



Ontario

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# Cancer Risk Factors in Ontario

Tobacco



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## FOREWORD

*Cancer Risk Factors in Ontario: Tobacco* is the second in our Cancer Risk Factors in Ontario series. It follows the March 2013 release of *Cancer Risk Factors in Ontario: Evidence Summary*, which summarized the epidemiologic evidence for a wide range of cancer risk factors, including tobacco. This report series supports one of Cancer Care Ontario's key strategic priorities to reduce chronic disease through prevention.

Tobacco control is important for preventing and controlling cancer and other chronic diseases in Ontario because tobacco use is a well-established cause of lung and several other cancers, and is a leading cause of cancer death worldwide. It also causes other chronic conditions, such as cardiovascular diseases and chronic respiratory diseases.

This report extends the work of *Cancer Risk Factors in Ontario: Evidence Summary* by providing information on the prevalence and distribution of tobacco use and cessation in Ontario. It uniquely examines tobacco smoking, smoking cessation and second-hand smoke exposure from a cancer perspective, including estimates of the tobacco smoking-associated cancer burden in the Ontario population.

In addition to its cancer focus, the report offers a detailed examination of socio-demographic variation in smoking, smoking cessation and second-hand smoke exposure, plus a special section on off-reserve Aboriginal Peoples.

The intent of this report is to complement and supplement other publications on tobacco use in Ontario and serve as a resource for public health and health professionals, as well as policy-makers. The next report in this series will focus on alcohol and cancer in Ontario.

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## HIGHLIGHTS

- Approximately 9,800 new cases of cancer diagnosed in Ontario during 2009 are estimated to be attributable to tobacco smoking, specifically to cigarettes.
- Smoking is responsible for the majority of lung and laryngeal cancers, accounting for nearly three-quarters of these cancers diagnosed in males and two-thirds in females.

### ADULTS

- In 2011, 20.6% of Ontario adults aged 20 years and older (roughly 2 million) were current daily or occasional smokers, a significant decline from 23.0% in 2003.
- Tobacco use and exposure is generally higher in males than females in Ontario:
  - In 2011, the prevalence of current smoking was significantly higher in males (24.2%) than females (17.1%); the current smoking rate in males has remained stable since 2003, while the rate in females has declined from 20.3% in 2003.
  - Male daily smokers, on average, smoked more cigarettes per day than females (median consumption 14.2. and 10.0, respectively).
  - Males more commonly used other tobacco products, such as cigars, pipes, snuff and chewing tobacco (8.9%, compared to 0.95% of females).
  - A lower proportion of male ever-smokers had successfully quit for at least one year (48.6%) than females (53.4%).
  - A higher proportion of non-smoking males were exposed to second-hand smoke in public places (13.0%) and in vehicles (6.5%); second-hand smoke exposure at home was similar for males and females.
- The prevalence of tobacco use and exposure to second-hand smoke is generally higher among younger adults, although younger adult smokers report fewer cigarettes per day than older adults.
  - Current smoking rates in 2011 were highest among adults aged 20–29 and 30–44 years, and lowest among those aged 65 years and older.
  - The use of other tobacco products was also most common among adults aged 20–29 years, and generally decreased with increasing age.
  - On average, adult daily smokers aged 20–29 and 30–44 years had slightly lower cigarette consumption (9.6 and 11.6 cigarettes per day, respectively) than older adults.
  - The proportion of ever-smoking adults who had quit smoking for at least one year was lowest in the 20–29 year age group and increased across older age groups.
  - Adults aged 20–29 years had a significantly higher prevalence of second-hand smoke

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exposure at home, in a vehicle and in public places than all other age groups; with the exception of exposure at home, second-hand smoke exposure generally declined across older age groups.

- Significant inequalities in tobacco use, cessation and exposure exist across levels of several socio-demographic factors in Ontario.
  - Adults with less than a secondary school education and those in the lowest income quintile had significantly higher rates of current smoking and exposure to second-hand smoke, but significantly lower rates of long-term quitting, compared to post-secondary school graduates and adults in the highest income quintile.
  - Adults living in rural areas had significantly higher smoking rates than those in urban areas, but had lower prevalence of exposure to second-hand smoke in public places; no differences were seen for smoking cessation or exposure to second-hand smoke at home.
- Current smoking varies significantly across the province; among Local Health Integration Networks (LHINs), current smoking rates range from 16.7%–28.4%.

## YOUTH

- Current smoking among Ontario teens aged 12–19 years declined significantly between 2003 and 2011, from 13.6% to 7.9% in males and from 13.8% to 4.0% in females. Significant declines in second-hand smoke exposure at home and in a vehicle were also observed since 2003, likely due to a combination of greater awareness of the hazards of second-hand smoke, smoke-free bylaws in several municipalities and the implementation of the *Smoke-Free Ontario Act*.
- Unlike the pattern seen in adults, males and females aged 12–19 years have a similar prevalence of current smoking. Male and female non-smoking teens also had a similar prevalence of exposure to second-hand smoke at home, in a vehicle and in public places.
- Current smoking was significantly more common among older teens aged 16–19 years (10.0%) than teens aged 12–15 years (1.7%).

## ABORIGINALS (OFF-RESERVE)

- Off-reserve Aboriginal populations in Ontario experience a substantially greater burden of tobacco exposure, including a significantly higher prevalence of current smoking, significantly higher median cigarette consumption, and significantly higher prevalence of exposure to second-hand smoke at home and in a vehicle, than the non-Aboriginal population. Both First Nations and Métis males and females had significantly higher current smoking rates than the non-Aboriginal population.



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## ABOUT THIS REPORT

- This report presents the distribution of tobacco use in Ontario and features
  - tobacco-associated cancer risk in the population
  - socio-demographic inequalities in exposure to tobacco and cessation
  - tobacco use and exposure reported by Local Health Integration Networks and public health units
  - the tobacco burden in off-reserve Aboriginal populations in Ontario
- The report follows the March 2013 release of Cancer Care Ontario's *Cancer Risk Factors in Ontario: Evidence Summary*, which summarized the epidemiologic evidence for a wide range of cancer risk factors, including tobacco. We hope this report, with its focus on tobacco as it relates to cancer, will supplement other reports on tobacco use in Ontario as a resource for public health and health professionals, policy-makers, and planners involved in both cancer control and tobacco control in the province.
- The primary source of data for this report is the Canadian Community Health Survey (CCHS), Ontario Share files. The CCHS is a national cross-sectional survey conducted by Statistics Canada, with a large sample size considered representative of 98% of the Canadian population aged 12 years and older (individuals living on First Nation Reserves and other Aboriginal settlements, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions are excluded).
- Figures included in this report and their associated data tables are available online, separate from the main contents of this report and prepared as slides for presentation. Selected supplementary tables are also available online, including estimates of tobacco use, cessation and second-hand smoke exposure unadjusted for age. Methods and indicator definitions are included in the appendices.



# 1. CONTEXT

## WHY IS TOBACCO CONTROL IMPORTANT FOR CANCER AND CHRONIC DISEASE PREVENTION?

- Tobacco smoking is a major preventable cause of morbidity and mortality. Smoking tobacco is a cause of many chronic conditions, including several types of cancer, cardiovascular disease, chronic respiratory diseases (chronic obstructive pulmonary disease, respiratory symptoms) and possibly diabetes.<sup>1,2</sup> It is also known to cause acute respiratory diseases, such as pneumonia, have adverse effects in pregnancy and its outcomes, reduce bone density in postmenopausal females, cause periodontitis and cataracts, and negatively impact post-surgical wound healing.<sup>1</sup>
- Tobacco use is a major preventable cause of several cancer types:
  - Actively smoking tobacco causes cancer of the oral cavity, pharynx, naso-pharynx, nasal cavity, para-nasal sinuses, esophagus, stomach, colon and rectum, liver, pancreas, larynx, lung, cervix (as a co-factor with human papillomavirus), ovary, kidney, bladder and other urinary system (including ureter), and bone marrow (acute myeloid leukemia).<sup>3,4</sup> There is limited evidence that tobacco smoke causes breast cancer, although this association is controversial and research is ongoing in this area.
  - Exposure to second-hand smoke causes lung cancer and probably increases the risk of cancers of the larynx and pharynx.<sup>3,4</sup>
  - Smokeless tobacco products (e.g., chewing tobacco, snuff, snus) cause cancer of the oral cavity, esophagus and pancreas.<sup>3,4</sup>
- Cigarettes are the main form of tobacco smoked worldwide; other types of smoked tobacco products, including cigars and pipes, are also causally associated with a higher risk of several cancers (e.g., oral cavity, pharynx, larynx).<sup>3,4</sup>
- Quitting smoking markedly reduces the risk of tobacco-related cancers, with risk generally decreasing with increasing time since cessation and decreasing age at cessation. For some cancers (e.g., lung), the risk declines rapidly (generally in the first five years), but remains elevated compared to never-smokers for many years.<sup>5,6</sup> For other cancers (e.g., oral), the risk reduces to become nearly the same as for never-smokers around 10 years after cessation.<sup>3</sup>

## TOBACCO CONTROL IN ONTARIO

- Ontario is a leader in comprehensive tobacco control programming. Through the introduction of the Ontario Tobacco Strategy (OTS) in 1992 and the Smoke-Free Ontario Strategy in 2004–2005, Ontario has implemented innovative tobacco control measures.
- The Smoke-Free Ontario Strategy combines public education with programs, policies and legislation to help smokers quit, protect the public from exposure to second-hand smoke and prevent young people from starting to smoke. The *Smoke-Free Ontario Act* (SFOA) bans smoking in workplaces, enclosed public spaces (e.g., bars, restaurants, casinos), patios covered by a rooftop and in vehicles when children under age 16 are present (as of January

