending on the data source.

Additional details about the methods used to calculate the number of oral-cancer cases, hospitalizations and deaths attributable to either smoking or alcohol use and the prevalence of smoking and daily alcohol consumption can be found in *Chapter 10 – Data Methods.*

### *Oral Cancer Incidence Attributed to Smoking and Alcohol Use*

In reading this section, readers should understand that combining tobacco and alcohol increases the risk for oral cancers than consumption of either substance alone.[54] These analyses do not take into consideration the synergistic effects of both tobacco and alcohol use.

Table 4.9 shows the number of incident cases of selected oral cancers attributable to smoking or daily alcohol use in Peel on an annual basis.

Definition

**An incident case is a newly diagnosed case of a disease within a specified time period. For example, an incident case of cancer would represent a case of cancer that has been diagnosed in a particular calendar year.**

In reviewing these tables, be aware of the following caveats:

- It is possible that one person could have had multiple cases of cancer at one time. The data in these tables have not been adjusted to reflect this.
- The calculations do not account for the synergistic effects of other exposures such as tobacco and alcohol use.

***What does this mean?***

In Peel, there are approximately:

- Forty-seven new cases of oral cancer diagnosed every year are attributable to smoking (Table 4.9).
- Nine new cases of oral cancer diagnosed every year are attributable to alcohol use (Table 4.9).

**Table 4.9**
**Average Annual Incident Cases† of Oral Cancer Attributable to Smoking and Daily Alcohol Consumption, Peel, 2005–2009**

| | | Smoking | | Alcohol | | Total |
|---|---|---|---|---|---|---|
| Oral cancer | Number of incident cases | Per cent SAF | Number of incident cases attributable to smoking | Per cent AAF | Number of incident cases attributable to alcohol | Number of incident cases attributable to smoking and alcohol |
| Cancer of the lip, oral cavity and pharynx | 12 | 62.8 | 7 | 20.8 | 2 | 9 |
| Esophageal cancer | 34 | 61.8 | 21 | 10.8 | 4 | 25 |
| Laryngeal cancer | 25 | 77.9 | 19 | 12.6 | 3 | 22 |
| **TOTAL** | **71** | | **47** | | **9** | **56** |

SAF = Smoking-attributable fraction
AAF = Alcohol-attributable fraction
† Assumes that the relative risk of developing the selected oral cancer (incidence) is similar to the relative risk of dying from the selected oral cancer.
Notes: Number of incident cases reflects the average annual number of cases for the years 2005-2009 for those aged 15 years and older.
Sources:
Cancer Incidence: Cancer Care Ontario - SEER*Stat - OCRIS (May 12) Oct 2012 release.
Prevalence of smoking: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014 combined, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Prevalence of daily drinking: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014 combined, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Relative risk for diseases attributable to alcohol: Rehm, J. Kekoe, T; Taylor, B; Patra J; with the assistance of Popova, S. Evidence Base for the Development of Canadian Drinking Guidelines. September 2009. Report prepared by the Centre for Addiction and Mental Health for the Canadian Centre on Substance Abuse on behalf of the Low-Risk Drinking Guidelines Expert Working Group.
Relative risk for diseases attributable to smoking: Thun J, Day-Lally C, Myers DG, Calle EE, Flanders WD, Zhu BP et al. Trends in tobacco smoking and mortality from cigarette use in cancer prevention studies (1959 through 1965). Bethesda, MD. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1997.

### *Oral Cancer Hospitalizations Attributed to Smoking and Alcohol Use*

Table 4.10 shows the number of hospitalizations for selected types of oral cancer attributable to smoking or daily alcohol use in Peel on an annual basis.

In reviewing these tables, be aware of the following caveats:

- It is possible that one person could have had multiple cases of cancer at one time. The data in these tables have not been adjusted to reflect this.
- The calculations do not account for the synergistic effects of other exposures such as smoking and alcohol use.

**Table 4.10**

**Average Annual Number of Oral Cancer Hospitalizations† Attributable to Smoking and Daily Alcohol Consumption, Peel, 2013**

| | | Smoking | | Alcohol | | Total |
|---|---|---|---|---|---|---|
| Oral cancer | Number of hospitalizations | Per cent SAF | Number of hospitalizations attributable to smoking | Per cent AAF | Number of hospitalizations attributable to alcohol | Number of hospitalizations attributable to smoking and alcohol |
| Cancer of the lip, oral cavity and pharynx | 85 | 59.3 | 50 | 19.4 | 16 | 66 |
| Esophageal cancer | 37 | 61.3 | 23 | 10.6 | 4 | 27 |
| Laryngeal cancer | 19 | 77.9 | 15 | 12.6 | 2 | 17 |
| **TOTAL** | **141** | | **88** | | **22** | **110** |

SAF = Smoking-attributable fraction
AAF = Alcohol-attributable fraction.
†Assumes that the relative risk of being hospitalized for the selected oral cancer is similar to the relative risk of dying from the selected oral cancer.
Notes:
Number of hospitalizations reflects the average annual number of individuals who were hospitalized for the years 2009-2013 for those aged 15 years and older.
Sources: Hospital In-Patient Discharge Data 2009-2013, Canadian Institute for Health Information. Intellihealth Ontario, Ministry of Health and Long-Term Care.
Prevalence of smoking: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014 combined, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Prevalence of daily drinking: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014 combined, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Relative Risk for diseases attributable to alcohol: Rehm, J. Kekoe, T; Taylor, B; Patra J; with the assistance of Popova, S. Evidence Base for the Development of Canadian Drinking Guidelines. September 2009. Report prepared by the Centre for Addiction and Mental Health for the Canadian Centre on Substance Abuse on behalf of the Low-Risk Drinking Guidelines Expert Working Group.
Relative risk for diseases attributable to smoking: Thun J, Day-Lally C, Myers DG, Calle EE, Flanders WD, Zhu BP et al. Trends in tobacco smoking and mortality from cigarette use in cancer prevention studies (1959 through 1965). Bethesda, MD. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1997.

### *What does this mean?*

In Peel, there are approximately:

- Eighty-eight hospitalizations for oral cancer diagnosed every year are attributable to smoking (Table 4.10)
- Twenty-two hospitalizations for oral cancer every year are attributable to alcohol use (Table 4.10).

## *Oral Cancer Deaths Attributable to Tobacco and Alcohol*

**Table 4.11**
**Average Annual Number of Oral Cancer Deaths Attributable to Tobacco and Daily Alcohol Consumption, Peel, 2007–2011**

| Disease | Number of deaths | Smoking | | Alcohol | | Total |
|---|---|---|---|---|---|---|
| | | Per cent SAF | Number of deaths attributable to smoking | Per cent AAF | Number of deaths attributable to alcohol | Number of deaths attributable to smoking and alcohol |
| Cancer of the lip, oral cavity and pharynx | 25 | 58.5 | 15 | 19.0 | 4 | 19 |
| Esophageal cancer | 36 | 62.0 | 22 | 10.9 | 4 | 26 |
| Laryngeal cancer | 9 | 77.6 | 7 | 12.4 | 1 | 8 |
| **TOTAL** | **70** | | **44** | | **9** | **53** |

SAF = Smoking-attributable fraction.
AAF= Alcohol attributable fraction.
Notes: Number of deaths reflects the average annual number of cases for the years 2007–2011 for those aged 15 years and older.
Sources:
Ontario Mortality Database 2007–2011. Ontario Registrar General. Intellihealth Ontario, Ministry of Health and Long-Term Care.
Prevalence of daily drinking: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014 combined, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Prevalence of smoking: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014 combined, Statistics Canada. Ontario Ministry of Health and Long-Term Care.
Relative risk for diseases attributable to alcohol: 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.
Relative risk for diseases attributable to smoking: Thun J, Day-Lally C, Myers DG, Calle EE, Flanders WD, Zhu BP et al. Trends in tobacco smoking and mortality from cigarette use in cancer prevention studies (1959 through 1965). Bethesda, MD. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1997.

### *What does this mean?*

In Peel, approximately:

- Forty-four deaths due to oral cancer are diagnosed every year that are attributable to smoking (Table 4.11).
- Nine deaths for oral cancer are attributable to alcohol use every year (Table 4.11).

When a person quits using tobacco, some of the adverse effects on the oral tissues are reversible.[36] Quitting smoking can lead to improvements in periodontal status and reduce lesion severity.[55] The longer the individual has quit smoking, the lower the risk for periodontal disease, tooth loss, and incidence of cheek lesions.

Table 4.12 is a summary table of data presented in Tables 4.9, 4.10 and 4.11. Table 4.12 shows the total number of incident oral cancer cases, oral cancer hospitalizations and oral cancer deaths that are attributable to smoking or alcohol use in Peel. To put into simpler terms, oral related cancers attributed to smoking and alcohol result in a:

- new case of oral cancer being diagnosed every six days;
- person being hospitalized for oral cancer every three days; and
- new death each week from oral cancer.

**Table 4.12**
**Total Number of Incident Cases of Cancer, Hospitalizations and Death for Oral Cancer Attributed to Smoking and Alcohol, Peel**

| | Incident Cases | Hospitalizations | Deaths |
|---|---|---|---|
| Smoking | 47 | 88 | 44 |
| Alcohol | 9 | 22 | 9 |
| **Total** | **56** | **110** | **53** |

Notes:
Number of incident cases reflects the average annual number of cases for the years 2005–2009 for those aged 15 years and older.
Number of hospitalizations reflects the average annual number of persons hospitalized for the years 2009–2013 for those aged 15 years and older.
Number of deaths reflects the average annual number of cases for the years 2007–2011 for those aged 15 years and older.
Sources:
Cancer Incidence: Cancer Care Ontario - SEER*Stat - OCRIS (May 12) Oct 2012 release.
Hospitalizations: Hospital In-Patient Discharge Data 2009–2013, Canadian Institute for Health Information. Intellihealth Ontario, Ministry of Health and Long-Term Care.
Deaths: Ontario Mortality Database 2007–2011. Ontario Registrar General. Intellihealth Ontario, Ministry of Health and Long-Term Care.

## Developmental Conditions of the Oral Cavity

### Congenital disorders

Congenital disorders are defined as structural or functional anomalies that develop while in utero (in the womb). Congenital disorders can be detected prenatally, at birth or later in life. One type of anomaly related to the orofacial area is orofacial clefts. Orofacial clefts that result from the incomplete formation of the mouth or roof of the mouth resulting in cleft lip or cleft palate.

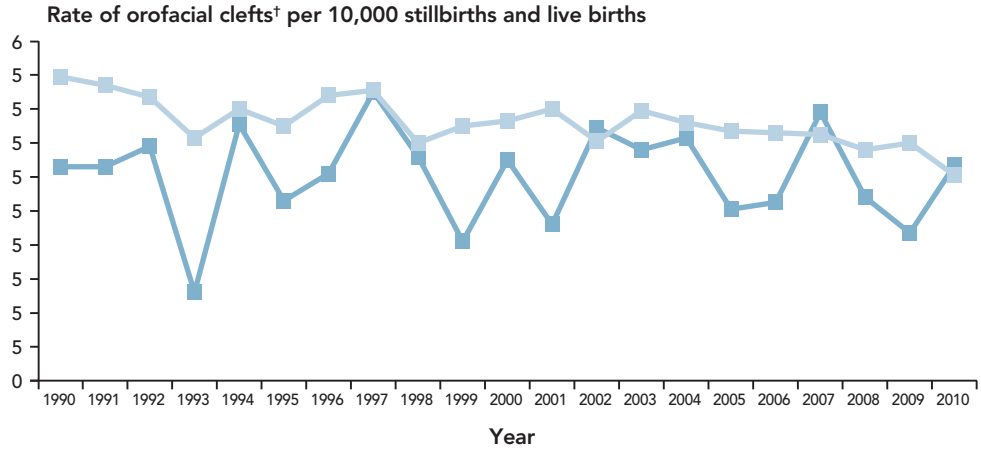
In most cases the cause of orofacial clefts is unknown; however, the following risk factors have been found to increase the chances of babies being born with an orofacial cleft:

- genetic factors
- smoking during pregnancy[56, 57]
- women diagnosed with diabetes before pregnancy[58]
- use of certain medicines during the first trimester (e.g., certain medications used to treat epilepsy)[59, 60]

In Canada, the prevalence of orofacial clefts has declined slightly between 1998 and 2007 from 17 per 10,000 total births to 15 per 10,000 total births.[61]

In Peel, there are approximately 18 orofacial clefts identified each year. These numbers represent the number of anomalies, and not the number of cases as a child may have more than one type of anomaly. The rate of orofacial clefts in Peel is similar to that for Ontario (Figure 4.8).

**Figure 4.8**
**Orofacial Cleft† Rate, Peel and Ontario, 1990–2010**




| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 12.6 | 12.6 | 13.8 | 5.2 | 15.1 | 10.6 | 12.2 | 17.0 | 13.2 | 8.2 | 13.0 | 9.2 | 14.9 | 13.6 | 14.3 | 10.1 | 10.5 | 15.8 | 10.8 | 8.7 | 12.7 |
| Ontario | 17.9 | 17.4 | 16.7 | 14.3 | 16.0 | 16.0 | 16.8 | 17.1 | 14.0 | 15.0 | 15.3 | 16.0 | 14.1 | 15.9 | 15.2 | 14.7 | 14.6 | 14.5 | 13.6 | 14.0 | 12.1 |

Notes: Orofacial clefts include cleft lip and palate (ICD9: 749.0-749.2).
† Defined as total number of cases of cleft lip and/or palate diagnosed prior to one year of age for years 1990 to 2000 and by 30 days of age for the years 2001 onwards.
Sources: Canadian Congenital Anomalies Surveillance System (CCASS) 1990-2012, Public Health Agency of Canada.
Ontario Live Birth Database 1990-2010, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Ontario Stillbirth Database 1990-2010, Ontario Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Fluorosis

Dental fluorosis is a change in the appearance of the teeth which occurs when too much fluoride is ingested by children when the teeth are developing.[62] Most commonly, this presents as small white specks on a child's teeth.[62]

Among Canadian children aged six to 12 years:

- sixty per cent have teeth that are without fluorosis
- twenty-four per cent have enamel with white flecks or spots where the cause is questionable
- twelve per cent have one or more teeth with fluorosis classified as very mild
- four per cent have fluorosis classified as mild
- The proportion of children with moderate or severe fluorosis is too low to be reported[5]

The fluorosis data collected during school screening in Peel does not provide a true picture of fluorosis in the school population. Additionally, the data from the Canadian Health Measure Survey (CHMS) cannot be compared to Peel data. In Peel, dental fluorosis affects about 2.1% (representing 1,113 children) of the 52,462 children that were screened during the 2014-2015 school year.

Data are not available for Peel youth or adults.