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2009). It also bans public display of tobacco products and prohibits the sale of youth-targeted tobacco products (e.g., flavoured cigarillos).<sup>7</sup>

- The Ontario government is committed to achieving the lowest smoking rates in Canada, and is continuing to expand prevention and cessation efforts to achieve this goal.<sup>8</sup> To advance its objective, the government has renewed and strengthened its commitment to a smoke-free Ontario, including an additional \$5 million investment to the Smoke-Free Ontario Strategy in 2011/2012. This renewed commitment focuses on smoking cessation, including hospital-based programs, regulatory action to reduce the supply of contraband tobacco, including enforcement of tougher fines for the possession of illegal tobacco products, and strategies to protect youth and keep them smoke free.<sup>9</sup>
- *Taking Action to Prevent Chronic Disease: Recommendations for a Healthier Ontario*, prepared by Cancer Care Ontario and Public Health Ontario, includes four population-level recommendations for preventing chronic disease in Ontario that are specific to tobacco control. These recommendations highlight the need for action to address program and policy gaps in tobacco control in the province, build on and extend existing strategy achievements (e.g., extending protection from second-hand smoke exposure to bar and restaurant patios), and reinforce activities that deserve further development.<sup>2</sup>
- Cancer Care Ontario's Aboriginal Tobacco Program (ATP) aligns with the Smoke-Free Ontario Strategy tobacco control objectives and aims to reduce smoking rates among the First Nation, Inuit and Métis (FNIM) populations. The ATP strives to enhance the Aboriginal community's knowledge, skills, capacity and behaviour. The primary goal is to build capacity toward Tobacco-Wise FNIM communities among FNIM and non-FNIM policy-makers, healthcare administrators, and social and healthcare practitioners.<sup>10</sup>

## WHAT PROPORTION OF CANCERS IN ONTARIO CAN BE ATTRIBUTED TO SMOKING?

- In 2009, approximately 9,800 new cases of cancer diagnosed in Ontario (equivalent to 15% of all new cancer cases) are estimated to be attributable to tobacco smoking, specifically cigarette smoking (Figure 1 and Table 1).
- A larger number of cancer cases in males are attributable to smoking (approximately 6,000) than females (approximately 3,800), primarily because smoking prevalence has historically been much higher among men.
- Among the cancer types associated with active cigarette smoking, cancers of the lung and larynx have the largest smoking-attributable burden in Ontario. In 2009, smoking accounted for roughly 76% of lung and 74% of laryngeal cancers diagnosed in males, and 66% of lung and 67% of laryngeal cancers in females (Figure 1 and Table 1).
- The proportion of Ontario lung cancer cases attributed to cigarette smoking in this report is lower than estimates for lung cancer incidence and mortality previously reported in Canada and other countries.<sup>1,11,12</sup> This discrepancy exists because more conservative estimates of the relative risk associated with current and former smoking obtained primarily from a

large meta-analysis<sup>13</sup> were used for this report. If relative risk estimates from the frequently cited Cancer Prevention Study II (CPS II) had been used,<sup>14</sup> estimates of the proportion of Ontario's lung cancer cases attributable to tobacco would have increased to 88% in males and 75% in females (see Appendix C).

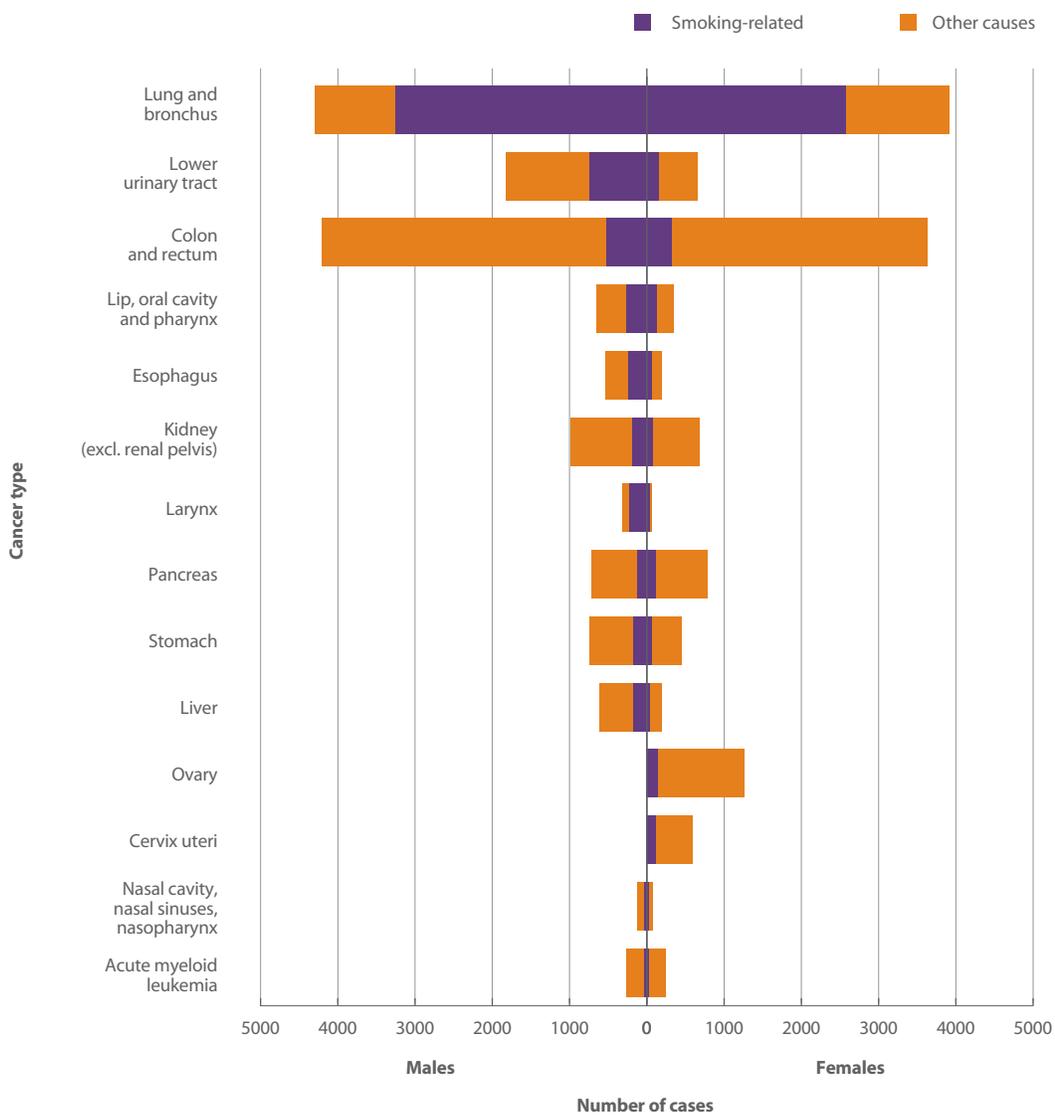
- A large proportion ( $\geq 33\%$ ) of cancers of the lip, oral cavity, pharynx and esophagus in Ontario can be attributed to tobacco smoking. This is true for males and females.
- The estimated burden of tobacco smoking in this report is likely conservative, albeit still large, because it does not include tobacco products other than cigarettes (e.g., cigars, pipes), it does not account for the synergistic relationship between tobacco and alcohol for certain cancers, and it relies on self-reported smoking behaviour, which likely underestimates true prevalence.

**TABLE 1.**  
Total number of cancer cases and proportion attributable to smoking, Ontario, 2009, by sex

CANCER TYPE	BOTH SEXES		MALE		FEMALE	
	TOTAL CASES	% SMOKING RELATED	TOTAL CASES	% SMOKING RELATED	TOTAL CASES	% SMOKING RELATED
Lung and bronchus	8205	71.0	4294	75.9	3911	65.6
Lower urinary tract	2473	36.4	1818	41.0	655	23.6
Colon and rectum	7828	10.7	4201	12.4	3627	8.7
Lip, oral cavity and pharynx	1005	39.4	656	41.2	349	36.2
Esophagus	725	41.0	537	43.7	188	33.2
Kidney (excl. renal pelvis)	1659	16.3	980	19.6	679	11.7
Larynx	370	73.2	310	74.3	60	67.3
Pancreas	1498	16.1	710	17.9	788	14.5
Stomach	1197	19.4	750	22.8	447	13.6
Liver	805	26.0	616	28.6	189	17.7
Ovary (mucinous)	1255	10.6	–	–	1255	10.6
Cervix uteri	586	20.0	–	–	586	20.0
Nasal cavity, nasal sinuses, nasopharynx	196	25.8	118	27.9	78	22.5
Acute myeloid leukemia	510	9.6	263	11.3	247	7.7
<b>TOTAL</b>	<b>28312</b>	<b>34.7</b>	<b>15253</b>	<b>39.2</b>	<b>13059</b>	<b>29.4</b>

Sources: Cancer Care Ontario (Ontario Cancer Registry, 2012); see Appendix A for complete data sources