## Dental Trauma or Injury

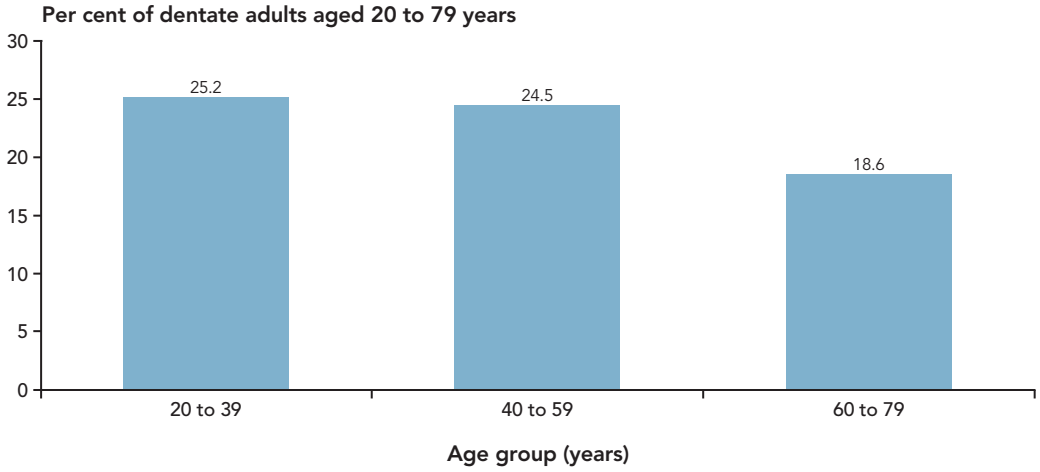
Traumatic dental injury refers to injury of the teeth and/or periodontium and nearby soft tissues (e.g., lips and tongue). Dental trauma may involve soft tissue lacerations or cracked, chipped or lost teeth, and can occur due to falls, contact sports and other jarring events. Dental trauma generally occurs more frequently in children and young adults.

### Self-Reported Dental Trauma

In Peel, 6% of students in grades 10 and 12 reported having had traumatic dental injuries to their front teeth. Males (8%) are twice as likely as females (4%* - use estimate with caution) to have a traumatic dental injury.

While not available for Peel adults, Canadian data show that the proportion of adults with one or more lost or traumatized incisor teeth is similar by age group as shown in Figure 4.9.

**Figure 4.9**
**Per cent of Adults with Incisor Trauma† by Age Group, Canada, 2007–2009**




† Defined as one or more lost or traumatized incisor teeth.
Source: Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007-2009. Minister of Health, Ottawa, 2010.

chapter 5

## ACCESS TO ORAL HEALTH CARE AND ASSOCIATED COSTS

### Key Messages

- Peel has approximately 2,046 oral health professionals to provide oral health care to Peel residents.
- Approximately two-thirds of Peel residents have access to dental insurance. Those in the lower-middle income level and recent immigrants are less likely to have dental insurance.
- In Peel, 70% of residents visited a dentist in the past year. Visits to the dentist are more common among those aged 12 to 18 years, those with high income levels and non-immigrants.
- Peel residents sought alternate dental care through the following health care options:
  - Physicians – 13,087 visits (rates are higher in Peel compared to Ontario)
  - Emergency department – 4,134 visits (rates are lower in Peel compared to Ontario)
  - Hospital – 325 visits (rates are lower in Peel compared to Ontario)
- In Peel, costs to the health care system for oral health care provided by physicians, emergency departments and through hospitalizations is approximately $4 million per year.

Overall, approximately three-quarters of Canadians visited the dentist in the previous year, however; those earning low-incomes were less likely to seek out a dental professional. Medical care is universal in Canada, but dental care is mostly private.[63] Access to dental care is influenced by several factors.

The ability to pay for oral health services is a strong predictor of dental care utilization.[64] This means that Canadians typically have to pay for dental care through private insurance, mainly offered through an employment benefit, or they must pay "out-of-pocket" themselves. While there are a few publicly funded dental programs available, they are typically limited to those in financial difficulties or on social or disability assistance.[65] Most publicly funded programs provide service to children and adolescents while other programs may provide eligible adults with emergency treatments.[65]

While the majority of Ontarians have good oral health and adequate access to dental care, there are subgroups in Ontario that cannot access dental care and have poorer oral health.[65] These inequalities in access to dental care are influenced by social, economic, cultural and environmental factors and contribute to inequalities in oral health.[66]

Social and economic factors include things such as income, education and availability of dental insurance. Cultural factors include things such as inherited ideas, beliefs, values and knowledge which can influence a person's perception of things such as the importance of oral health care and accessing oral health services.[66] Some examples of cultural beliefs include:

- primary teeth are not important, since they fall out;[67]
- you do not have to visit a dentist unless you have a problem;[67, 68]
- a caregiver's negative dental experience impacts their attitude about their child's oral health care.[67]

Inability to pay for dental care services often results in residents seeking care from other providers (such as doctors) where the costs will be covered. This can be measured by assessing rates of oral health care at doctor's offices, at the emergency department or in hospital.

This section will provide an overview of oral health care providers for Peel, who has access to dental insurance, and where Peel residents seek care for their oral health conditions. When possible, costs of care will be described.

## Dental Providers

It is important to have a sufficient number of dental health professionals in the community to increase accessibility. In some communities, like remote or rural areas, there may be fewer dentists available to provide services and this may present challenges to accessing dental care.

The number of dental care providers available to Peel residents is described in Table 5.1.

Although the use of a dentist-to-population ratio may suggest that the number of dental personnel is sufficient, the distribution of dentists within the population may not be adequate. Treatment needs within a population vary and may impact the quantity of dental services required.[69] Therefore, an understanding of population needs may provide a better estimate of the demand for services, and the adequacy of the dental workforce in meeting these needs of residents.

**Table 5.1**
**Number of Oral Health Professionals, Peel and Ontario**

| Oral health professional | Peel | | Ontario | |
|---|---|---|---|---|
| | Total | Rate per 100,000 | Total | Rate per 100,000 |
| Dentists* | 893 | 62.3 | 9,084 | 65.8 |
| Denturists | 44 | 3.1 | 670 | 4.9 |
| Dental hygienists | 1,119 | 78.0 | 13,426 | 97.2 |

* Defined as General Dentists, Dental Anaesthesiologists, Endodontists, Oral Pathologists, Orthodontists, Oral and Maxillofacial Surgeons, Oral Radiologists, Paediatric Dentists, Periodontists, Prosthodontists, and Public Health Dentists.
Sources:
Dentists: Royal College of Dental Surgeons of Ontario. Royal College of Dental Surgeons of Ontario Annual Report 2014. 2014.
Denturists: College of Denturists of Ontario, personal communication, 2016.
Peel Dental Hygienists: Dental Hygienist Search [Internet].: [cited May 27, 2016]. Available from: publicregister.cdho.org/Pages/en_US/Forms/Public/Register/Default.aspx?ReturnUrl=%2f
Ontario Dental Hygienists: College of Dental Hygienists of Ontario. Annual Report 2014. Toronto: College of Dental Hygienists of Ontario; 2014.
Population Projections 2013-2041, Ministry of Finance. Intellihealth Ontario, Ministry of Health and Long Term Care.

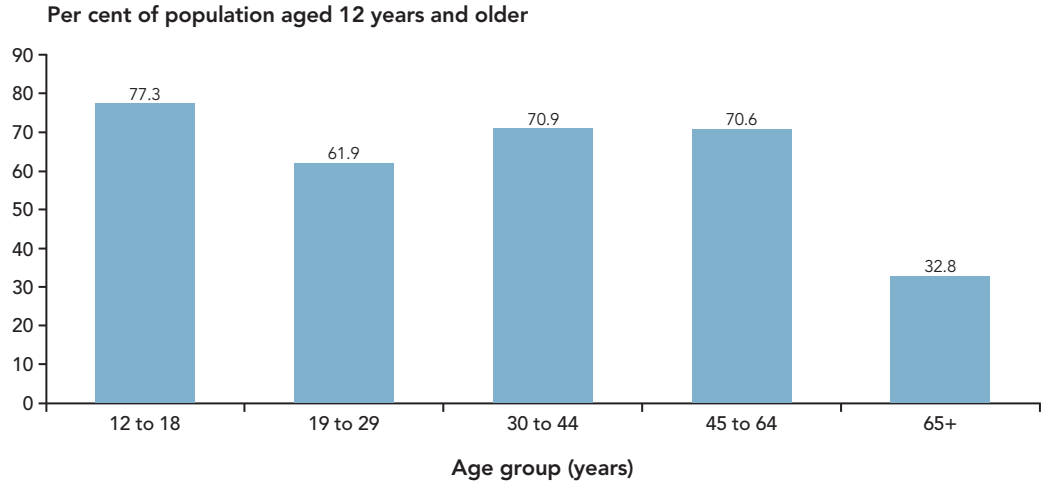
## Dental Insurance

Dental insurance in this section is described as insurance coverage provided by an employer, a government sponsored agency or from a private company.

In Peel and Ontario, 66% of the population aged 12 years and older have dental insurance. The proportion of Peel's population aged 12 years and older with dental insurance is significantly lower in 2009/2010 (66%) compared to 2003 (74%).[F]

The proportion of Peel's population aged 12 years and older with dental insurance is significantly higher among those aged 12 to 64 years compared to those aged 65 years and older (Figure 5.1 and Table 5.2).

**Figure 5.1**
**Per cent of Population that Have Dental Insurance by Age Group, Peel, 2009/2010**




Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

**Table 5.2**
**Per cent and Number of People that Have Dental Insurance by Age Group, Peel, 2009/2010**

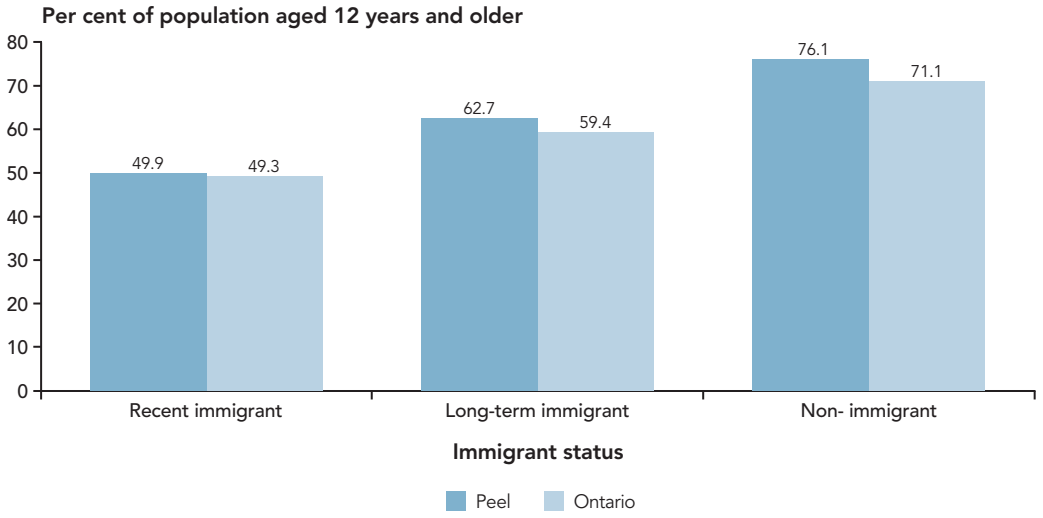
| | Peel | | Ontario | |
|---|---|---|---|---|
| Age group (years) | Per cent | Number | Per cent | Number |
| 12–18 | 77.3 | 87,800 | 79.2 | 827,400 |
| 19–29 | 61.9 | 129,900 | 63.6 | 1,211,400 |
| 30–44 | 70.9 | 216,600 | 72.8 | 1,987,000 |
| 45–64 | 70.6 | 238,500 | 70.5 | 2,505,300 |
| 65+ | 32.8 | 38,500 | 38.2 | 598,100 |
| Total | **65.6** | **711,300** | **66.0** | **7,129,200** |

Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

A significantly higher proportion of non-immigrants and long-term immigrants have dental insurance compared to recent immigrants (Figure 5.2).

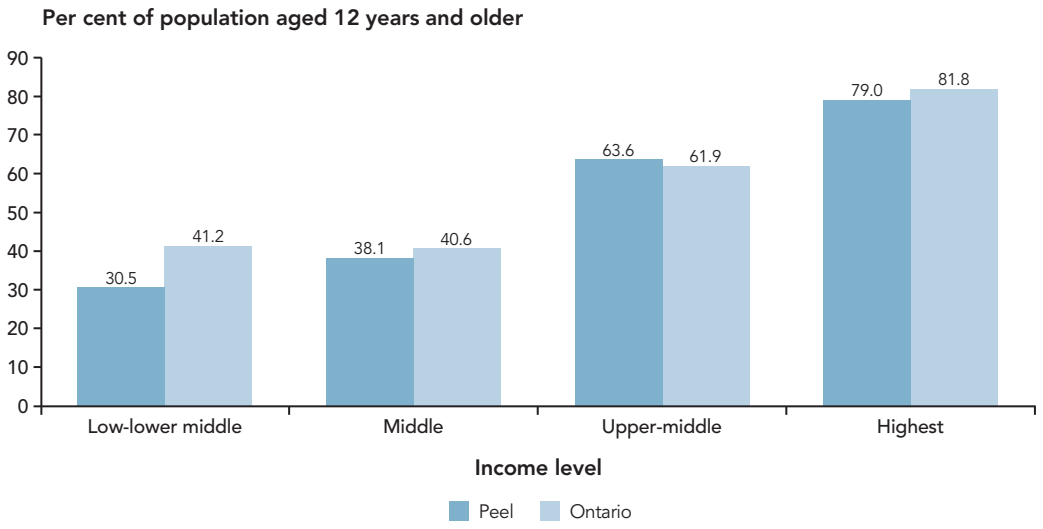
A higher proportion of the population in the highest income group have dental insurance compared with those in the low-middle income group (Figure 5.3).

**Figure 5.2**
**Per cent of Population with Dental Insurance by Immigrant Status, Peel and Ontario, 2009/2010**




Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

**Figure 5.3**
**Per cent of Population with Dental Insurance by Income Level, Peel and Ontario, 2009/2010**




Definitions of income level can be found in Table 11.2.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

### Type of Dental Insurance

The majority of Peel residents (58%) have employer-sponsored dental insurance. This is similar to Ontario (56%) (Table 5.3). Employer subsidized insurance provides greater access compared to publicly-funded sources, because there are fewer dentists available accepting publicly-funded programs.

**Table 5.3**
**Type of Dental Insurance, Peel and Ontario, 2009/2010**

| Type of dental insurance | Peel | Ontario |
|---|---|---|
| | Per cent (95% CI) | Per cent (95% CI) |
| Employer sponsored dental insurance | 58.3 (55.2–61.3) | 56.1 (55.2–57.0) |
| Government sponsored dental insurance | 2.8 (2.1–3.9) | 5.7 (5.4–6.1) |
| Private dental insurance | 4.6 (3.4–6.2) | 4.4 (4.0–4.7) |

95% CI reflects 95% confidence interval of the estimate.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Dental Visits

Regular visits to the dentist starting as early as one year of age are recommended to help promote good oral health.[70, 71]

The Canadian Dental Association recommends a dental assessment for infants, by a dental professional, within six months of the eruption of the first tooth or by one year of age. It is recommended that an ongoing relationship is established between the dentist and the patient no later than 12 months of age.[72] The first dental visit by age one year provides early parental education on infant oral hygiene, dietary factors, oral habits and dental injuries, as well as early interventions.[73]

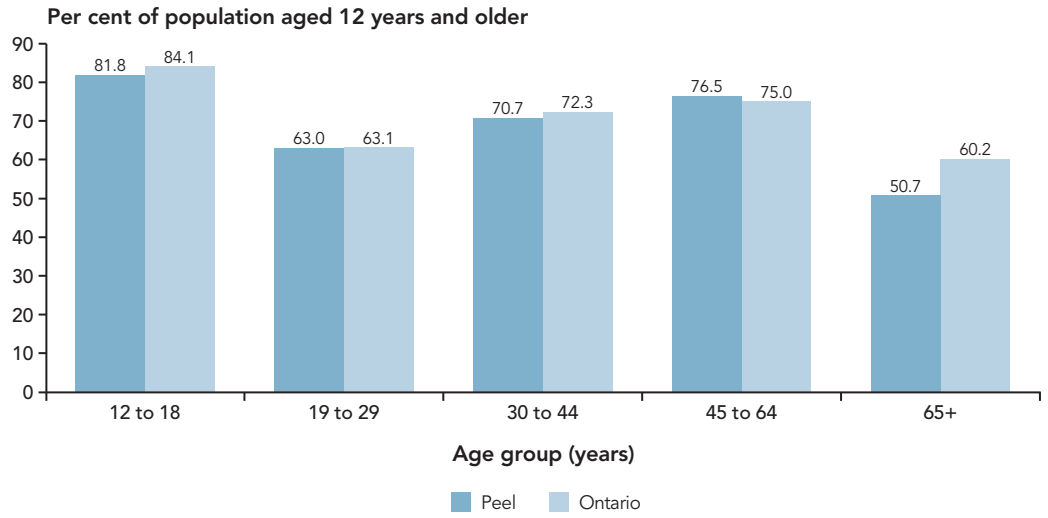
Furthermore, regular visits to the dentist allow for early examination, risk assessment and anticipatory guidance for parents, so that dental disease can be prevented.[71]

Children who have their first preventive dental visit before the age of two years are more likely to have re-occurring preventive visits. They are also less likely to have restorative or emergency visits compared to children who had their first preventive dental visit at two years of age or older.[10]

## Visits to Dentist in the Past Year

In Peel, 70% of the population aged 12 years and older visited a dentist within the past year. This is similar to Ontario (71%).[F] While a higher proportion of the population aged 12 to 18 years visited a dentist there is no significant difference by age (Figure 5.4).

**Figure 5.4**
**Per cent of Population who Visited a Dentist in the Past Year by Age Group, Peel and Ontario, 2009/2010**

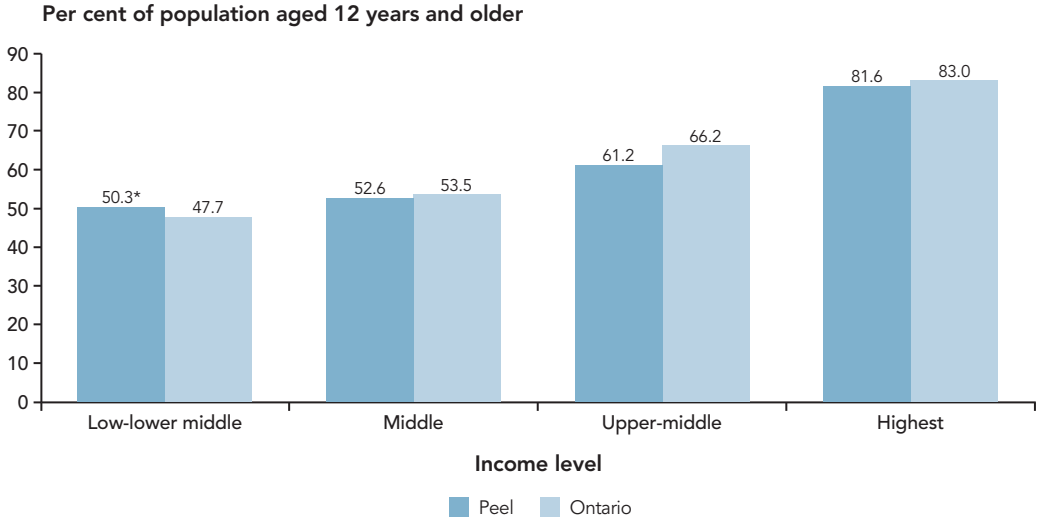



Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

In Peel and Ontario, the proportion of the population who visited a dentist in the past year was significantly higher among those in the highest income level compared to the lowest income level (Figure 5.5).

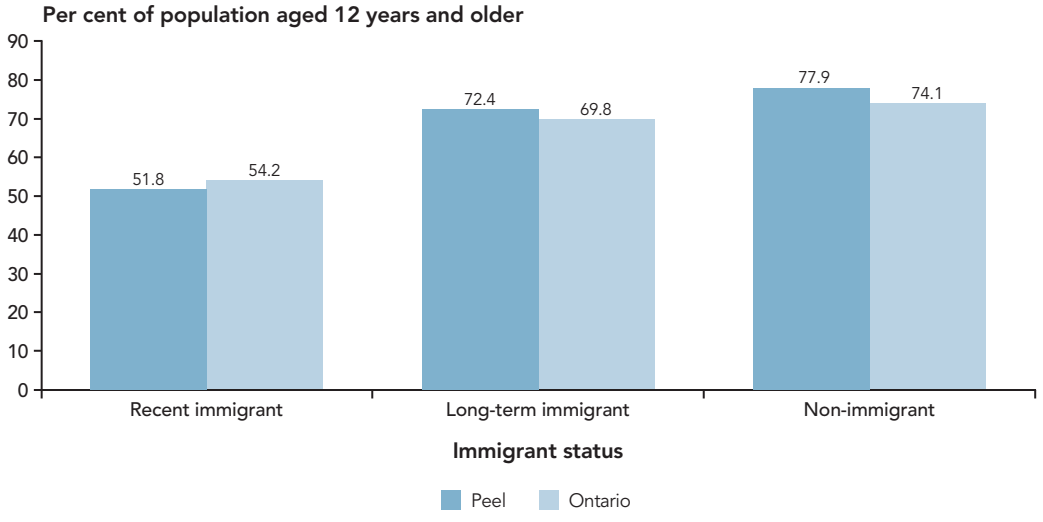
A significantly lower proportion of recent immigrants visited a dentist in the past year compared to long-term immigrants and non-immigrants (Figure 5.6).

**Figure 5.5**
**Per cent of Population who Visited a Dentist in the Past Year by Income Level, Peel and Ontario, 2009/2010**




*Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

**Figure 5.6**
**Per cent of Population who Visited a Dentist in the Past Year by Immigrant Status, Peel and Ontario, 2009/2010**




Source: Canadian Community Health Survey 2009/2010, Statistics Canada, Share File, Ontario Ministry of Health and Long-Term Care.

Individuals without dental insurance (46%) were significantly less likely to have visited a dentist in the past year than those with insurance (83%) (Table 5.4).

**Table 5.4**
**Per cent of the Population who Visited a Dentist in the Past Year by Dental Insurance Status, Peel and Ontario, 2009/2010**

| Dental insurance status | Peel | Ontario |
|---|---|---|
| | Per cent (95% CI) | Per cent (95% CI) |
| Dental insurance | 83.2 (80.2–85.8) | 82.8 (82.0–83.6) |
| No dental insurance | 46.4 (41.3–51.5) | 50.7 (49.1–52.3) |
| **Total** | **70.1 (67.2–72.8)** | **71.0 (70.2–71.8)** |

95% CI reflects 95% confidence interval of the estimate.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

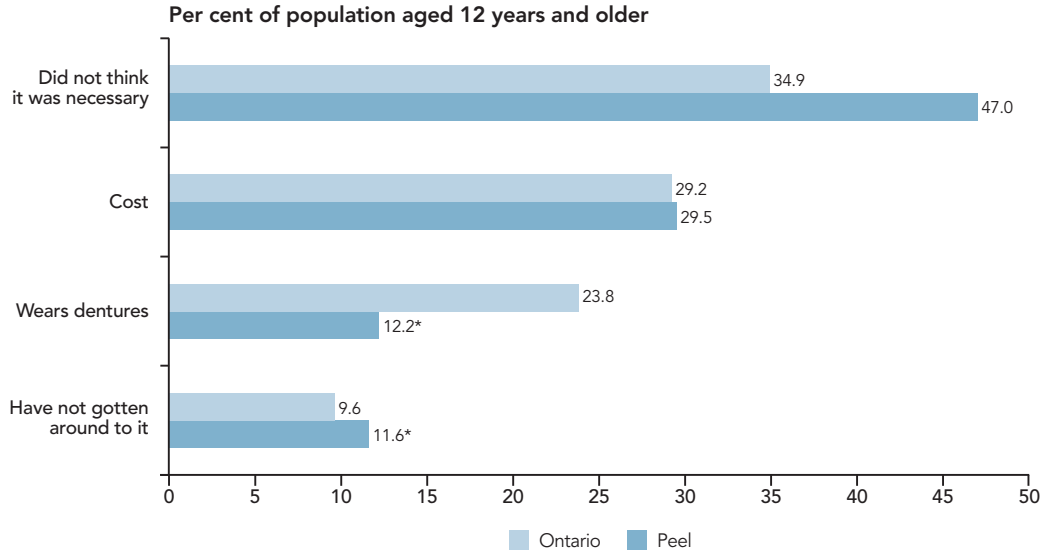
**Did You Know**

**In Canada, a higher proportion of those aged 20 to 39 years of age avoided visiting a dentist in the past year compared to all other age groups because of cost.[5]**


## Reasons for No Dental Visits

The top three reasons for not seeing a dentist in the past three years among individuals aged 12 years and older is shown in Figure 5.7 and Table 5.5. In Peel, approximately 41,100 people indicate that they did not see a dentist in the past three years because of the cost. There is no difference by sex (data not shown). Importantly, approximately half of Peel's population did not visit the dentist because they did not think it was necessary. While some of these individuals may not have any need, others may forgo dental treatment even though there may be a true clinical need.

**Figure 5.7**
**Reason for Not Visiting the Dentist in the Past Three Years, Peel and Ontario, 2009/2010**




*Use estimate with caution
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

**Table 5.5**
**Top Reasons for Not Visiting the Dentist in the Past Three Years, Peel and Ontario, 2009/2010**

| Reason | Peel | | Ontario | |
|---|---|---|---|---|
| | Per cent (95% CI) | Number | Per cent (95% CI) | Number |
| Did not think it was necessary | 47.0 (38.6 – 55.6) | 66,100 | 34.9 (32.2 – 37.6) | 495,900 |
| Cost | 29.5 (22.8 – 37.2) | 41,100 | 29.2 (26.9 – 31.6) | 414,900 |
| Wears dentures | 12.2* (8.3 – 17.8) | 17,200* | 23.8 (22.2 – 25.5) | 338,700 |
| Have not gotten around to it | 11.6* (7.6 – 17.3) | 16,300* | 9.6 (8.4 – 10.9) | 136,200 |

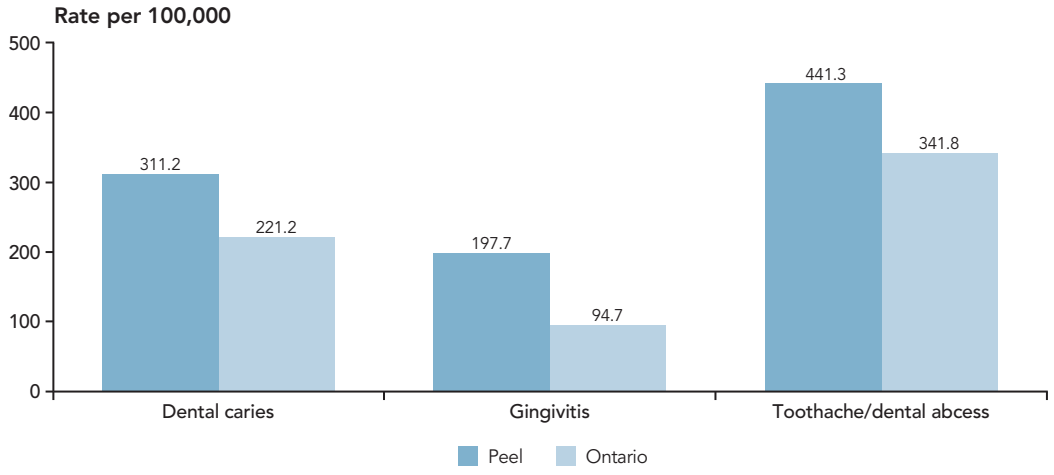
* Use estimate with caution.
Source: Canadian Community Health Survey Share File 2009/2010, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

## Dental-Related Doctor Visits

In Peel in 2013, there were 13,087 visits to a general practitioner or a family physician for dental caries, gingivitis or toothache/dental abscess. About half (46%) of visits were for toothache or dental abscess. An additional third (33%) were for dental caries.[K]

The rate of visits to a general practitioner or family physician for oral health problems is higher in Peel (950.1 per 100,000) compared to Ontario (657.7 per 100,000). Visit rates by oral health diagnosis are shown in Figure 5.8.

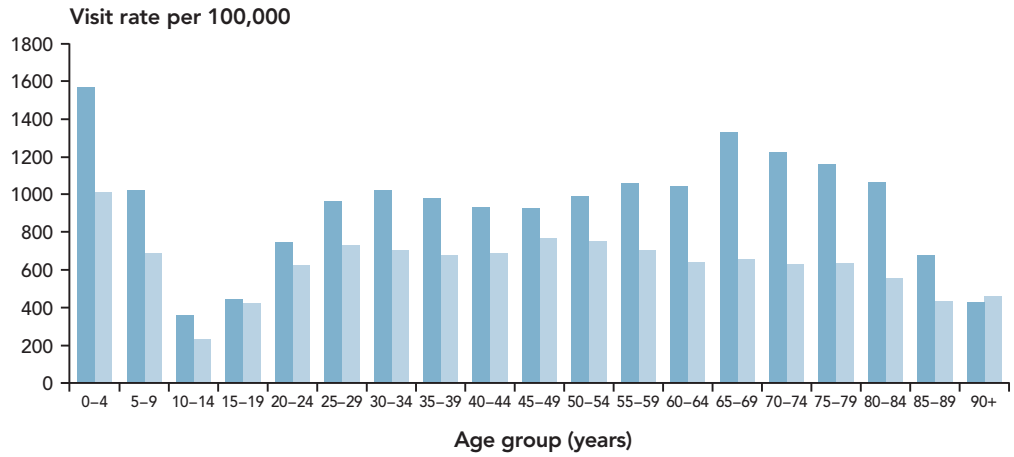
**Figure 5.8**
**Visits to General Practitioners or Family Physicians by Oral Health Diagnosis, Peel and Ontario, 2013**




Sources: Medical Services (OHIP) Data, 2013. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates, 2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The rate of visits to a general practitioner or family physician for oral helath related conditions is highest among those aged zero to four years. In general, visit rates are higher among Peel residents regardless of age group compared to Ontario (Figure 5.9). A summary table for Peel by age group is shown in Table 5.6. Conditions with the most visits to a general practitioner or family physician are for toothache or dental abscesses.