**FIGURE 1.**  
Total number of cancer cases attributable to smoking, Ontario, 2009, by sex



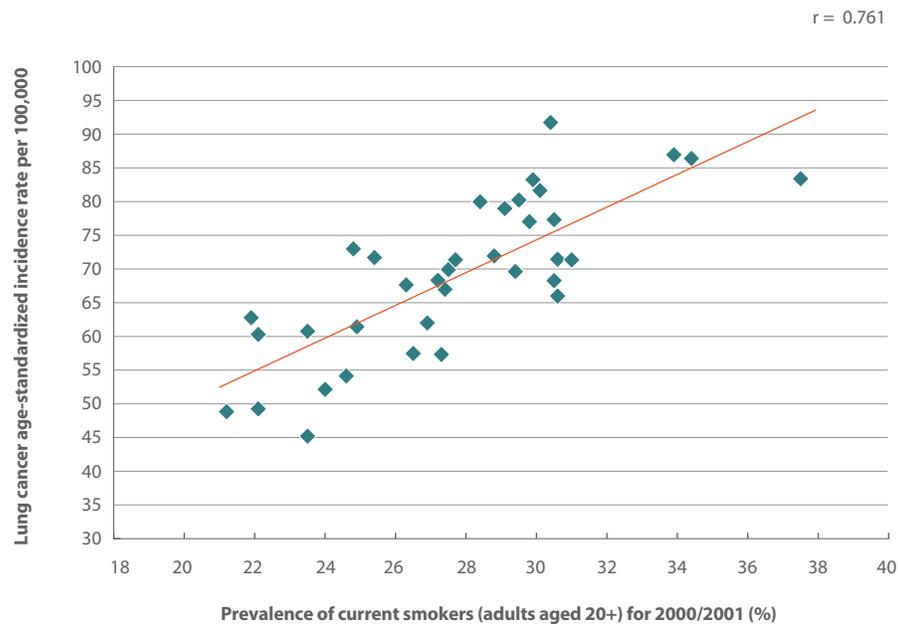
Sources: Cancer Care Ontario (Ontario Cancer Registry, 2012); see Appendix A for complete data sources

## REGIONAL SMOKING PREVALENCE CORRELATES WITH LUNG CANCER INCIDENCE

- Lung cancer incidence rates in Ontario's health regions are strongly correlated with past estimates of daily and occasional cigarette smoking. Figure 2 shows the strong positive correlation ( $r=0.761$ ) between the prevalence of current smoking in 2000/2001—the earliest period for which data could be readily obtained—and age-standardized incidence rates for lung cancer in the 2007–2009 period for Ontario's 36 public health units (PHUs).
- Given that the vast majority of lung cancer cases can be attributed to tobacco smoking, higher rates of lung cancer are expected in PHUs with higher rates of smoking in the past. The wide range in age-standardized incidence rates of lung cancer across Ontario's 36 PHUs (36.9 to 76.1 per 100,000 in 2007–2009; Ontario average is 50.4 per 100,000) highlights a continuing need for tobacco control efforts to reduce the burden of lung cancer and other tobacco-related cancers throughout Ontario, and particularly in some regions of the province. Figure 9 shows more recent smoking rates by PHU.

**FIGURE 2.**

Lung cancer incidence rates (2007–2009) and adult current smoking prevalence (2000/2001), Ontario, by public health unit, both sexes



**Notes:** Lung cancer incidence rates and current smoking estimates are age-standardized to the 2006 Canadian population.

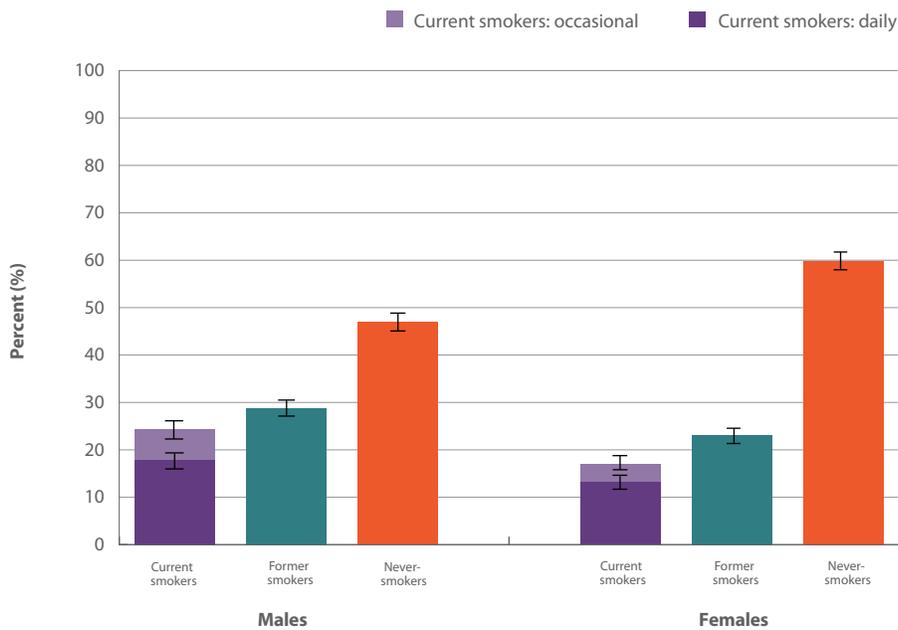
**Sources:** Cancer Care Ontario (Ontario Cancer Registry, 2012); Canadian Community Health Survey, 2000/2001 (Statistics Canada)



## 2. ADULTS

### 2.1 OVERVIEW: CURRENT, FORMER AND NEVER-SMOKERS

**FIGURE 3.**  
Smoking status of Ontario adults (aged 20+), by sex, 2011



**Notes:** Estimates are age-standardized to the 2006 Canadian population.

I represent 95% confidence intervals.

**Current smokers:** adults who reported that they presently smoke cigarettes “daily” or “occasionally.” See Appendix B for more details.

**Former smokers:** adults who reported that they presently do not smoke cigarettes but they had smoked at least 100 cigarettes in their lifetime.

**Never-smokers:** adults who reported that they presently do not smoke cigarettes and that they had smoked less than 100 cigarettes in their lifetime.

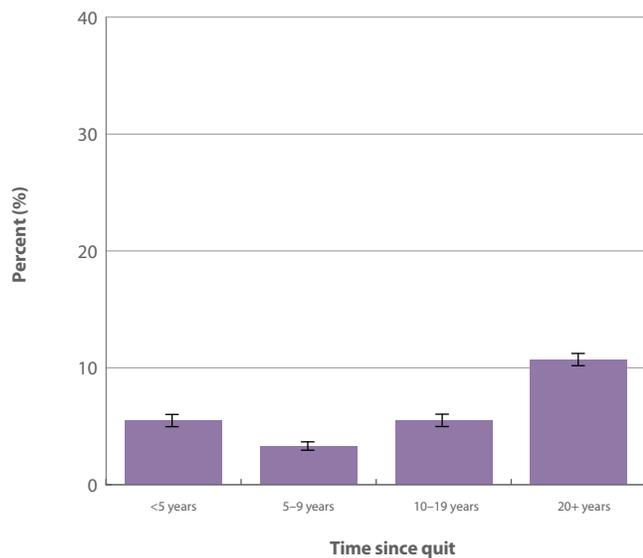
**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- In 2011, approximately 2 million Ontario adults aged 20 years and older (20.6% after adjusting for age) smoked cigarettes daily or occasionally, while an additional 2.6 million (25.7%) were former daily or occasional smokers (based on self-reports) (see supplementary table S1).
- A larger proportion of adult males than females in Ontario were current (daily or occasional) smokers and former smokers, while the proportion who had never smoked was significantly higher in females than males (Figure 3):
  - Among males, 24.2% were current smokers, 28.8% were former smokers and 46.9% were never-smokers.
  - Among females, the prevalence of current, former and never-smoking was 17.1%, 23.1% and 59.8%, respectively.

- Daily smoking was much more common than occasional smoking for men and women; 17.9% of males and 13.2% of females were daily smokers, while 6.3% of males and 3.9% of females were occasional smokers.
- Occasional smokers are individuals who reported that they “smoke cigarettes occasionally” at the present time. Ontario’s occasional smokers are a heterogeneous group of persistent occasional smokers and of former daily smokers at risk of returning to daily smoking.<sup>15</sup>

**FIGURE 4.**

Prevalence of former smokers among Ontario adults (aged 20+), by time since quitting, 2011



**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
I represent 95% confidence intervals.

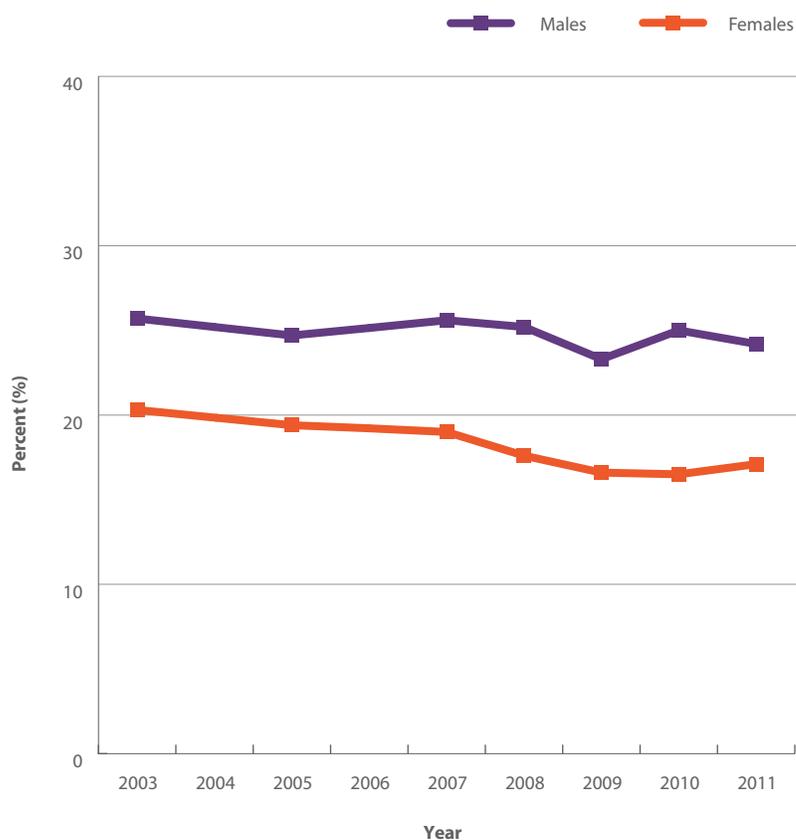
**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- Tobacco-associated cancer risk generally decreases as the time since quitting increases. For some cancers, such as lung, risk declines rapidly but remains elevated compared to never-smokers for many years, while for others, such as oral cancer, the risk is nearly the same as for never-smokers around 10 years after cessation.<sup>3,4</sup>
- Among adults aged 20 years and over, 5.5% were former smokers who had stopped smoking within the last five years, 3.3% had quit five to nine years ago, 5.5% were former smokers who quit 10 to 19 years ago, and 10.7% were former smokers who had not smoked for at least 20 years (Figure 4). Significantly more males had quit smoking 10 to 19 years ago and for 20 years or more than females (see supplementary table S2).
- The higher proportion of former smokers who quit less than five years ago, compared with five to nine years ago, may reflect the fact that this group includes people who have recently quit smoking and are at a high risk of relapsing.

## 2.2 CURRENT SMOKING

FIGURE 5.

Trends in current smoking prevalence among Ontario adults (aged 20+), 2003–2011



**Notes:** Estimates are age-standardized to the 2006 Canadian population.

First year of data is 2003 because of a change in the method of administering the survey after the 2000/2001 CCHS cycle, which affected some smoking estimates.

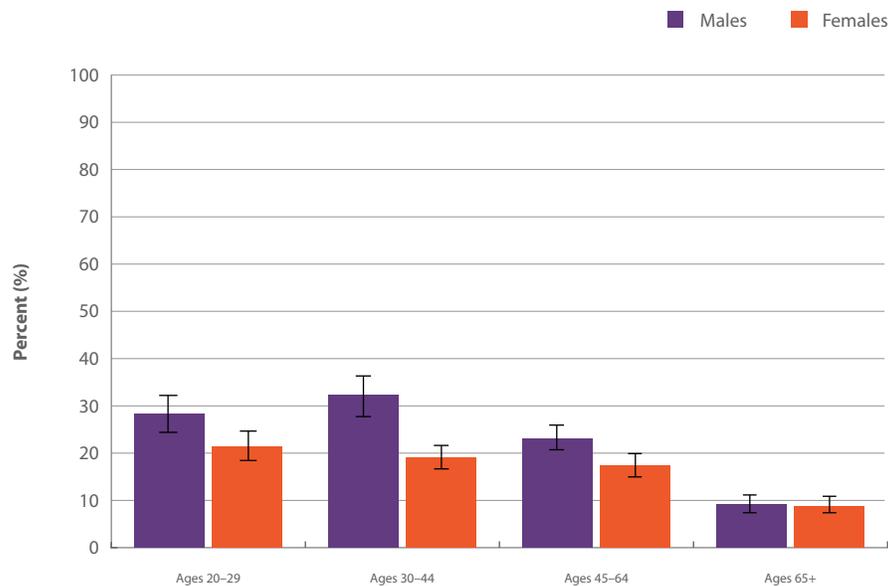
**Source:** Canadian Community Health Survey, 2003, 2005, 2007–2011 (Statistics Canada)

- The overall prevalence of current smoking (daily or occasional) among Ontario adults aged 20 years and older decreased significantly between 2003 and 2011 (see supplementary table S3), continuing a decline seen for several decades.<sup>16</sup> This decline is largely due to decreases in the prevalence of daily rather than occasional smoking.<sup>17</sup>
- The prevalence of current smoking remained consistently higher in males than in females between 2003 and 2011; this is similar to earlier periods. The proportion of female adults who were daily or occasional smokers decreased significantly, from 20.3% in 2003 to 17.1% in 2011, although the rate appears to have stabilized since 2009. Smoking rates for males remained stable for the 2003–2011 period (Figure 5).

- Despite long-term declines in smoking rates, a sizeable number of Ontario adults smoke and this number can be expected to rise in future years, even if the smoking rate remains stable, because of ongoing population growth. The recent stabilization of smoking rates, particularly in males, following a long-term decline suggests a need for additional strategies to promote cessation and prevent uptake to re-start this downward trend.

**FIGURE 6.**

Current smoking prevalence in Ontario adults (aged 20+), by sex and age group, 2011



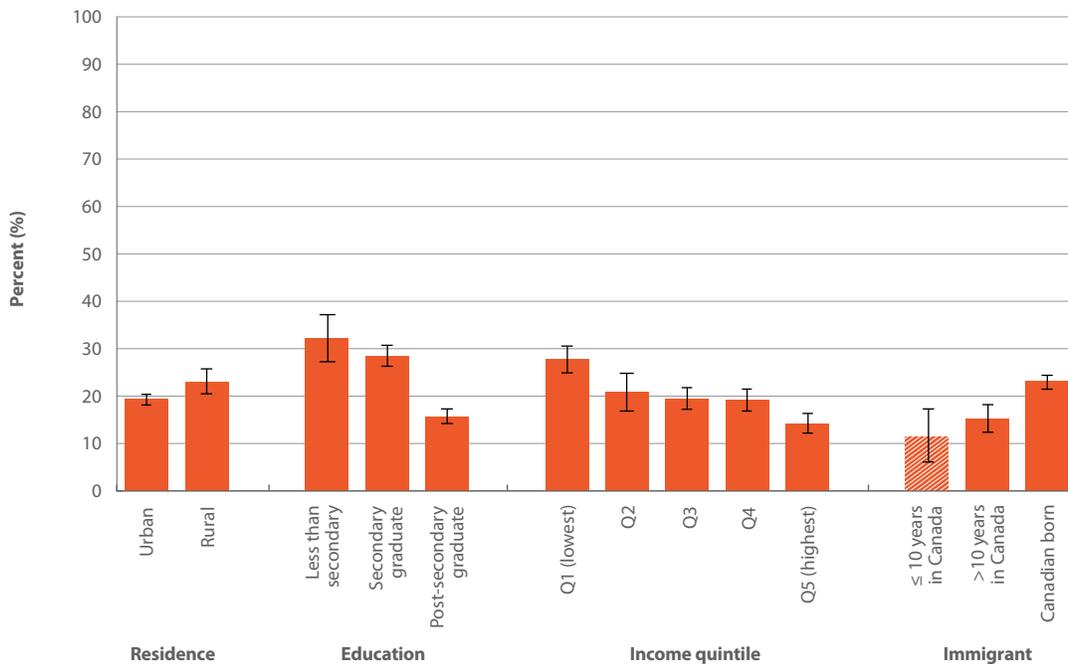
**Notes:** I represent 95% confidence intervals.

**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- In 2011, the age-specific prevalence of current daily or occasional smoking among both males and females was highest in the 20–29 (males 28.2%, females 21.4%) and 30–44 (males 32.3%, females 19.0%) age groups. Prevalence was significantly lower at ages 65 and older (males 9.2%, females 8.8%) (Figure 6; supplementary table S4). It should be noted that despite lower percentages, the older age groups 30 years and up represent more Ontarians and thus higher actual numbers of smokers than the 20–29-year-old group.
- Lower prevalence in the older age groups likely reflects a combination of higher rates of successful quitting among ever-smokers in these age groups and greater tobacco-related mortality as smokers age.
- Similar to the pattern for all ages combined, males younger than age 65 had a significantly higher prevalence of current smoking than females. Males and females aged 65 and older had similar rates of current smoking (Figure 6).