**Figure 5.9**
**Visits to General Practitioners or Family Physicians for Oral Health Consultation by Age Group, Peel and Ontario, 2013**




| | 0–4 | 5–9 | 10–14 | 15–19 | 20–24 | 25–29 | 30–34 | 35–39 | 40–44 | 45–49 | 50–54 | 55–59 | 60–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85–89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 1566.3 | 1022.3 | 360.0 | 443.0 | 747.3 | 962.3 | 1019.4 | 976.0 | 931.3 | 924.7 | 987.0 | 1059.1 | 1039.3 | 1329.0 | 1223.9 | 1158.2 | 1063.7 | 674.6 | 425.5 |
| Ontario | 1009.5 | 688.8 | 231.2 | 421.4 | 625.1 | 730.3 | 700.9 | 674.2 | 688.9 | 766.6 | 748.2 | 703.3 | 640.3 | 652.5 | 627.4 | 633.2 | 554.1 | 434.7 | 461.2 |

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 (OHIP) Data, 2013, IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

**Table 5.6**
**Number and Rate of Visits to General Practitioners or Family Physicians Related to Oral Health Diagnoses by Age Group, Peel, 2013**

| Age group (years) | Dental caries | | Gingivitis | | Toothache/ dental abscess | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Number | Rate per 100,000 | Number | Rate per 100,000 | Number | Rate per 100,000 | Number | Rate per 100,000 |
| **0–17** | 946 | 299.5 | 367 | 116.2 | 1,358 | 430.0 | 2,671 | 845.7 |
| **18–64** | 2,777 | 303.4 | 1,923 | 210.1 | 3,887 | 424.7 | 8,587 | 938.2 |
| **65+** | 559 | 356.5 | 475 | 302.9 | 795 | 507.0 | 1,829 | 1166.4 |
| **Total*** | **4,282** | **311.2** | **2,765** | **197.7** | **6,040** | **441.3** | **13,087** | **950.1** |

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.
* Total rates are age-standardized to the 1991 Canadian population.
Sources: Medical Services (OHIP) Data, 2013. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Visit rates to general practitioners or family physicians by health diagnoses for Peel and Ontario are shown in Table 5.7. Visit rates for Peel are higher than Ontario for each of the health diagnoses and for each age group.

**Table 5.7**
**Rate of Visits to General Practitioners or Family Physicians Related to Oral Health Diagnoses by Age Group, Peel and Ontario, 2013**

| Age group (years) | Dental caries | | Gingivitis | | Toothache/ dental abscess | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Peel | Ontario | Peel | Ontario | Peel | Ontario | Peel | Ontario |
| | Rate per 100,000 | Rate per 100,000 | Rate per 100,000 | Rate per 100,000 | Rate per 100,000 | Rate per 100,000 | Rate per 100,000 | Rate per 100,000 |
| **0–17** | 299.5 | 237.1 | 116.2 | 53.2 | 430.0 | 295.5 | 845.7 | 585.9 |
| **18–64** | 303.4 | 219.8 | 210.1 | 106.2 | 424.7 | 365.7 | 938.2 | 691.7 |
| **65+** | 356.5 | 182.7 | 302.9 | 133.5 | 507.0 | 285.9 | 1,166.4 | 602.1 |
| **Total*** | **311.2** | **221.2** | **197.7** | **94.7** | **441.3** | **341.8** | **950.1** | **657.7** |

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.
* Total rates are age-standardized to the 1991 Canadian population.
Sources: Medical Services (OHIP) Data, 2013. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates, 2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The variation in cost for seeing a doctor for oral health conditions can be found in *Chapter 9 – Data Methods, Table 9.10.* Using this information, it is estimated that in Peel in 2013, the 13,087 visits to a doctor for oral health care cost just under half a million dollars ($463,648).

## Public Funded Oral Health Visits

Peel children and seniors who meet specific criteria are able to access oral health care through specific programs offered by the Region of Peel. The type of public dental service and the number of people who received these services are shown in Table 5.8.

On January 1, 2016, the six publicly funded children programs (Children in Need of Treatment [CINOT], Healthy Smiles Ontario [HSO], Ontario Works [OW], Ontario Disability Support Program [ODSP], Assistance for Children with Severe Disabilities [ACSD] and Preventive Oral Health Services) integrated into the new Healthy Smiles Ontario program.

**Table 5.8**
**Number of Residents Receiving Public Dental Services, Peel, 2015**

| Population | Type of public dental service | Number |
|---|---|---|
| **Children** | Ontario Works (OW) | NA |
| | Ontario Disability Support Program (ODSP) | NA |
| | Screened | 51,297 |
| | Enrolled in Children in Need of Treatment (CINOT) | 6,726 |
| | Enrolled in Healthy Smiles Ontario (HSO) program | 3,781 |
| | Received services under the Preventive Oral Health Services protocol | 3,442 |
| | Assistance for Children with Severe Disabilities (ACSD) | NA |
| **Adults** | Ontario Works (OW) | NA |
| | Ontario Disability Support Program (ODSP) | NA |
| **Seniors** | Enrolled in the Region of Peel Seniors Dental program | 609 |
| | Received treatment in the Region of Peel Seniors Dental program | 852 |

NA – Data not available

## Oral-related Emergency Department Visits

Diseases of the oral cavity, salivary glands and jaw and oral-related injuries are not usually diagnosed and treated by physicians; however, these conditions can cause severe pain and discomfort. As a result, individuals without dental insurance may visit emergency departments for management and pain relief for these conditions because they may not be able to afford conventional dental treatment.

Emergency departments don't always have the resources to address dental problems[12] and will often provide antibiotics/analgesics, rather than treat the dental problem.[12] In the absence of appropriate treatment, this pattern of care and its associated costs may be repeated due to the unresolved conditions.[74] Emergency department visits for dental problems are highly inefficient and costly to the health care system.[12]

The two types of conditions individuals visit the emergency department or the hospital for most are diseases of the mouth and jaw and oral-related injuries. Diseases of the mouth and jaw are disorders affecting the jaw, oral cavity and related structures, such as the teeth and gums, salivary glands, temporomandibular joint and the skin around the mouth. Some examples of diseases of the mouth and jaw include gingivitis and periodontitis, oral candidiasis and herpes simplex virus. Oral-related injuries include injury to all parts of the oral cavity and head.

Details about the types of conditions contained within these categories can be found in *Chapter 9 – Data Methods, Table 9.1.*

In Peel in 2013 there were a total of 4,134 emergency department visits for oral-related injuries or oral-related diseases. Emergency department visit rates for oral-related injuries is lower than for visit rates due to oral-related diseases (Table 5.9).

**Table 5.9**
**Emergency Department Visits due to Diseases of the Oral Cavity, Salivary Glands and Jaw and Oral Injuries† by Year, Peel, 2004–2013**

| Year | Diseases of the oral cavity, salivary glands and jaw | | Oral injuries | | Total | |
|---|---|---|---|---|---|---|
| | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 |
| **2004** | 1,829 | 161.0 | 1,516 | 134.6 | 3,345 | 295.5 |
| **2005** | 1,909 | 167.3 | 1,498 | 129.2 | 3,407 | 296.5 |
| **2006** | 2,160 | 183.4 | 1,632 | 138.7 | 3,792 | 322.2 |
| **2007** | 2,141 | 176.0 | 1,583 | 131.1 | 3,724 | 307.1 |
| **2008** | 2,163 | 172.6 | 1,473 | 119.5 | 3,636 | 292.1 |
| **2009** | 2,212 | 172.9 | 1,567 | 125.2 | 3,779 | 298.1 |
| **2010** | 2,356 | 177.4 | 1,651 | 129.7 | 4,007 | 307.1 |
| **2011** | 2,445 | 182.6 | 1,691 | 129.7 | 4,136 | 312.2 |
| **2012** | 2,690 | 198.0 | 1,632 | 124.8 | 4,322 | 322.8 |
| **2013** | 2,587 | 186.3 | 1,547 | 115.6 | 4,134 | 302.0 |

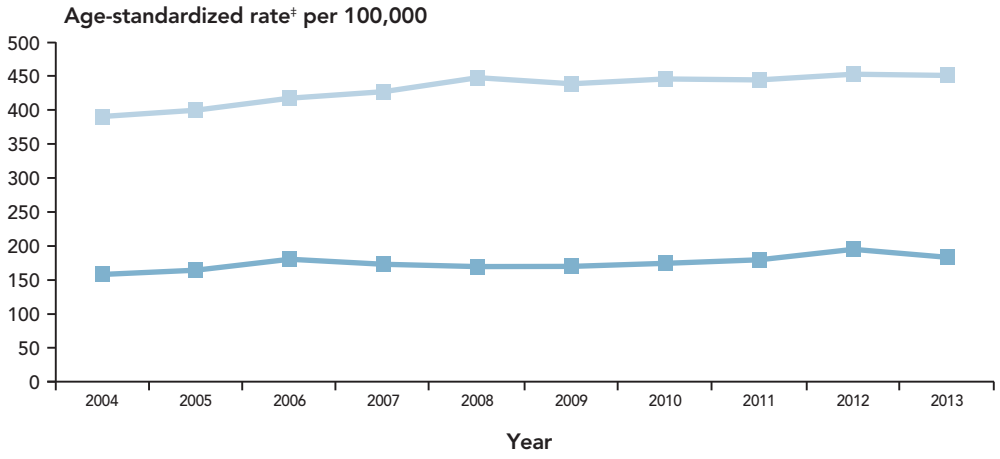
† ICD-codes K00-K14, S00.5, S01.4, S01.5, S02.4-S03.5
‡ Age-standardized to the 1991 Canadian population.
Source: National Ambulatory Care Reporting System 2004–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2004–2013, Statistics Canada IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Diseases of the oral cavity, salivary glands and jaw

The age-standardized rate of emergency department visits due to diseases of the oral cavity, salivary glands and jaw has increased slightly between 2004 and 2013 and accounted for 1% of all emergency department visits in 2013. Rates are lower in Peel compared to Ontario across all years (Figure 5.10).

In Peel, the rate of emergency department visit for injuries related to diseases of the oral cavity or glands tends to be slightly higher for males than females. Rates have increased over time for both sexes (data not shown).


**Figure 5.10**
**Emergency Department Visits due to Diseases of the Oral Cavity, Salivary Glands and Jaw†, Peel and Ontario, 2004–2013**

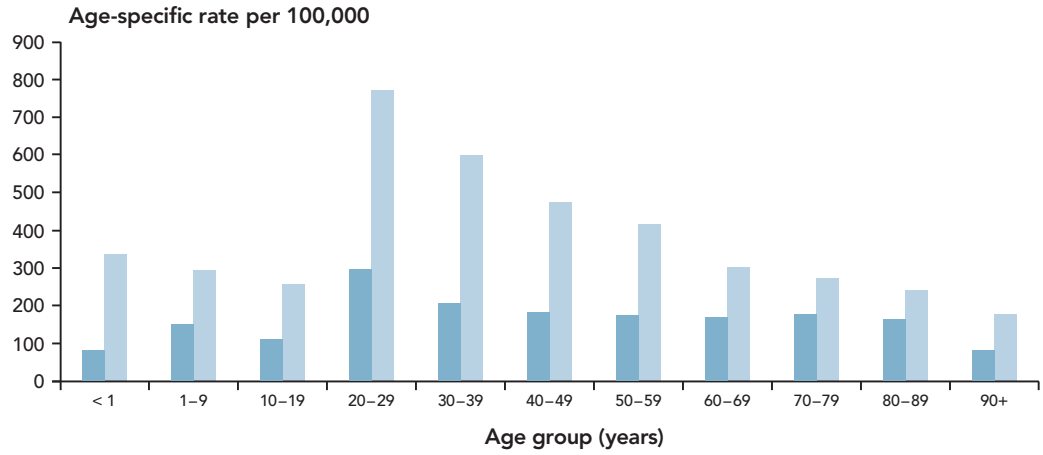



| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 161.0 | 167.3 | 183.4 | 176.0 | 172.6 | 172.9 | 177.4 | 182.6 | 198.0 | 186.3 |
| Ontario | 393.6 | 402.9 | 420.6 | 430.2 | 450.8 | 441.8 | 448.9 | 447.5 | 455.9 | 454.1 |

† ICD-codes K00-K14.
‡ Age-standardized to the 1991 Canadian population.
Sources: National Ambulatory Care Reporting System 2004-2013. Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2004-2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Those in the 20 to 39 year age group have the highest emergency department visit rate for diseases of the oral cavity, salivary glands and jaw compared to all other age groups (Figure 5.11).

**Figure 5.11**
**Emergency Department Visits due to Diseases of the Oral Cavity, Salivary Glands and Jaw† by Age Group, Peel and Ontario, 2013**




| | < 1 | 1–9 | 10–19 | 20–29 | 30–39 | 40–49 | 50–59 | 60–69 | 70–79 | 80–89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 82.0 | 150.0 | 109.0 | 295.2 | 205.6 | 181.0 | 172.6 | 169.4 | 175.2 | 163.6 | 80.3 |
| Ontario | 334.9 | 293.0 | 254.7 | 769.2 | 597.2 | 474.1 | 413.9 | 300.4 | 272.5 | 240.4 | 176.6 |

† ICD-codes K00-K14.
Sources: National Ambulatory Care Reporting System 2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In Peel, the most common emergency department (ED) visits for diseases of the oral cavity, salivary glands and jaw are shown in Table 5.10. All conditions in Table 5.10 are ones that can be medically managed by a dental professional.

**Table 5.10**
**Emergency Department Visits for Diseases of the Oral Cavity, Salivary Glands and Jaw by Disease Type, Peel and Ontario, 2009–2013 Combined**

| Oral disease and code | Peel | | Ontario | |
|---|---|---|---|---|
| | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 |
| Diseases of the pulp and periapical teeth (K04) | 3,457 | 51.2 | 106,680 | 163.9 |
| Other disorders of the teeth and supporting structure (K08) | 3,246 | 49.6 | 74,996 | 120.2 |
| Stomatitis and related lesions (K12) | 1,076 | 16.3 | 19,844 | 31.8 |
| Diseases of the salivary glands (K11) | 920 | 13.1 | 16,366 | 23.3 |
| Dentofacial anomalities (K07) | 703 | 10.4 | 12,912 | 19.7 |
| Other diseases of the lip and oral mucosa (K13) | 599 | 8.8 | 10,589 | 16.0 |
| Gingivitis and periodontal disease (K05) | 581 | 8.7 | 10,420 | 16.4 |
| Other diseases of the jaw (K10) | 492 | 7.2 | 8,694 | 13.1 |
| Caries (Cavities) (K02) | 460 | 7.0 | 14,655 | 23.8 |
| Diseases of the tongue (K14) | 341 | 5.1 | 6,082 | 8.8 |
| Other disorders of the gingiva and edentulous (K06) | 204 | 3.0 | 2,751 | 4.0 |
| Disorders of tooth developments and eruptions (K00) | 101 | 1.7 | 2,977 | 5.8 |
| Embedded and impacted teeth (K01) | 50 | 0.8 | 1,186 | 2.1 |
| Cyst of the oral region (K09) | 45 | 0.7 | 575 | 0.9 |
| Other diseases of the hard tissue of teeth (K03) | 15 | 0.2 | 144 | 0.2 |
| **Total** | **12,290** | **183.7** | **288,871** | **449.8** |

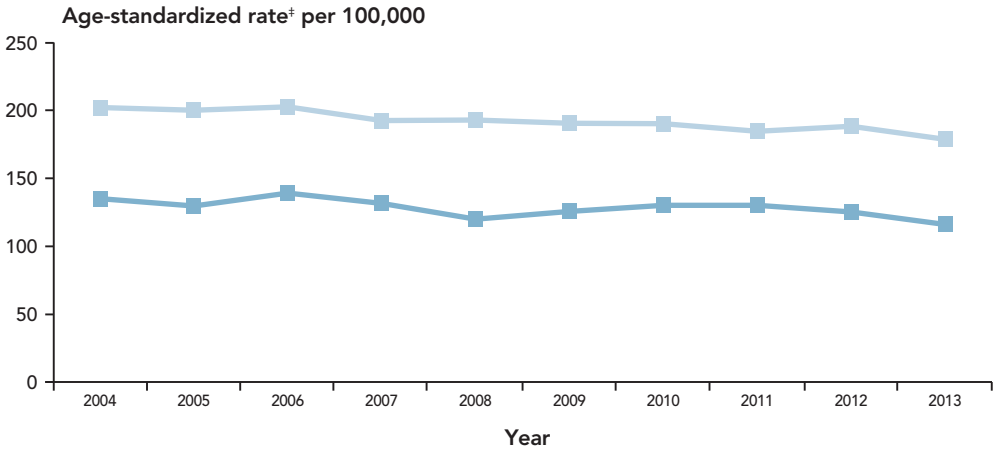
† ICD-codes K00-K14.
‡ Age-standardized to the 1991 Canadian population.
Source: National Ambulatory Care Reporting System 2004–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2009–2013, Statistics Canada IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Oral-related injuries to the head

The rate of emergency department visits for oral-related injuries of the head in Peel and Ontario declined between 2004 and 2013 (Figure 5.12). Peel's oral-related injury rate is lower than Ontario across all years. In Peel, oral-related injuries account for 9% of all injury-related emergency department visits.