**FIGURE 7.**

Current smoking prevalence in Ontario adults (aged 30+), by selected socio-demographic factors, 2011

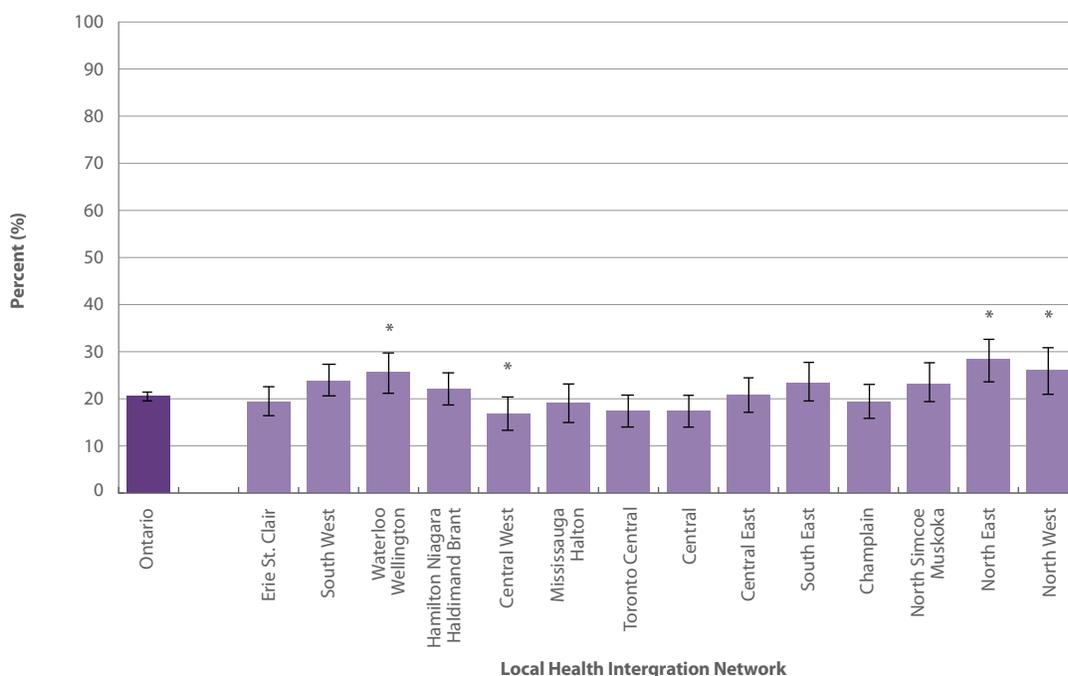


**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
I represent 95% confidence intervals.  
Interpret estimates denoted with diagonal lines with caution due to high sampling variability.  
**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- The prevalence of current smoking differs significantly across levels of several socio-demographic factors. Socio-demographic characteristics were analyzed for adults aged 30 and over to restrict the sample to those who have likely completed their education and reached their adult socio-demographic status.
- In 2011, current smoking prevalence was significantly higher among adults (aged 30+) living in rural (23.0%) compared to urban areas (19.3%), among those with less than a secondary school education (32.1%) compared to post-secondary school graduates (15.7%), and among the lowest income group (27.8%) compared with the highest (14.2%) (Figure 7).
- Consistent with a healthy immigrant effect, Canadian-born adults had significantly higher smoking rates (23.1%) than immigrants.
- Similar differences in current smoking prevalence by education, income and immigrant status were seen for males and females (see supplementary table S5).

- Adult smokers (ages 18+), compared to non-smokers, are less likely to be food secure, have a family doctor, own their dwelling and be a post-secondary graduate, and are more likely to be white, Canadian-born, male, have unhealthy eating habits and exceed low-risk drinking guidelines.<sup>7</sup>

**FIGURE 8.**  
Current smoking prevalence in Ontario adults (aged 20+), by Local Health Integration Network, 2011



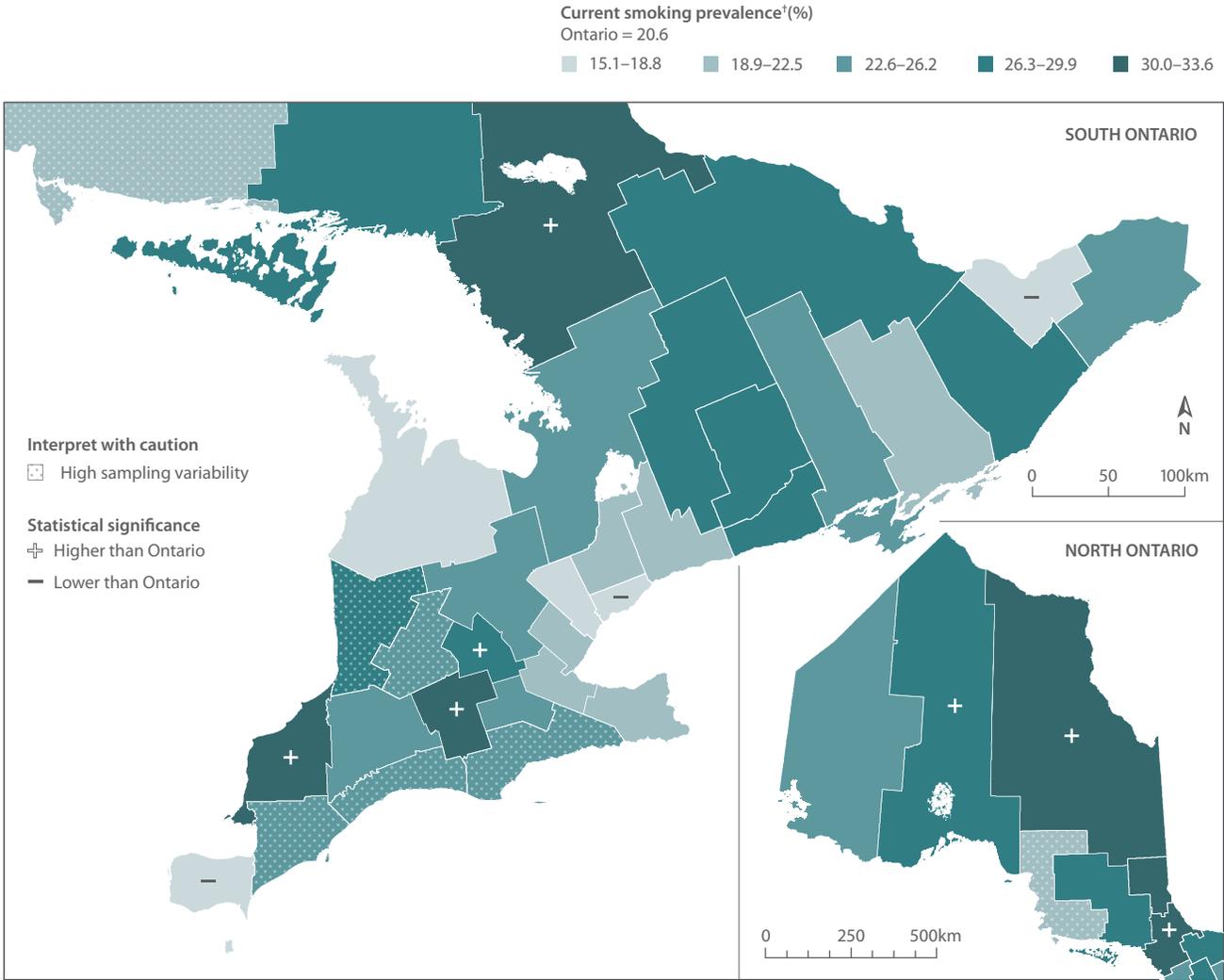
**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
 † represent 95% confidence intervals.  
 \*Estimate is significantly higher/lower than the Ontario estimate.  
**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- Ontario has significant regional variation in current smoking rates, with the lowest rates generally observed in the central part of the province and the highest rates generally in the north.
- Compared to the 2011 provincial estimate of 20.6%, the Waterloo Wellington, North East and North West Local Health Integration Networks (LHINs) had significantly higher age-adjusted rate of current smoking, while the Central West LHIN had a significantly lower smoking rate (Figure 8; see Appendix D for map showing LHIN boundaries).
- Current smoking prevalence among Ontario's 14 LHINs ranged from a low of 16.7% in the Central West LHIN to a high of 28.4% in the North East LHIN.

- 
- The variation in current smoking prevalence across LHINs appears to be largely influenced by variation in LHIN-specific female rates of current smoking (see supplementary table S6).
  - In 2011, the prevalence of current smoking among Ontario's 36 public health units (PHUs) ranged from a low of 15.1% in the Windsor-Essex PHU to a high of 33.6% in the Porcupine PHU (Figure 9 and supplementary table S7).
  - Compared to the provincial estimate of 20.6%, the Porcupine, Oxford, Lambton, North Bay Parry Sound, Waterloo and Thunder Bay PHUs had significantly higher prevalence of current smoking, while the Windsor-Essex, Ottawa and Toronto PHUs had significantly lower smoking prevalence.
  - Greater regional variation in current smoking prevalence was apparent at the PHU level than at the LHIN level, with marked variation between some PHUs within the same LHIN. Within the Erie St. Clair LHIN at the southwest tip of Ontario, for example, current smoking rates ranged from as low as 15.1% in the Windsor-Essex PHU to as high as 31.0% in the Lambton PHU; these differences are averaged out at the LHIN level resulting in a smoking estimate that is similar to all Ontario. Likewise, smoking prevalence in northern Ontario was not uniformly higher than the provincial average, as the LHIN rates imply (see Appendix D for map showing LHIN and PHU boundaries).

**FIGURE 9.**

Current smoking prevalence in Ontario adults (aged 20+) by public health unit, 2011



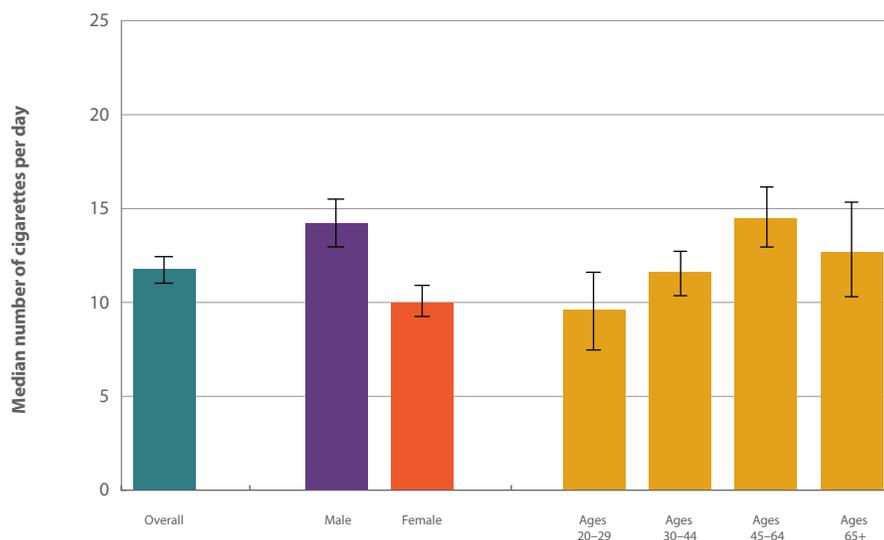
**Notes:** \* Estimates are age-standardized to the 2006 Canadian population.

**Sources:** Canadian Community Health Survey, 2011 (Statistics Canada); 2006 Census Boundaries (Statistics Canada)

## 2.3 CIGARETTE CONSUMPTION

**FIGURE 10.**

Median cigarette consumption among adult (aged 20+) daily smokers in Ontario, by sex and by age group, 2011



**Notes:** I represent 95% confidence intervals.

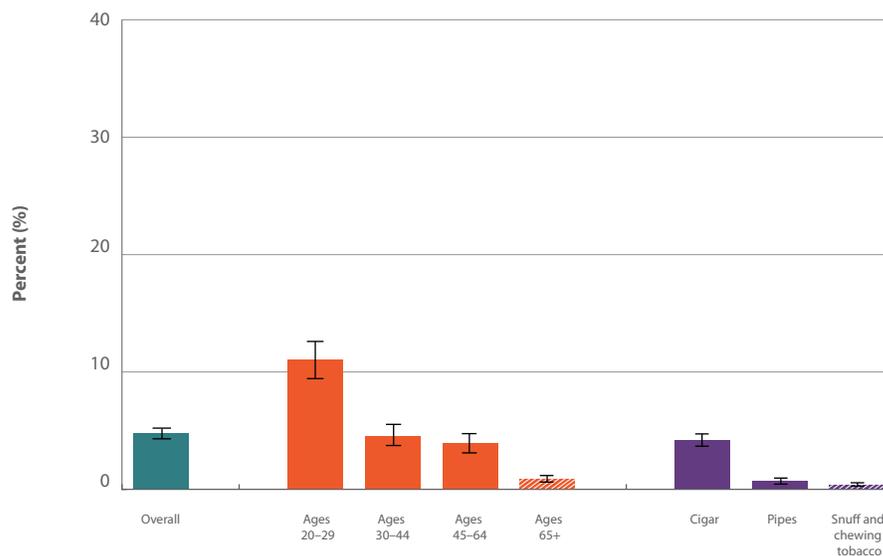
**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- In 2011, the median number of cigarettes consumed by daily smokers was 11.8 (mean 14.5) cigarettes per day (CPD) (Figure 10; supplementary table S8).
- Males had a significantly higher median cigarette consumption (14.2 CPD) compared to females (10.0 CPD).
- Daily cigarette consumption varied significantly across age groups. In 2011, median consumption was lowest among adults aged 20–29 (9.6 CPD), higher in the 30–44 age group (11.6 CPD), higher still in the 45–64 age group (14.5 CPD), and slightly lower among adults aged 65 years and older (12.7 CPD).
- Although half of daily smokers in Ontario smoked well below 20 cigarettes (one pack) per day, 32.4% reported smoking 20 or more cigarettes per day and can be considered “heavy smokers.” The proportion of daily smokers smoking heavily appears to have declined since at least 2003, but nonetheless remains high (data not shown).

## 2.4 USE OF OTHER TOBACCO PRODUCTS

**FIGURE 11.**

Prevalence of other tobacco product use in Ontario adults (aged 20+), by age group and by type of product, 2011



**Notes:** Estimates for overall and by type are age-standardized to the 2006 Canadian population.

I represent 95% confidence intervals.

Interpret estimates denoted with diagonal lines with caution due to high sampling variability.

**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- In 2011, 4.8% of Ontario adults used tobacco products other than cigarettes, such as cigars, pipes and chewing tobacco, in the past month (Figure 11; supplementary table S9).
- The use of other tobacco products of all types was 10.4 times higher in males (8.9%) than in females (0.9%) (see supplementary table S9).
- Other tobacco use was most common among adults aged 20–29 (11.1%) and generally decreased with increasing age; the prevalence of other tobacco products in the 65+ age group was less than one percent.
- Cigars were the most commonly used alternate form of tobacco, with 4.2% of Ontario adults reporting smoking at least one in the past month. A much smaller proportion of adults reported using pipes (0.7%) and snuff or chewing tobacco (0.4%).
- Current cigarette smokers were more likely to use other tobacco products than adults who do not smoke cigarettes (data not shown).

- 
- In addition to the tobacco products considered here, more information on other products, such as cigarillos and flavoured tobacco products, is important for a complete understanding of the burden of tobacco use in the Ontario population. Data on such products are not available in the Canadian Community Health Survey (CCHS); however, the Canadian Tobacco Use Monitoring Survey (CTUMS) suggests that in 2011 nearly 2% of Ontarians aged 19+ had used a little cigar or cigarillo in the past month.<sup>18</sup>

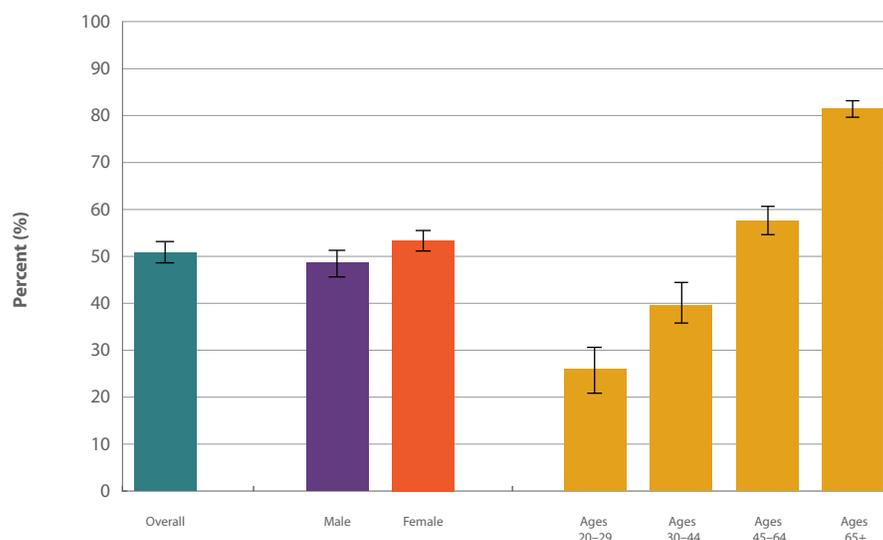
## 2.5 SMOKING CESSATION

Tobacco control efforts aim to increase the proportion of smokers who have successfully quit smoking and to support successful quitters to remain abstinent over the long term. Smoking cessation is a complex process influenced by a number of factors, such as past quit attempts, motivation, level of dependence and bans on smoking inside the home. While factors such as sex, age and measures of socioeconomic status may also play a role, these have been reported inconsistently in the literature.<sup>19</sup>

- Among Ontario adults who have ever been smokers, over half (53.1%) have now quit (data not shown).
- In 2011, 25% of current smokers intended to quit in the next 30 days and over half intended to quit in the next six months.<sup>7</sup>
- The percentage of recent smokers (i.e., current smokers and recent quitters) who had quit smoking in the past year and were smoke-free at the time of interview in 2011 was 7.1% (6.5% for males and 8.0% for females). Resuming regular smoking is common among recent quitters; data from the Ontario Tobacco Survey suggests that 79% of these recent quitters will relapse in the subsequent year.<sup>7</sup>
- Roughly half (50.8%) of ever-smoking adults surveyed in Ontario in 2011 had successfully quit smoking for at least one year (Figure 12). This long-term quitting indicator provides a more robust estimate of trends in smoking cessation than an estimate including more recent quitters, given the high rate of relapse experienced in the first year of quitting (Shawn O'Connor, Ontario Tobacco Research Unit, personal communication).

**FIGURE 12.**

Prevalence of long-term quitters among Ontario ever-smokers (aged 20+), by sex and by age group, 2011



**Notes:** Estimates for overall and by sex are age-standardized to the 2006 Canadian population  
I represent 95% confidence intervals.