The rate of emergency department visits for oral-related injuries of the head for males are approximately two times higher than for females across all years. Rates of emergency department visits have declined for males between 2004 and 2013, but remained stable for females (data not shown).

**Figure 5.12**
**Emergency Department Visits for Oral-Related Injuries to the Head†, Peel and Ontario, 2004–2013**

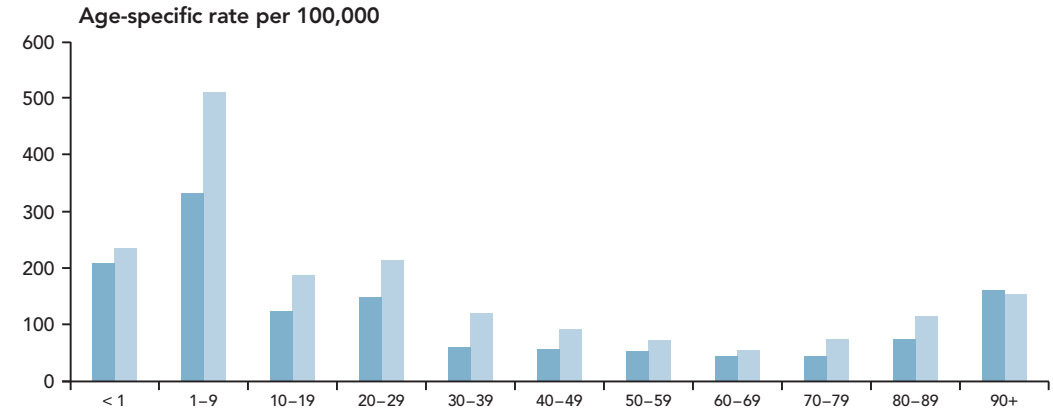



| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 134.6 | 129.2 | 138.7 | 131.1 | 119.5 | 125.2 | 129.7 | 129.7 | 124.8 | 115.6 |
| Ontario | 201.7 | 199.7 | 202.2 | 192.1 | 192.5 | 190.1 | 189.8 | 184.2 | 187.9 | 178.3 |

† ICD-codes S00.5, S01.4, S01.5, S02.4-S03.5.
‡ Age-standardized to the 1991 Canadian population.
Sources: National Ambulatory Care Reporting System 2004-2013. Canadian Institute for Healthcare Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2004-2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In both Peel and Ontario, the rate of emergency department oral-related injury visits is highest among children aged one to nine years (Figure 5.13).

**Figure 5.13**
**Emergency Department Visits for Oral-related Injuries† by Age Group, Peel and Ontario, 2013**




| | < 1 | 1–9 | 10–19 | 20–29 | 30–39 | 40–49 | 50–59 | 60–69 | 70–79 | 80–89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 207.8 | 330.8 | 122.5 | 147.6 | 58.8 | 55.9 | 51.3 | 43.3 | 42.7 | 73.4 | 160.6 |
| Ontario | 234.1 | 509.2 | 187.2 | 212.2 | 118.8 | 90.9 | 71.7 | 54.7 | 74.1 | 113.2 | 152.4 |

† ICD-codes S00.5, S01.4, S01.5, S02.4-S03.5.
Sources: National Ambulatory Care Reporting System 2013, Canadian Institute for Healthcare Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Many of the emergency department visits for oral-related injuries listed in Table 5.11 are conditions that would likely need to be managed in a health care setting. However, injuries such as fracture of the tooth and dislocated tooth are best managed by a dental health professional.

**Table 5.11**
**Emergency Department Visits due to Oral-Related Injury of the Head† by Type of Injury, Peel and Ontario, 2009–2013 Combined**

| Type of injury | Peel | | Ontario | |
|---|---|---|---|---|
| | Number | Age-standardized rate per 100,000 | Number | Age-standardized rate per 100,000 |
| Open wound of the lip/oral cavity (S01.5) | 4,966 | 77.1 | 63,952 | 108.8 |
| Fracture of tooth (S02.5) | 495 | 7.7 | 9,077 | 15.3 |
| Fracture of mandible (S02.6) | 489 | 7.5 | 7,409 | 12.0 |
| Superficial Injury to the head: Lip and oral cavity (S00.5) | 483 | 7.4 | 6,961 | 11.8 |
| Open wound of cheek and temporomandibular area (S01.4) | 477 | 7.2 | 8,724 | 14.6 |
| Fracture to mallar and maxillary bone (S02.4 ) | 308 | 4.7 | 4,320 | 6.5 |
| Fracture of other skull and facial bones (S02.8) | 197 | 3.0 | 2,588 | 4.0 |
| Fracture of other skull and facial bones unspecified (S02.9) | 186 | 2.9 | 1,820 | 2.9 |
| Dislocation tooth (S03.2) | 176 | 2.8 | 2,436 | 4.4 |
| Dislocation of jaw (S03.0) | 175 | 2.7 | 2,079 | 3.2 |
| Multiple fractures involving skull and facial bones (S02.7) | 64 | 1.0 | 887 | 1.3 |
| Sprain/strain of jaw (S03.4) | 55 | 0.8 | 716 | 1.2 |
| Sprain/strain of joints/ligament and unspecified parts of head (S03.5) | 13 | 0.2 | 80 | 0.1 |
| Dislocation septal cartilage (S03.1) | 4 | 0.1 | 55 | 0.1 |
| Dislocation of other and unspecified part of hear (S03.3) | 0 | 0 | 8 | 0.01 |
| **Total** | **8,088** | **125.0** | **111,112** | **186.0** |

† ICD-codes K00-K14.
‡ Age-standardized to the 1991 Canadian population.
Source: National Ambulatory Care Reporting System 2009–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2009–2013, Statistics Canada IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Oral-related Hospitalizations

The number and rate of hospitalizations due to diseases of the oral cavity, salivary glands and jaw and oral-related injuries in Peel are shown in Table 5.12.

**Table 5.12**
**Hospitalizations due to Oral-Related Diseases and Injuries of the Head†, Peel, 2004–2013**

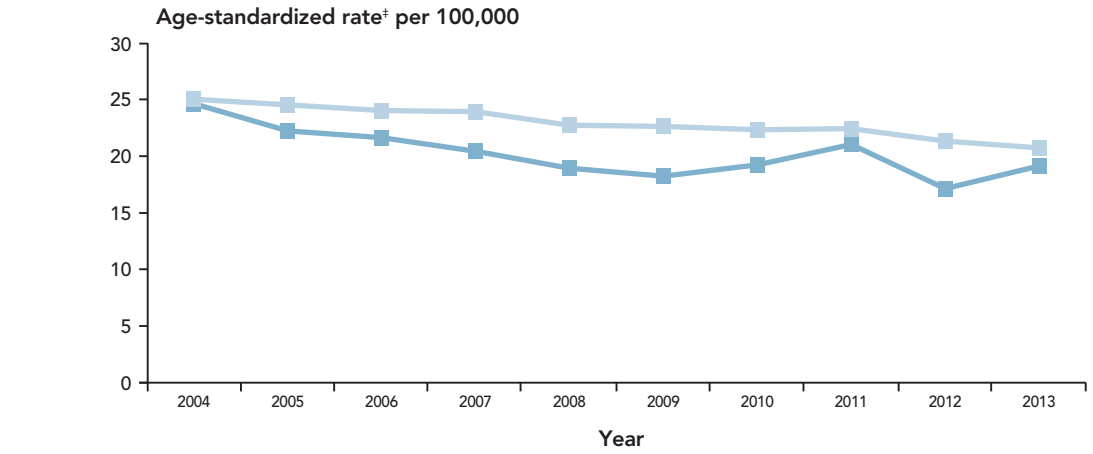
| Year | Diseases of the oral cavity, salivary glands and jaws | | Oral injuries | | Total | |
|---|---|---|---|---|---|---|
| | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 |
| **2004** | 274 | 24.6 | 68 | 6.0 | 342 | 30.6 |
| **2005** | 251 | 22.2 | 43 | 3.7 | 294 | 25.8 |
| **2006** | 261 | 21.6 | 72 | 6.1 | 333 | 27.6 |
| **2007** | 248 | 20.4 | 53 | 4.5 | 301 | 24.9 |
| **2008** | 240 | 18.9 | 63 | 5.1 | 303 | 24.0 |
| **2009** | 231 | 18.2 | 57 | 4.5 | 288 | 22.7 |
| **2010** | 252 | 19.2 | 61 | 4.9 | 313 | 24.1 |
| **2011** | 278 | 21.0 | 67 | 5.2 | 345 | 26.2 |
| **2012** | 234 | 17.1 | 78 | 5.8 | 312 | 23.0 |
| **2013** | 264 | 19.1 | 61 | 4.5 | 325 | 23.6 |

† ICD-codes K00-K14, S00.5, S01.4, S01.5, S02.4-S03.5
‡ Age-standardized to the 1991 Canadian population
Source: In-Patient Database 2004–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates 2009–2013, Statistics Canada IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

### Diseases of the oral cavity, salivary glands and jaw

The hospitalization rate for diseases of the oral cavity, salivary glands and jaw is slightly lower in Peel than Ontario. Hospitalization rates in both Peel and Ontario have declined between 2004 and 2013 (Figure 5.14). There are no differences by sex (data not shown).

**Figure 5.14**
**Hospitalization Rates for Diseases of the Oral Cavity, Salivary Glands and Jaw†, Peel and Ontario, 2004–2013**

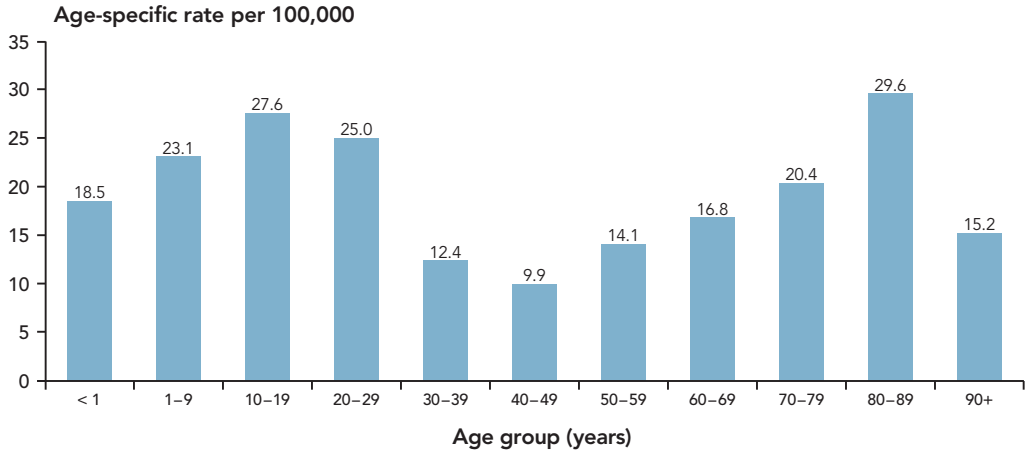



| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 24.6 | 22.2 | 21.6 | 20.4 | 18.9 | 18.2 | 19.2 | 21.0 | 17.1 | 19.1 |
| Ontario | 25.0 | 24.5 | 24.0 | 23.9 | 22.7 | 22.6 | 22.3 | 22.4 | 21.3 | 20.7 |

† ICD-codes K00-K14.
‡ Age-standardized to the 1991 Canadian population.
Sources: In-Patient Database 2004-2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates 2004-2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

In Peel, rates of hospitalization for diseases of the oral cavity, salivary glands and jaw are highest among those aged 80 to 89 years and 10 to 19 years (Figure 5.15).

**Figure 5.15**
**Hospitalizations due to Diseases of the Oral Cavity, Salivary Glands and Jaw† by Age Group, Peel, 2009–2013 Combined**




† ICD-codes K00-K14.
Sources: In-Patient Database 2009-2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates 2009-2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The causes of hospitalization for diseases of the oral cavity, salivary glands and jaw are described in Table 5.13. All of the listed diseases are ones that could have been managed by a dental professional in the early stages of the disease.

**Table 5.13**
**Hospitalizations for Diseases of the Oral Cavity, Salivary Glands and Jaw† by Disease Type, Peel and Ontario, 2009–2013 Combined**

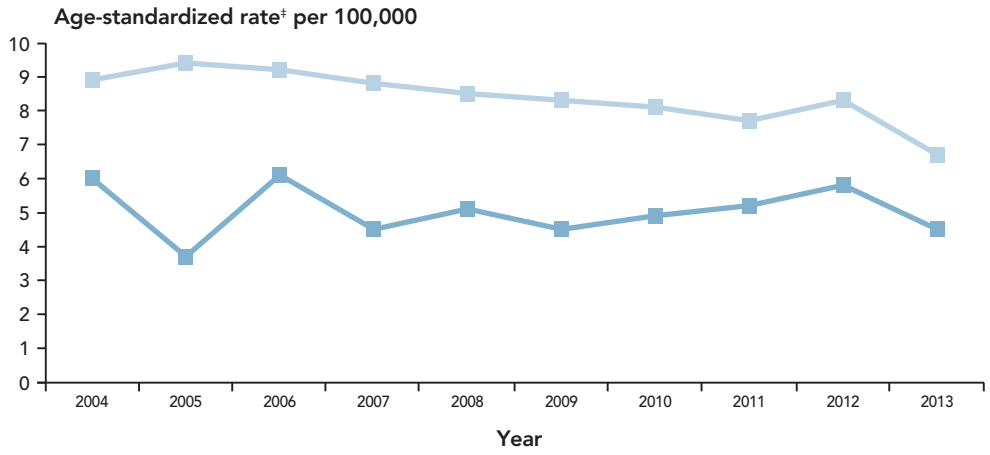
| Oral disease and code | Peel | | Ontario | |
|---|---|---|---|---|
| | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 |
| Dentofacial anomalies (K07) | 453 | 7.0 | 6,541 | 10.8 |
| Stomatitis and related lesions (K12) | 195 | 3.0 | 1,721 | 2.5 |
| Diseases of the salivary glands (K11) | 175 | 0.1 | 1,684 | 0.1 |
| Diseases of the pulp and periapical teeth (K04) | 117 | 1.7 | 1,145 | 1.8 |
| Caries (Cavities) (K02) | 92 | 1.4 | 760 | 1.1 |
| Other disorder of the teeth and supporting structure (K08) | 56 | 0.8 | 641 | 1.0 |
| Other disease of the Jaw (K10) | 47 | 0.7 | 506 | 0.7 |
| Embedded and impacted teeth (K01) | 39 | 0.6 | 212 | 0.4 |
| Gingivitis and periodontal disease (K05) | 28 | 0.5 | 156 | 0.2 |
| Diseases of the tongue (K14) | 18 | 0.3 | 196 | 0.3 |
| Cyst of oral region (K09) | 14 | 0.2 | 179 | 0.3 |
| Other diseases of lip and oral mucosa (K13) | 11 | 0.2 | 147 | 0.2 |
| Disorders of tooth developments and eruptions (K00) | 10 | 0.2 | 98 | 0.2 |
| Other diseases of the hard tissue of teeth (K03) | 0 | 0 | 0 | 0 |
| Other disorders of gingiva and edentulous (K06) | 4 | 0.1 | 44 | 0.1 |
| **Total** | **1,259** | **18.7** | **14,030** | **21.5** |

† ICD-codes K00-K14
‡ Age-standardized to the 1991 Canadian population.
Source: In-Patient Database 2009–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates 2009–2013, Statistics Canada IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Oral-related injuries

The rate of hospitalization for oral-related injuries of the head is low. In Peel in 2013 the hospitalization rate was 4.5 per 100,000, compared to Ontario 6.7 per 100,000 (Figure 5.16). There are no differences by sex (data not shown).