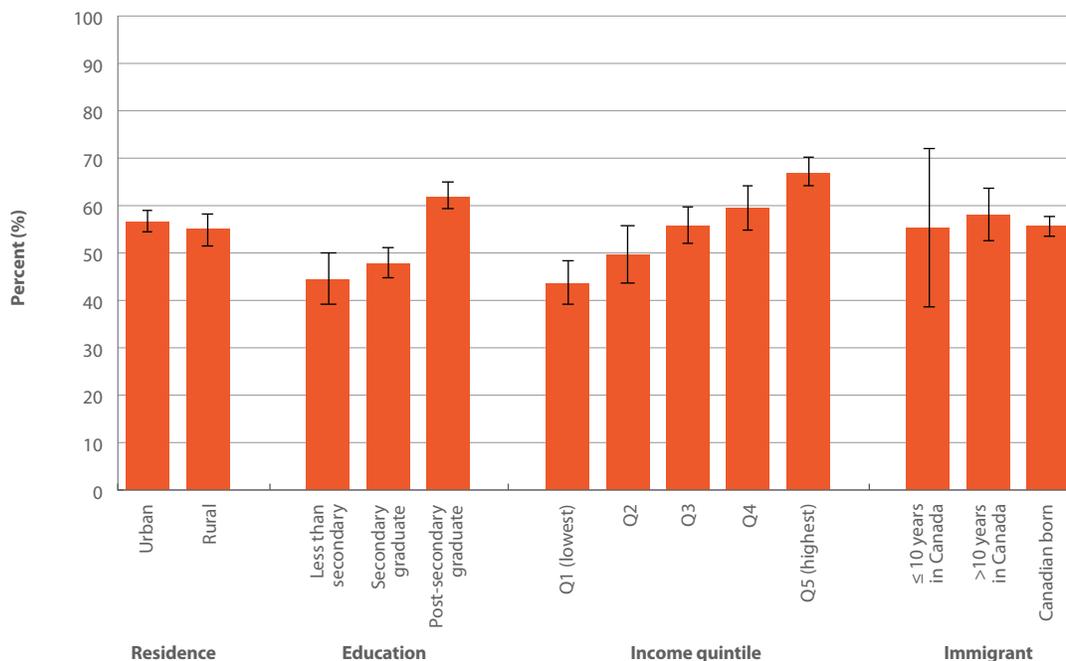
**Long-term quitters:** adult former smokers who reported that they quit smoking at least 1 year ago.

**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- A larger proportion of ever-smoking females (53.4%) than males (48.6%) had successfully quit smoking at least one year ago (Figure 12; supplementary table S10).
- The proportion of ever-smokers who successfully quit smoking at least one year ago was significantly higher with increases in age, from 25.9% among adults aged 20–29 to 81.5% among adults aged 65 years and older.
- A higher rate of successful long-term quitting with increasing age is consistent with the lower rates of current smoking in these groups. Older smokers have had more time to try to quit and most smokers attempt to quit smoking several times before succeeding.<sup>20</sup>

**FIGURE 13.**

Prevalence of long-term quitters among Ontario ever-smokers (aged 30+), by socio-demographic factors, 2011



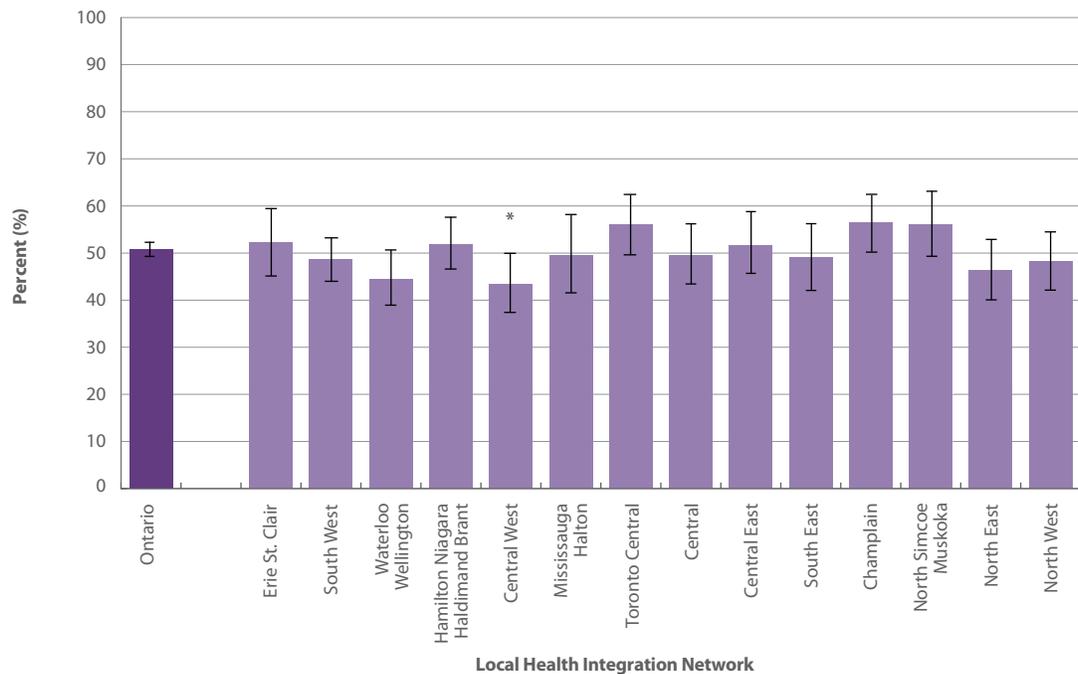
**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
I represent 95% confidence intervals.

**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

- The prevalence of ever-smoking Ontario adults who have successfully quit smoking for at least one year varies significantly across levels of several socio-demographic factors.
- In 2011, ever-smokers with the highest level of education (61.7%) and those in the highest income quintile (66.8%) were significantly more likely to have successfully quit smoking for at least one year, compared with the least educated (44.4%) and those in the lowest income quintile (43.5%) (Figure 13; supplementary table S11).
- Long-term quitting did not differ between urban and rural areas or between Canadian-born adults and immigrants to Canada, regardless of time since immigration.
- These results, together with the current smoking results by socio-demographic factors, highlight significant income- and education-related disparities in tobacco use in Ontario; adults with the lowest level of education and in the lowest income group are more likely to smoke and less likely to quit smoking over the long term.

- Socio-demographic disparities in smoking cessation have been reported previously in Canada<sup>21</sup> and may be partially related to differences in health-seeking behaviours, as well as awareness of and access (including availability and uptake) to smoking cessation assistance methods (e.g., stop-smoking medications) and other sources of cessation support in the province.<sup>21</sup>

**FIGURE 14.**  
Prevalence of long-term quitters among Ontario ever-smokers (aged 20+), by Local Health Integration Network, 2011



**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
I represent 95% confidence intervals.  
\*Estimate is significantly lower than Ontario's estimate.

**Source:** Canadian Community Health Survey, 2011 (Statistics Canada)

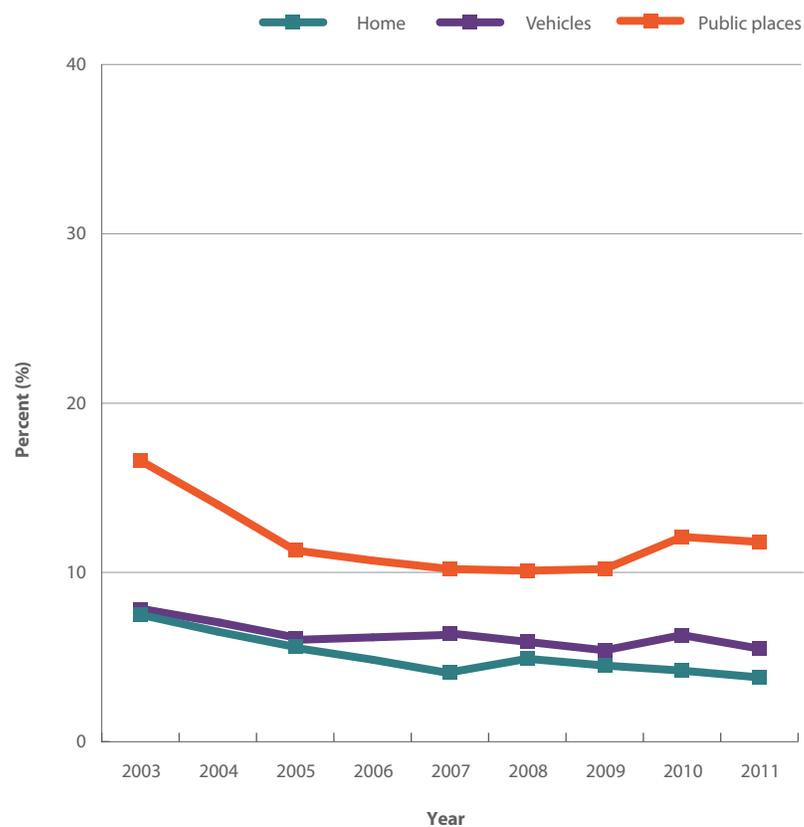
- 
- In 2011, the proportion of ever-smokers who had successfully quit smoking for at least one year in Ontario's 14 LHINs ranged from 43.4% in the Central West LHIN to 56.5% in the Champlain LHIN. The Central West LHIN was, however, the only LHIN that differed significantly from the Ontario estimate of 50.8% (Figure 14; supplementary table S12). This LHIN has the lowest rate of current smoking, and the remaining smokers may be those who find it hardest to quit.
  - The Smoke-Free Ontario Strategy includes a variety of initiatives to help smokers quit, although the reach of these may be too narrow and too recent to explain the variation in cessation rates presented here. The Government of Ontario provides funding for the provincial, population-level quit-line operated by the Canadian Cancer Society and also funds smoking cessation prescription medications for eligible Ontarians through the Ontario Drug Benefit (ODB) program. Through its renewed commitment to the Smoke-Free Ontario Strategy, the Government of Ontario is also working on expanding the availability of smoking cessation support in clinical and community settings. A recommendation to further extend efforts to create an integrated and coordinated tobacco cessation system in Ontario was part of the 2012 *Taking Action to Prevent Chronic Disease: Recommendations for a Healthier Ontario* report.<sup>2</sup>
  - Electronic cigarettes (e-cigarettes) will be important for the Ontario government to consider. E-cigarettes heat nicotine solution into vapours inhaled by the user<sup>23</sup> and are gaining public interest as a potential harm reduction and smoking cessation aid.<sup>23,24</sup> Little research has been conducted to date on their effectiveness as cessation aids.