**Figure 5.16**
**Hospitalization Rates for Oral-Related Injury of the Head†, Peel and Ontario, 2004–2013**

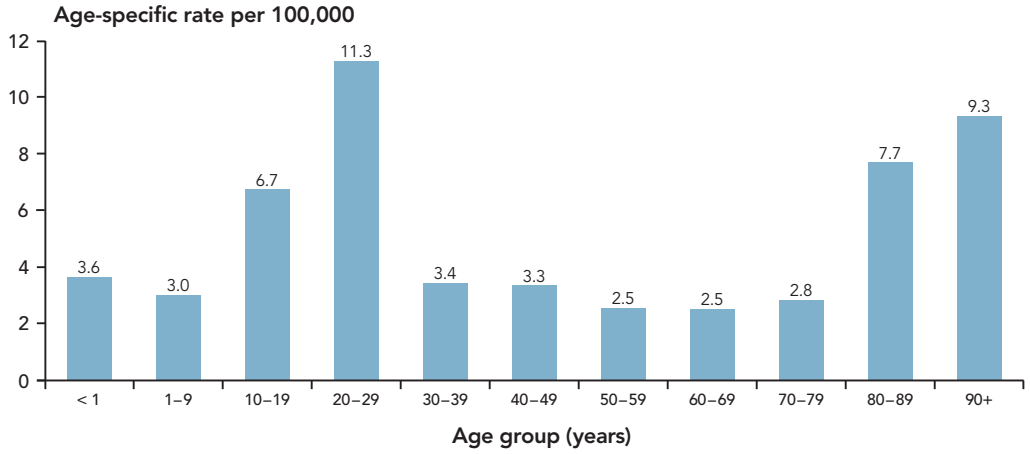



| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| Peel | 6.0 | 3.7 | 6.1 | 4.5 | 5.1 | 4.5 | 4.9 | 5.2 | 5.8 | 4.5 |
| Ontario | 8.9 | 9.4 | 9.2 | 8.8 | 8.5 | 8.3 | 8.1 | 7.7 | 8.3 | 6.7 |

† ICD-codes K00-K14.
‡ Age-standardized to the 1991 Canadian population.
Sources: In-Patient Database 2004-2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates 2004-2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

Hospitalizations for oral-related injuries are highest among those aged 80 years and older (Figure 5.17).

**Figure 5.17**
**Hospitalizations due to Oral Injury† by Age Group, Peel, 2009–2013 Combined**




† ICD-codes K00-K14.
Sources: In-Patient Database 2009-2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care. Population Estimates 2009-2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

The leading causes of hospitalizations for oral-related injuries of the head were due to fractures of the mandible, fractures to the mallar and maxillary bone, and other skull and facial bones. Details can be found in Appendix A.

Table 5.16 summarizes the number and rate of emergency department visits and hospitalizations for both oral-related injuries and oral-related diseases. Overall, these conditions result in 4,134 emergency department visits and 325 hospitalizations per year.

**Table 5.16**
**Summary of Emergency Department Visits and Hospitalizations for Oral-Related Diseases and Injuries of the Head, Peel, 2013**

| Oral disease and code† | Emergency department visits | | Hospitalizations | |
|---|---|---|---|---|
| | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 |
| Oral-related Injuries | 1,547 | 115.6 | 61 | 4.5 |
| Diseases of the oral cavity, salivary glands and jaw | 2,587 | 186.3 | 264 | 19.1 |
| **Total** | **4,134** | **302.0** | **325** | **23.6** |

† ICD-codes K00-K14, S00.5, S01.4, S01.5, S02.4-S03.5.
‡ Age-standardized to the 1991 Canadian population.
Sources:
National Ambulatory Care Reporting System 2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
In-Patient Database 2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Mortality Database 2011. Office of the Registrar General. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2013, Statistics Canada IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Hospital Care Oral Health Costs

In Canada, the hospital cost associated with oral conditions is approximately $410 million per year. For Ontario, the cost is approximately $130 million (Table 5.17). Across all types of costs, the majority of costs are associated with physician care in both Canada and Ontario.

**Table 5.17**
**Hospital Care Oral Treatment Costs, Canada and Ontario, 2008**

| | Canada | | | | Ontario | | | |
|---|---|---|---|---|---|---|---|---|
| Oral conditions | Physician care costs $ | Drug costs $ | Hospital costs $ | All costs $ | Physician care costs $ | Drug costs $ | Hospital costs $ | All costs $ |
| Other oral conditions | 115,060,100 | 38,090,500 | 89,112,300 | 242,262,900 | 54,580,400 | 17,642,700 | 35,457,300 | 107,680,400 |
| Dental caries | 92,757,100 | 426,600 | 61,002,800 | 154,186,500 | 2,800 | 0 | 18,367,800 | 18,370,600 |
| Periodontal disease | 6,282,900 | 3,781,900 | 3,444,300 | 13,509,100 | 1,691,100 | 1,647,700 | 1,319,800 | 4,658,600 |
| **Total** | **214,100,100** | **42,299,000** | **153,559,400** | **409,958,500** | **56,274,300** | **19,290,400** | **55,144,900** | **130,709,600** |

Source: Economic Burden of Illness in Canada (EBIC) [Internet]. Ottawa, Ontario: Government of Canada. Public Health Agency of Canada [updated January 13, 2016; cited January 13, 2016]. Available from: ebic-femc.phac-aspc.gc.ca/index.php

In Peel, health care costs related to oral health are summarized in Table 5.18.

**Table 5.18**
**Costs of Oral Health Care by Type of Care, Peel, 2013**

| Type of care | Number of visits | Visit cost | Total cost |
|---|---|---|---|
| **Private dentist visits** | **NA** | **NA** | **NA** |
| **Physician visits†** | 13,087 | Costs for visits vary. Refer to Table 9.10 for costing details | $463,649 |
| **Emergency department visits** | 4,134 | Average of $513 per visit§ | $2,120,742 |
| **Hospitalizations** | 325 | Costing defined in notes‡ | $1,372,838 |
| **Total cost** | — | — | $3,957,229 |

NA – data not available
† Physician visits capture visits where a code for oral health was among the possible diagnoses being examined during the visit. 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. Costs were based on primary Assessment or Consultation Codes and Fee Costs from the 2014 Schedule of Benefits)
§ Information on Hospital Emergency Room Visits for Dental Problems in Ontario [Internet]. Toronto, Ontario: Association of Ontario Health Centres [updated October 2014; cited May 10, 2016]. Available from: http://www.aohc.org/Information-Hospital-Emergency-Room-Visits-Dental-Problems-Ontario
‡ Hospitalization costs were calculated using the following cost estimates: $4,955 for K00-08 codes; $5,289 for K09-14 codes; $6,450 for codes S00.5, S01.4, S01.5, S02.4-S03.5.
Sources
**Physician visits:** Medical Services (OHIP) Data, 2013, Ontario Ministry of Health and Long-Term Care, obtained through IntelliHEALTH Ontario. Fees taken from the Schedule of Benefits: Physician Services Under the Health Insurance Act, Ministry of Health and Long-Term Care, 2014.
**Emergency department visits:** National Ambulatory Care Reporting System 2004–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
**Hospitalizations:** In-Patient Database 2004–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

## Deaths from Oral-related Injuries or Diseases of the Mouth, Face and Jaw

Deaths due to oral-related injury and disease are rare.

- In Ontario between 2004 and 2009, there were a total of 15 deaths from injuries related to mouth, face and jaw. There were no deaths in Peel.[J]
- In Ontario between 2007 and 2011, there were a total of 53 deaths from diseases of the mouth, face and jaw. In Peel there were less than five cases for the same time period.[J]

chapter 6

## FUTURE OUTLOOK FOR DISCUSSION AND NEXT STEPS

This report has documented how common chronic oral diseases are; how they cause symptoms such as pain; and how they impact the function, sociability and health of the residents of Peel and Ontario. Furthermore, we have documented significant inequalities in certain oral health status measures as well as access to dental care among residents of Peel and Ontario. While we have some available information about the oral health of Peel's residents, it does not provide a true picture of the oral health status about all segments of our population.

## What do we know about the oral health status of Peel's residents?

***Many of Peel's residents report positive oral health status; however, disparities in health status and outcomes exist among population subgroups***

Most residents aged 12 years and older self-report their oral health to be good, very good or excellent. In addition, the majority of Peel residents seek regular dental care; however, there are disparities in both health status and access to dental services. For example, those with lower income are less likely to report very good or good oral health status, and are often less able to pay for oral health care services.

***There is a patchwork of data about the clinical status and health status of Peel's population***

Data about oral health status for Peel comes primarily from the Canadian Community Health Survey and from Peel Public Health's Oral Health Screening database. While both systems provide useful information, there are limitations to using these databases for monitoring oral health status in Peel (e.g., lack of data for adults and seniors; lack of population level clinical data; timeliness, limited information about the oral health status of certain priority populations including recent immigrants, refugees and First Nations, Métis and Inuit people residing in the Region).

As a result of this patchwork of data, Peel Public Health is unable to provide a comprehensive overview of the health status, and specifically the clinical status, of the population for all ages. In addition, the timeliness of each data source varies. These gaps in local data limit the ability to employ an evidence-informed approach to program planning, implementation and evaluation

***Oral health care services are available to residents within Peel; but affordability remains an issue***

Many Peel residents have access to an oral health care provider and visit them regularly. However, there are some sub-groups within Peel that have barriers to afford and access oral health care services. For example:

- Between 62% and 77% of those aged 12 to 64 years have dental insurance. This declines to only 33% by the age of 65 years.
- A lower proportion of those in the low-lower middle income level (30%) have dental insurance compared to those in the highest income group (79%).
- A lower proportion of recent immigrants (50%) and long-term immigrants (63%) have dental insurance compared to non-immigrants (76%).
- In Peel, only 51% of those aged 65 years and older have visited a dentist in the past year compared to between 68% and 82% of all other age groups.
- In addition, a lower proportion of residents with lower incomes visited the dentist in the previous year compared to those with higher incomes. Importantly, cost was seen to be among the top reasons for not visiting the dentist in the past three years.

This barrier to payment is reflected in the type of health care visit for oral health care. For example:

- A higher proportion of Peel residents visit their family doctor for conditions such as dental caries, gingivitis and toothache/ dental abscess than Ontario residents. This is true for all age groups.

This barrier to access is further reflected by oral health visits to physicians, emergency departments and hospitals. In Peel, approximately $4 million dollars is billed to the health care system each year for oral-health related visits. This estimate does not include costs for publically-funded public health programs for Peel residents.

## What comes next?

This report provides some insight into the oral health status of Peel's residents and has identified key areas of focus for Peel Public Health:

- There is a need to enhance our knowledge about the oral health status of Peel's population through a comprehensive approach to oral health monitoring and surveillance. This includes capturing key clinical and health status indicators for all age groups including children, adults and seniors. Peel Public Health will work closely with research institutions, agencies and healthcare providers to seek access to local oral health data. Access to comprehensive local data will provide a clearer picture of the oral health needs of Peel's residents. In addition, they will be combined with regional, national and international data to inform the planning, implementation and evaluation of Peel Public Health's policies and programs to improve the oral health of Peel's residents.
- Although Peel Public Health offers programs to support children and seniors, there is a need to improve regional oral health programming to better the oral health outcomes for specific subpopulations. In addition to continuing with a comprehensive oral health approach through population, community and individual level interventions, there is a need to increase access to preventive and treatment services for targeted high-risk groups. Furthermore, it is essential to engage with existing and new community partners to improve program delivery to underserved populations in Peel.
- Peel Public Health will continue to advocate for publically funded oral health programs to improve access to oral health care services for vulnerable populations such as low-income adults and seniors.

chapter 7


## ACKNOWLEDGEMENTS

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Chapter authors and other major contributors included Dr. Dan Otchere, Katherine O'Rourke, Debbie Robb, Mandy Vaiya and Zeeshan Mahmood.

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This report was designed and formatted by Marketing and Communications, Region of Peel.

chapter 8

## DATA SOURCES AND LIMITATIONS

Data where additional analyses were conducted for this report are described in this section. For additional details about the methods of analysis used in each of the chapters of this report, please refer to *Chapter 11 - Data Methods.*

## Census Data

The Census is conducted every five years and data are provided by Statistics Canada. The 2011 Census was conducted on May 10, 2011.

Limitations:

- The Census undercounts some groups, such as the homeless, young adults and Aboriginal people on reserves.
- Comparison between censuses is affected by changes in question wording and in the definition of the population concerned.

## National Household Survey

The National Household Survey (NHS) was implemented for the first time between May and August 2011. 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.

Limitations:

- Due to the voluntary nature of the NHS, there is a possibility of non-response bias if those who chose not to respond to the survey are systematically different than those who respond.
- There were differences in the questions used to capture some concepts between the 2006 long-form census and the 2011 NHS. Therefore, comparisons between the 2006 and 2011 variables should be made with caution.
- The NHS overestimated some population groups (e.g., population born in the Philippines, per cent of population with a university certificate or diploma below bachelor's level) and underestimated other population groups (e.g., population born in Pakistan, recent immigrants).
- Data from Statistics Canada are transformed using a random rounding process to maintain confidentiality. Values, including totals, are randomly rounded either up or down to a multiple of five or 10. The result is that, when these data are summed or grouped, the total value may not match the sum of the individual values, since the total and subtotals are independently rounded. Similarly, percentages calculated on rounded data may not necessarily add up to 100%. Note also that the same value in the same table may be rounded up in one analysis and rounded down in the next.

## Canadian Community Health Survey

The Canadian Community Health Survey (CCHS) is a Statistics Canada survey designed to provide health information at the provincial, regional and public health unit levels. The target population of the CCHS includes household residents in all provinces and territories. Excluded are populations living on Indian Reserves, Canadian Forces Bases and those living in institutions or more remote areas. There is one randomly selected respondent per household, with an over-sampling of youths resulting in a second member of certain households being interviewed. The CCHS sample is primarily a selection of dwellings drawn from the Labour Force Survey area sampling frame. For the regional-level survey, the sample is supplemented with a random digit-dialling sample in some health regions.

The interview for the health region-level survey includes common content asked of all sample units, optional content determined by each health region from a predefined list of questionnaire modules, and socioeconomic and demographic content.

A focused provincial-level survey consists of some general health content and one focus content topic per cycle. Focus content is intended to be an in-depth treatment of topical issues (e.g., mental health, nutrition).

Prior to 2007, data were collected every two years. Data presented for 2000/2001, 2003 and 2005 reflect this data collection method. Starting in 2007, major changes were made to the survey design in order to improve its effectiveness and flexibility for data collection on an ongoing basis. As a result, data collection now occurs every year, but for Peel a "cycle" is still considered to be a two-year period (e.g., 2007/2008, 2009/2010). Data collection for the CCHS is done by either computer assisted personal or telephone interviewing for the area sample or telephone interviewing for the random digit-dialling sample. Data are weighted to reflect the population of Peel.

All computations, use and interpretation of these data are entirely that of Peel Public Health.

Limitations:

- Depending upon the question, data may be subject to recall bias, social desirability bias and errors from proxy reporting.
- Individuals and/or households without a telephone would be excluded from the sampling frame.
- Some analyses are limited by sample size.

## Peel Student Health Survey 2011

In March 2011, Peel Public Health conducted a health survey of students in Peel between grades 7 and 12 in partnership with the Dufferin-Peel Catholic District School Board and the Peel District School Board. The survey consisted of a questionnaire completed by students within randomly selected schools and classes.

The survey captured information on a variety of topics including eating habits, physical activity, substance use, mental health, bullying, injury and sun safety. Height and weight measurements were taken by a public health nurse for each participating student. In addition, a physical fitness assessment was conducted by trained assessors (for Grade 9 students only) and an oral health assessment was completed by public health dental hygienists (for Grades 10 and 12 only). The final sample included approximately 8,500 students from 37 elementary schools and 23 secondary schools in Peel.

Limitations:

- Data are not weighted to reflect the student population in Peel.
- Survey results are not generalizable to all Grade 7 to 12 students in Peel as the survey was administered to a sample of students in only two participating school boards.
- Excluded by design are student dropouts and students enrolled in French schools and private schools.
- Results should be interpreted with caution as self-reported survey data have the potential for recall error and providing socially desirable answers.
- Due to the cross-sectional nature of the data, causal relationships cannot be inferred.

## Ontario Student Drug Use and Health Survey 2013

The Ontario Student Drug Use and Health Survey (OSDUHS), is the longest ongoing school survey of adolescents in Canada and the second longest in North America. The study is based on 18 survey cycles (to date) conducted every two years since 1977.

All data are based on self-reports derived from anonymous questionnaires administered in classrooms to Ontario students between grades 7 and 12 between November and June of the school year. The survey is restricted to adolescent students enrolled in publicly-funded schools (public and Catholic schools).

Limitations:

- The survey is based on self-reported information, and may therefore be subject to recall bias, social desirability bias and non-response bias.
- Those enrolled in private schools, institutionalized for correctional or health reasons, on First Nations reserves, military bases and in the far northern region of Ontario are excluded.
- The survey does not capture the extent of illicit drug use or trends in illicit drug use among adolescents who may be at higher risk, such as those that dropped out of school or street youth.
- The cross-sectional design provides a snapshot of drug use at a specific time point but does not monitor changes in an individual's drug use over time.

In 2013, Peel bought an enhanced sample in the OSDUHS. The OSDUHS data used in this publication came from the Ontario Student Drug Use and Health Survey conducted by the Centre for Addiction and Mental Health and administered by the Institute for Social Research, York University. Its contents and interpretation are solely the responsibility of Peel Public Health and do not necessarily represent the official view of the Centre for Addiction and Mental Health.

## Cancer Incidence and Mortality

The Ontario Cancer Registry (OCR), housed at Cancer Care Ontario, is a computerized database of information about all Ontario residents who have been newly diagnosed with cancer (incidence) or who have died of cancer (mortality). All types of cancer are registered, except non-melanoma skin cancer. The system is passive and relies predominantly on administrative data. The Registry is compiled by linking administrative data, clinical and demographic data from four major data sources:

- Hospital discharge and ambulatory care records with cancer diagnoses in the Canadian Institute of Health Information (CIHI), Discharge Abstract Database (DAD) and National Ambulatory Care Reporting System (NACRS).
- Pathology reports with any mention of cancer from hospitals and private laboratories.
- Records from Regional Cancer Centres or Princess Margaret Hospital.
- 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 (ICDO-3).

Limitations:

- Currently, this data source only provides information at the Census Division (CD) or Public Health Unit (PHU) level of geography.

## Emergency Department Data

Hospital emergency departments were the first centres to report to the National Ambulatory Care Reporting System (NACRS) in fiscal year 2002/2003. Ambulatory visit data provide only a crude measure of the prevalence of a cause for the following reasons:

- A person may visit several times for the same disease or injury event.
- A person may visit more than one hospital for the same disease or injury event.
- A person may not seek care at a hospital emergency department.

Limitations:

- Ontario residents visiting hospitals outside of the province are excluded. Areas bordering other provinces may be more affected.

## Hospital Discharge Data

All hospitals report into the Discharge Abstract Database (DAD). A hospital discharge is a release from hospital due to death, discharge home or transfer to another facility. 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 event.
- A person may be discharged from more than one hospital (when transferred) for the same injury event.
- A person may not seek care at a hospital.

Limitations:

- 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. This may influence comparisons between areas and over time.

## Mortality Data

The Office of the Registrar General obtains information about mortality from death certificates, which are completed by physicians. All deaths within Ontario are registered in the office of the division registrar within which the death occurs. A Statement of Death must be filed with a division registrar before a Burial Permit can be issued.

Limitations:

- Co-morbidity contributes to uncertainty to classifying the underlying cause of death.
- Determining the true cause of death may require further investigation in some instances. For example, when the cause of death could have social or legal ramifications (e.g., suicide).

## Congenital Anomaly Data

Historically, the Canadian Congenital Anomalies Surveillance System (CCASS) collected information about anomalies identified through hospitalization in the first year of life. Since babies with congenital anomalies are often hospitalized more than once in their first year, the CCASS attempts to identify all duplicates using sex, date of birth, province, postal code, geocode, mother's health insurance number (scrambled to protect confidentiality) and medical conditions. Because there are no unique identifiers to ensure positive identification, incomplete records make matching less accurate and result in over-counting the number of cases.

Between 2001 and 2011, the CCASS data was based on identification of congenital anomalies as a result of hospitalization in the first month of life.

In this report, the congenital anomaly of oral facial clefts was defined as cases with an international classification of disease code of 749.0 – 749.2. The rate is calculated as the total number of cases of cleft lip and/or palate reported for stillbirths and live births diagnosed prior to one year of age for years 1990 to 2000 and 30 days of age for 2001 on, divided by the total number of births (live and still), expressed per 10,000 births.

Limitations:

- Data are based on geographic place of residence and not location of hospital.
- Numbers represent the number of anomalies, not the number of cases; a child may have more than one type of anomaly.

## Medical Services Data

Medical services information is obtained from the Ontario Health Insurance Plan (OHIP) Approved Claims files. The Approved Claims contains service and payment information for both fee-for-service claims submitted by physicians and other licensed health professionals and some of the "shadow billings" by providers in organization covered by alternate payment arrangements. Included in a typical claim is information about the patient, provider, Fee Schedule Code/procedure performed, number of services/units delivered and some diagnostic information.

Limitations:

- Since only some of the claims from the MOHLTC's various alternate payment programs or "shadow billers" are included there may be undercounting of total volume of certain services.
- OHIP has a unique coding system for diagnosis. Although some of the codes do bear a resemblance to equivalent International Classification of Disease codes, they should not be confused with any other diagnostic coding system.
- Some diagnosis codes may have completely different meanings depending on the specialty of the provider and should therefore always be used in conjunction with the diagnosis type field.
- Approximately 50% of diagnosis codes are missing from the medical claims data since there is no requirement to include them.
- There may have been other, additional diagnoses associated with the assessments or consultations that also took up physician time.[12]
- Since not all physicians may be billing for services through OHIP, or following the process of "shadow-billing" if they are paid through alternative methods, Medical Services Data may under-represent services being provided by physicians.

## Oral Health Information Support System (OHISS)

The Oral Health Information Support System (OHISS) is a production system that is used by 36 public health units (PHUs) in the province of Ontario. The use of this database in Ontario has been mandated by the Ministry of Health and Long-Term Care in order to standardize the way in which oral health data is collected and stored, so as to support program implementation, monitoring, evaluation and payment accountability for the oral health components of the Ontario Public Health Standards (OPHS) and the Healthy Smiles Ontario program. It also provides ministry staff with real time data access for program monitoring, reporting and accountability.

For Peel Public Health, OHISS contains data relating to the Peel Public Health oral health programs. More specifically, it contains dental screening data collected from schools and community clinics as well as data for the Children In Need Of Treatment (CINOT) program (which was

integrated into the new Healthy Smiles Ontario (HSO) program effective January 1, 2016) and the HSO program.

Limitations:

- Although OHISS can also be used to analyze oral health data, the types of analyses that can be performed by the PHUs are limited (since the PHUs do not have access to the micro-data)
- OHISS data only contains information for children that have been screened at schools or provided services through the CINOT or HSO programs and cannot be generalized to the population.
- Only children in schools belonging to the Peel District School Board (PDSB), the Dufferin-Peel Catholic District School Board (DPCDSB) (excluding schools that are outside of Peel), the French public and catholic boards, and children in a few select private schools are screened and included in OHISS.
- Children who refuse screening or are absent on the day of screening or whose parents sign an exemption form comprise about one-quarter of the children who would otherwise be screened. These children are not screened and are excluded from OHISS.

chapter 9

## DATA METHODS

### Rounding

Within the majority of tables and figures of this report, values are presented to one decimal of precision. Values in the text of the report are rounded to nearest whole number. Due to rounding, some values may sum to more or less than 100%.

### Statistical Significance

The following terms have been used to imply statistical significance between groups: “significantly,” “more likely” and “less likely.” Ninety-five per cent confidence intervals were used to determine the significance of differences between groups.

## Data Releasability

To ensure confidentiality and to meet reporting requirements, data are presented as follows:

- Canadian Community Health Survey (CCHS):
  - "NR – Not releasable due to small numbers" (when coefficient of variation greater than or equal to 0.334)
  - "* Use estimate with caution" (when coefficient of variation is between 16.6 and 33.3)
- Cell counts with less than five individuals were suppressed for mortality, hospitalization, emergency department visits, cancer incidence and ambulance and police data.
- Peel Student Health Survey:
  - "NR – not releasable due to small numbers" (when un-weighted numerators had less than 10 individuals and denominator counts had less than 30 individuals
  - "* Use estimate with caution" (when coefficient of variation is between 16.6 and 33.3)
- Ontario Student Drug Use and Health Survey
  - "NR – Not releasable due to small numbers" (when coefficient of variation greater than or equal to 0.334)
  - "* Use estimate with caution" (when coefficient of variation is between 16.6 and 33.3)

## International Classification of Diseases (ICD) Codes

"Causes" of death or illness are coded using a standard system called the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10).75 The Ninth Revision of the International Classification of Diseases (ICD-9) was used to code cause of death between 1979 and 1999 and hospital separations between 1986 and 2002. The ICD-10 system was used to code mortality data from 2000 forward. Hospitalization data from 2003 forward were coded using the Canadian version of the ICD-10 system (ICD-10-CA), with codes provided by the Canadian Institute for Health Information. As changes in the coding system may cause artificial changes in the number of cases of a particular cause of illness, trends in specific causes must be interpreted with caution. These were noted in the text when applicable.

Codes used for the analysis of oral related diseases and oral-related injury are described in Table 9.1.

**Table 9.1**
**ICD-10 Codes for Diseases of the Oral Cavity, Salivary Glands and Jaw, and Oral-related Injury**

| ICD-10 Category | ICD-10 Code | Description |
|---|---|---|
| Diseases of the oral cavity, salivary glands and jaw | K00 | Disorders of tooth development and eruption |
| | K01 | Embedded and impacted teeth |
| | K02 | Dental caries |
| | K03 | Other diseases of hard tissues of teeth |
| | K04 | Diseases of pulp and periapical tissues |
| | K05 | Gingivitis and periodontal diseases |
| | K06 | Other disorders of gingiva and edentulous alveolar ridge |
| | K07 | Dentofacial anomalies (including malocclusion) |
| | K08 | Other disorders of the teeth and supporting structures |
| | K09 | Cysts of the oral region, not elsewhere classified |
| | K10 | Other diseases of the jaws |
| | K11 | Diseases of the salivary glands |
| | K12 | Stomatitis and related lesions |
| | K13 | Other diseases of the lip and oral mucosa |
| | K14 | Diseases of the tongue |
| Oral-related injuries | S00.5 | Superficial injury to the head: lip and oral cavity |
| | S01.4 | Open wound to the cheek and temporomandibular area |
| | S01.5 | Open wound of the lip/oral cavity |
| | S02.4 | Fracture to mallar and maxillary bone |
| | S02.5 | Fracture of tooth |
| | S02.6 | Fracture of mandible |
| | S02.7 | Multiple fractures involving skill and facial bones |
| | S02.8 | Fracture of other skill and facial bones |
| | S02.9 | Fracture of other skill and facial bones, unspecified |
| | S03.0 | Dislocation of the jaw |
| | S03.1 | Dislocation of septal cartilage |
| | S03.2 | Dislocation of the tooth |
| | S03.3 | Dislocation of other and unspecified part of the head |
| | S03.4 | Sprain/strain of the jaw |
| | S03.5 | Sprain/strain of joints/ligaments and unspecified parts of the head |

Source: Canadian Institute for Health. International statistical classification of diseases and related health problems. Revision, Canada. Tenth Revision, Canada. Ottawa, Ontario, Canada, 2012.

## Canadian Community Health Survey Data Analysis

For analyses using the Canadian Community Health Survey (CCHS), outcomes of interest where a "missing," "do not know" or "refused" response was greater than 5% were included in the denominator.

Unless otherwise stated, the following CCHS variables were defined as follows:

**Household Income** is based on self-reported total household income and the number of individuals in the household (Table 9.2):

**Table 9.2**
**Canadian Community Health Survey Household Income Categories**

| Income level name | Income level categories | Number of people in the household | Total household income |
|---|---|---|---|
| **Lowest – middle** | Lowest – lower middle | 1 – 2 people<br>3 – 4 people<br>5+ people | <$14,999<br><$19,999<br><$29,999 |
| | Middle | 1 – 2 people<br>3 – 4 people<br>5+ people | $15,000 to $29,999<br>$20,000 to $39,999<br>$30,000 to $59,999 |
| **Upper middle** | Upper middle | 1 – 2 people<br>3 – 4 people<br>5+ people | $30,000 to $59,999<br>$40,000 to $79,999<br>$60,000 to $79,999 |
| **Highest** | Highest | 1 – 2 people<br>3+ people | More than $60,000<br>More than $80,000 |

Source: Canadian Community Health Survey, Statistics Canada.

**Education** is categorized as follows:

- less than secondary school graduation
- secondary school graduation, no post-secondary education
- other post-secondary education
- post-secondary degree/diploma

**Immigrant Status** is defined as follows:

- recent immigrant: arrived in Canada within the past 10 years
- long-term immigrant: resident of Canada for 11 or more years
- non-immigrant: Canadian-born population

**Ethnicity** is categorized into the following eight groups based on a question about cultural and racial background at the time of the interview:

- White
- Black
- East/Southeast Asian (e.g. Chinese, Filipino, Southeast Asian, Cambodian, Indonesian, Laotian, Vietnamese, Japanese, Korean)
- West Asian/Arab (e.g. Arab, West Asian, Afghan, Iranian)
- South Asian (e.g. East Indian, Pakistani, Sri Lankan)
- Latin American (e.g. Mexican, Caribbean, South American)
- Aboriginal people of North America (e.g. North American Indian, Metis, Inuit/ Eskimo)
- Other (multiple responses across categories defined here, and non-response/don't know/refusal)

## Medical Services Data Analysis

Analysis of these data included the following filters:

- Patients had to have a valid encrypted Health Number
- Patients' residence had to be "Peel"
- The OHIP Diagnosis Type had to be type "1 – Main" (for physician, as opposed to physiotherapist or chiropractor)
- The Practice Type was set to "1 – Physician"
- The Fiscal Specialty was set to "General and Family Practice"
- The Physician had to have a licence to practice in Ontario
- The OHIP Diagnosis Codes had to be related to Oral Health (e.g., 521: "Dental Caries"; 523: "Gingivitis"; 525: "Dental Abscess" and/or "Toothache")
- The Institution Type was set to "Unknown" in order to exclude as many hospital and institutional settings as possible
- The Service Location was set to "Community Physician Office" or "Unknown"
- Only Fee Schedule Codes related to Assessments or Consultations were included (i.e., additional fees around premiums, incentives, office procedures and in-office laboratory tests were omitted)
- The Service Date was included and a special field created in order to remove duplicate occurrences of visits by the same patient on the same day
- Costs for the Fee Schedule Codes came from a 2014 version of the Schedule of Benefits: Physician Services Under the Health Insurance Act, Ministry of Health and Long-Term Care.

## Chapter-Specific Methods

### Chapter 4 – Oral Health Risk Conditions

In this chapter, the smoking-attributable fraction and the alcohol-attributable fraction was used to determine the annual number of preventable cases of oral cancer cases, hospitalizations and deaths. The oral-related cancers selected for this analysis, along with the relative risk of disease by smoking status or number of drinks consumed per day, are shown in Tables 9.3 and 9.4. The rate of smoking and daily alcohol consumption is shown in Tables 9.5 and 9.6

**Table 9.3**
**Relative Risk* for Oral Health Diseases by Smoking Status and Sex**

| Oral cancer | Male | | Female | |
|---|---|---|---|---|
| | Relative risk current smoker | Relative risk former smoker | Relative risk current smoker | Relative former smoker |
| Cancer of the lip, oral cavity and pharynx | 10.89 | 3.40 | 5.08 | 2.29 |
| Esophageal cancer | 6.76 | 4.46 | 7.75 | 2.79 |
| Laryngeal cancer | 14.60 | 6.34 | 13.02 | 5.16 |

* Relative risk associated with the outcome of mortality.
Source: Thun J, Day-Lally C, Myers DG, Calle EE, Flanders WD, Zhu BP et al. Trends in tobacco smoking and mortality from cigarette use in cancer prevention studies (1959 through 1965). Bethesda, MD. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1997.

**Table 9.4**
**Relative Risk* for Diseases by Alcohol Consumption Level**

| Oral cancer | Relative Risk by Number of Drinks per Day | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3–4 | 5–6 | >6 |
| Cancer of the lip, oral cavity and pharynx | 1.42 | 1.96 | 2.97 | 4.68 | 7.97 |
| Esophageal cancer | 1.20 | 1.43 | 1.87 | 2.64 | 4.67 |
| Laryngeal cancer | 1.21 | 1.47 | 1.95 | 2.81 | 4.99 |

* Relative risk associated with the outcome of mortality.
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 9.5**
**Per cent and Number of Smokers† by Sex, Peel, 2009/2010, 2011/2012, 2013/2014 Combined**

| | Current smoker | | Former smoker | | Never smoker | |
|---|---|---|---|---|---|---|
| | Per cent | Number | Per cent | Number | Per cent | Number |
| **Male** | 19.1 | 74,000 | 26.3 | 101,900 | 54.5 | 211,000 |
| **Female** | 9.4 | 38,700 | 17.1 | 70,100 | 73.5 | 301,200 |
| **Total** | 14.1 | 112,700 | 21.6 | 172,000 | 64.3 | 512,200 |

† Reflects respondents aged 30 years and older
Notes:
Current smoker is defined as a person who currently smokes daily or occasionally, has smoked at least 100 cigarettes in their lifetime and some in the past 30 days.
Former smoker is a person who currently does not smoke at all and has smoked at least 100 cigarettes in their lifetime.
Never smoker is a person who does not currently smoke and has not smoked 100 cigarettes in their lifetime.
Source: Canadian Community Health Survey Share File 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

**Table 9.6**
**Per cent and Number of Drinks Consumed Daily† by Sex, Peel, 2009/2010, 2011/2012, 2013/2014 Combined**

| Number of drinks per day | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Per cent | Average annual number | Per cent | Average annual number | Per cent | Average annual number |
| **0** | 63.5 | 248,600 | 79.5 | 263,200 | 70.8 | 511,800 |
| **1** | 23.3 | 91,100 | 16.9 | 56,100 | 20.4 | 147,300 |
| **2** | 7.0 | 27,200 | 2.6* | 8,500 | 4.9 | 35,700 |
| **3–4** | 5.1* | 20,000 | 0.8* | 2,600 | 3.1* | 22,700* |
| **5–6** | 0.7* | 2,700 | NR | NR | 0.4* | 3,200* |
| **>6** | NR | NR | NR | NR | NR | NR |

† Reflects population aged 15 years and older.
* Use estimate with caution.
NR – Not releasable due to small numbers.
Source: Canadian Community Health Survey Share File, 2009/2010, 2011/2012, 2013/2014, Statistics Canada. Ontario Ministry of Health and Long-Term Care.

The definition of daily drinks and the amount of alcohol within a drink is defined as follows:

- One drink per day (13.6g of alcohol)
- Two drinks per day (27.2g of alcohol)
- Three to four drinks per day (average of 3.5 drinks; average of 47.6 g of alcohol)
- Five to six drinks per day (average of 5.5 drinks; average of 74.8 g of alcohol)
- More than six drinks per day (average of nine drinks; average of 122.4 g of alcohol).
- For comparison a 750 litre bottle of wine contains about 70g of pure alcohol.

### *Smoking and Alcohol-Attributable Cancer Incidence, Hospitalization and Death Coding*

Codes used to obtain counts of oral-related cancer incidence, hospitalizations for oral-related cancer and mortality from oral-related cancer were captured using the International Classification of Diseases – Tenth revision described in Table 9.7. When necessary, several years of data were averaged and used when calculating alcohol-attributable fractions to avoid concerns about small numbers and year to year variation.

**Table 9.7**
**Data Sources and Criteria for Case Inclusion in Calculations of Smoking or Alcohol-Attributable Cancer Incidence, Hospitalizations and Mortality**

| Oral Cancer | Cancer incidence | Hospitalization | Mortality |
|---|---|---|---|
| **Cancer of the lip, oral cavity and pharynx** | ICD-10 C00-C14<br>Age=15+ years<br>Years=2005–2009 | ICD-10 C00-C14<br>Age=15+ years<br>Years=2010–2014 | ICD-10 C00-C14<br>Age=15+ years<br>Years=2007–2011 |
| **Esophageal cancer** | ICD-10 C15<br>Age=15+ years<br>Years=2005–2009 | ICD-10 C15<br>Age=15+ years<br>Years=2010–2014 | ICD-10 C15<br>Age=15+ years<br>Years=2007–2011 |
| **Laryngeal cancer** | ICD-10 C32<br>Age=15+ years<br>Years=2005–2009 | ICD-10 C32<br>Age=15+ years<br>Years=2010–2014 | ICD-10 C32<br>Age=15+ years<br>Years=2007–2011 |

Sources:
Cancer incidence: Cancer Care Ontario – SEER*Stat Release 7.1.0 Cancer, 2005–2009
Hospitalization: Hospital In-Patient Discharge 2010–2014, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care.
Mortality: Ontario Mortality Database 2007–2011, Ontario Registrar General. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care.

### *Calculating Smoking and Alcohol-Attributable Oral-related Cancer Outcomes from Relative Risk Numbers, Attributable Fractions and Prevalence of Smoking or Daily Alcohol Use*

The smoking and alcohol-attributable fractions for new or existing cases of disease, hospitalizations and deaths were calculated using relative risk estimates from Tables 9.3 and 9.4 and Peel specific smoking prevalence rates (Table 9.5) and daily alcohol use prevalence (Table 9.6) using the following formulas:

## Smoking-Attributable Fraction

$$SAF = [(p0 = p1(RR1) = p2\ (RR2))\text{-}1] / [p0 + p1(RR1) + p2(RR2)]$$

Formula measures for alcohol-attributable fraction calculations are defined in Table 9.8.

**Table 9.8**
**Description of Formula Parameters for Smoking-Attributable Fraction Calculation**

| Measure | Definition |
|---|---|
| p0 | Percentage of adult never smokers in study group |
| p1 | Percentage of adult current smokers in study group |
| p2 | Percentage of adult former smokers in study group |
| RR1 | Relative risk of death for adult current smokers relative to never smokers |
| RR2 | Relative risk of death for adult former smokers relative to never smokers |

## Alcohol-Attributable Fraction

$$AAF = [(p0 + p1(RR1) + p2(RR2)) + p3(RR3)) + p4(RR4)) + p5(RR5)) - 1] / [p0 + p1(RR1) + p2(RR2) + p3(RR3)) + p4(RR4)) + p5(RR5]$$

Formula measures for alcohol-attributable fraction calculations are defined in Table 9.9.

**Table 9.9**
**Description of Formula Parameters for Alcohol-Attributable Fraction Calculation**

| Measure | Definition |
|---|---|
| p0 | Percentage of population aged 12 years and older who do not currently drink alcohol |
| p1 | Percentage of population aged 12 years and older who consume one drink per day |
| p2 | Percentage of population aged 12 years and older who consume two drinks per day |
| p3 | Percentage of population aged 12 years and older who consume three to four drinks per day |
| p4 | Percentage of population aged 12 years and older who consume five to six drinks per day |
| p5 | Percentage of population aged 12 years and older who consume six or more drinks per day |
| RR1 | Relative risk of death or disease for the population who consume one drink per day relative to non-drinkers |
| RR2 | Relative risk of death or disease for the population who consume two drinks per day relative to non-drinkers |
| RR3 | Relative risk of death or disease for the population who consume three to four drinks per day relative to non-drinkers |
| RR4 | Relative risk of death or disease for the population who consume five to six drinks per day relative to non-drinkers |
| RR5 | Relative risk of death or disease for the population who consume six or more drinks per day relative to non-drinkers |

## Chapter 5 – Access to Oral Health Care and Associated Costs

Cost information for this report varies by source. Cost estimates for physician visits was obtained by using the information about schedule of benefits fee codes as shown in Table 9.10.

**Table 9.10**
**Estimated Cost of Physician Visits† for Any Oral Health Diagnosis, Peel, 2013**

| Fee schedule code | Fee schedule code description | Number of visits | Schedule of benefits fee (2014) | Estimated cost |
|---|---|---|---|---|
| (A007) | Intermediate assessment for well-baby care†‡ | 8,442 | $33.70 | $284,495.40 |
| (A888) | Partial assessment – emergency department equivalent | 1,812 | $35.40 | $64,144.80 |
| (A001) | Minor assessment† | 1,596 | $21.70 | $34,633.20 |
| (A903) | General/family Practice – Pre-dental operation assessment (limit two per year per patient) | 1,104 | $65.05 | $71,815.20 |
| (A003) | General assessment† | 84 | $77.20 | $6,484.80 |
| (A901) | General/family practice – house call assessment | 12 | $45.15 | $541.80 |
| (K131) | Periodic health visit – adult aged 18 to 64 inclusive | 12 | $50.00 | $600.00 |
| (A004) | General re-assessment† | 9 | $38.35 | $345.15 |
| (A008) | Mini assessment† | 9 | $13.05 | $117.45 |
| (A005) | Consultation† | 2 | $77.20 | $154.40 |
| (A905) | General/family practice – limited consultation | 2 | $65.90 | $131.80 |
| (A002) | 18 month well-baby check- up† | 1 | $62.20 | $62.20 |
| (A900) | Complex house call assessment | 1 | $45.15 | $45.15 |
| (K132) | Periodic health visit – adult 65 years of age and older | 1 | $77.20 | $77.20 |
| **Total** | | **13,087** | | **$463,648.55** |

† General practitioner or family practitioner
‡ Paediatrician
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. Costs were based on primary Assessment or Consultation Codes and Fee Costs from the 2014 Schedule of Benefits)
Sources:
Medical Services (OHIP) Data, 2013, Ontario Ministry of Health and Long-Term Care, obtained through IntelliHEALTH Ontario.
Fees taken from the Schedule of Benefits: Physician Services Under the Health Insurance Act, Ministry of Health and Long-Term Care, 2014

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# data references and appendices

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**C** National Household Survey 2011, Statistics Canada

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**J** Ontario Mortality Database 2007-2011, Ontario Registrar General. IntelliHEALTH Ontario, Ontario Ministry of Health and Long-Term Care

**K** Medical Services (OHIP) Data, 2013. IntelliHEALTH, Ontario, Ministry of Health and Long-Term Care

## Appendix A

**Hospitalizations for Oral-Related Injuries of the Head† by Injury Type, Peel and Ontario, 2009–2013 Combined**

| Injury Type | Peel | | Ontario | |
|---|---|---|---|---|
| | Number | Age-standardized rate‡ per 100,000 | Number | Age-standardized rate‡ per 100,000 |
| Fracture of mandible | 186 | 2.9 | 2,814 | 4.6 |
| Fracture to mallar and maxillary bone== | 84 | 1.3 | 1,347 | 2.0 |
| Fracture of other skull and facial bon4 | 17 | 0.3 | 256 | 0.4 |
| Open wound of the lip/oral cavi3 | 11 | 0.2 | 163 | 0.3 |
| Multiple fractures involving skull and facial bones | 9 | 0.1 | 190 | 0.3 |
| Fracture of other skull and facial bones unspecified | 9 | 0.1 | 92 | 0.1 |
| Fracture of tooth | 4 | 0.1 | 16 | 0.1 |
| Lip and oral cavity | 3 | 0.1 | 22 | <0.1 |
| Open wound of cheek and temporomandibular area | NR | NR | 53 | <0.1 |
| Dislocation of jaw | — | — | 10 | 0.1 |
| Dislocation septal cartilage | — | — | NR | <0.1 |
| Dislocation tooth | — | — | 8 | <0.1 |
| Dislocation of other and unspecified part of hear | — | — | — | — |
| Sprain/strain of Jaw | — | — | — | — |
| Sprain/strain of joints/ligaments and unspecified parts of head | — | — | — | — |
| **Total** | **324** | | **4,973** | |

† ICD-codes S00.5, S01.4, S01.5, S02.4-S03.5.
‡ Age-standardized to the 1991 Canadian population.
NR – Not releasable due to small numbers.
— No hospitalizations for this category.
Source: In-Patient Database 2009–2013, Canadian Institute for Health Information. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.
Population Estimates 2009–2013, Statistics Canada. IntelliHEALTH Ontario, Ministry of Health and Long-Term Care.

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