## 2.6 EXPOSURE TO SECOND-HAND SMOKE

Exposure to second-hand smoke may occur in several locales, including the home, vehicles, workplaces and public places, such as bars, restaurants and outdoor public spaces. A smoke-free home policy not only benefits the non-smokers inside a household, but has also been found to help smokers reduce their cigarette consumption and quit smoking completely.<sup>19,25</sup>

**FIGURE 15.**

Trends in second-hand smoke exposure among non-smoking adults (aged 20+) in Ontario, 2003–2011



**Notes:** Estimates are age-standardized to the 2006 Canadian population.

**Source:** Canadian Community Health Survey, 2003, 2005, 2007–2011 (Statistics Canada)

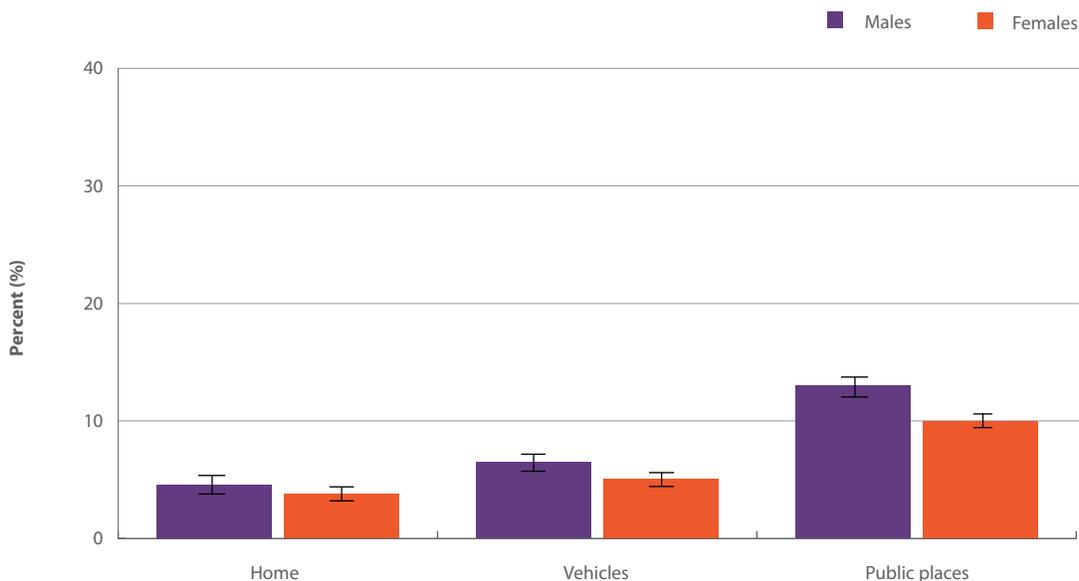
- Between 2003 and 2011, the proportion of Ontario non-smokers reporting that they were regularly exposed to second-hand smoke at home, in public places and in vehicles generally declined (Figure 15).
- In 2011, 11.8% of non-smokers were exposed to second-hand smoke in public places, down

from 16.6% in 2003. The decline was most apparent between 2003 and 2005, and appears to have since levelled off after an apparent but not statistically significant increase between 2009 and 2011. The earlier declines likely reflect smoking bans in bars and restaurants in several large municipalities in the years prior to the implementation of the *Smoke-Free Ontario Act* in 2006.

- Second-hand smoke exposure in vehicles declined significantly from 7.8% in 2003 to 5.5% in 2011, although it appears that rates have stabilized since 2007. Exposure at home also declined significantly, from 7.5% in 2003 to 3.8% in 2011 (see supplementary table S13).
- Declines in second-hand smoke exposure in the home and in vehicles have likely resulted from increased awareness of the health hazards associated with tobacco exposure, increased non-smoking social norms, the increased adoption of voluntary non-smoking policies at home, and the *Smoke-Free Ontario Act* ban on smoking in vehicles when children under age 16 are present.

**FIGURE 16.**

Prevalence of second-hand smoke exposure among non-smoking adults (aged 20+) in Ontario, by sex, 2009–2011 combined



**Notes:** Estimates are age-standardized to the 2006 Canadian population.

Data from CCHS cycles 2009, 2010, and 2011 combined to increase sample size for analyses of second-hand smoke exposure.

I represent 95% confidence intervals.

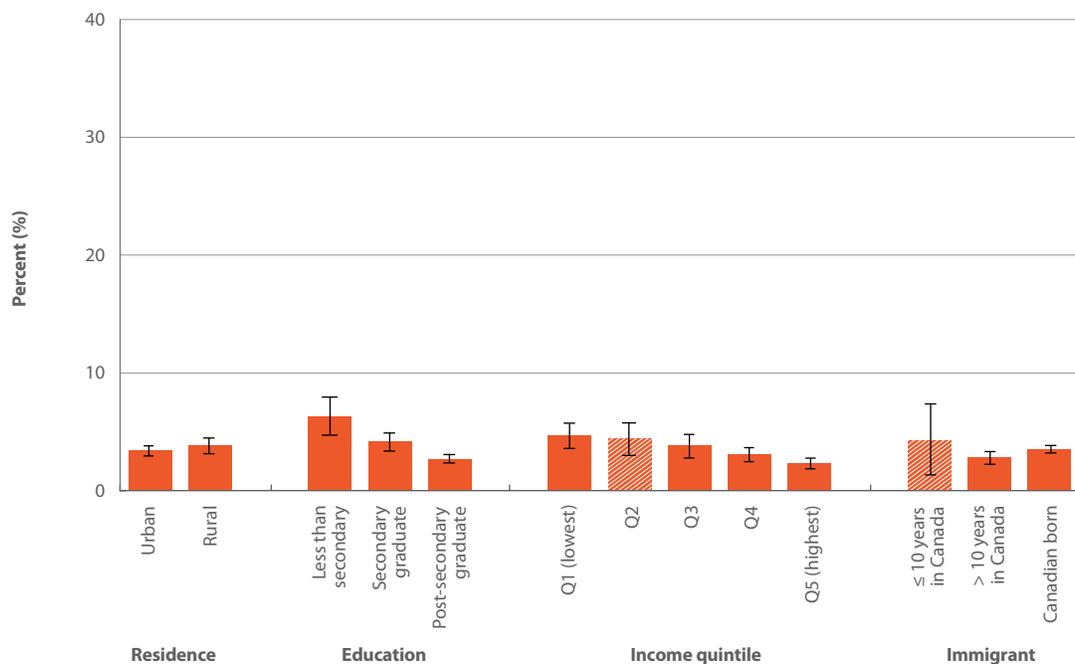
**Source:** Canadian Community Health Survey, 2009–2011 (Statistics Canada)

- 
- During 2009–2011, the proportion of non-smokers regularly exposed to second-hand smoke in public places (11.4%) was significantly higher than the proportion regularly exposed in a vehicle (5.7%) and at home (4.2%) (see supplementary table S14). This was true for males and females (Figure 16).
  - Male non-smokers had a significantly higher prevalence of regular exposure to second-hand smoke in a public place (13.0%) and in a vehicle (6.5%) than female non-smokers (10.0% and 5.1%, respectively). The sexes were similar in the proportion exposed to second-hand smoke at home (4.6% males, 3.8% females).
  - The youngest group of adults, aged 20–29 years, had the highest prevalence of second-hand smoke exposure at home (7.3%), in a vehicle (11.3%) and in public places (20.1%), and these generally decreased across the older age groups (see supplementary table S15).
  - High prevalence of second-hand smoke exposure among young adults aged 20–29 may be due, in part, to a high prevalence of current smoking in this age group and therefore a greater likelihood of exposure among non-smoking 20–29 year-olds from their friends and acquaintances.
  - The relatively high prevalence of exposure to second-hand smoke in public places in Ontario is likely due to exposure in settings not covered by the *Smoke-Free Ontario Act* (e.g., uncovered patios, entranceways to most buildings, parks and other outdoor spaces). Data from the CTUMS demonstrates much higher prevalence of second-hand smoke exposure on patios than any other public place.<sup>7</sup> To address this source of exposure, *Taking Action to Prevent Chronic Disease: Recommendations for a Healthier Ontario* recommends expanding the *Smoke-Free Ontario Act* to include unenclosed bar and restaurant patios.<sup>2</sup>
  - The relatively low prevalence of regular exposure to second-hand smoke at home among Ontario adult non-smokers likely reflects high adoption of voluntary bans on smoking within the home. In 2011, 86.4% of all Ontario households reported that smoking is not allowed inside their home and even the majority (61.9%) of current smokers reported living in a “smoke-free home” (data not shown). It is, however, likely that the estimates of exposure to second-hand smoke at home reported here underestimate the true prevalence of exposure because individuals living in multi-unit dwellings where no one smokes inside their home may still be exposed to smoke coming from other units within the same building and because the CCHS does not ask about regular exposure that does not occur “every day” or “almost every day.”

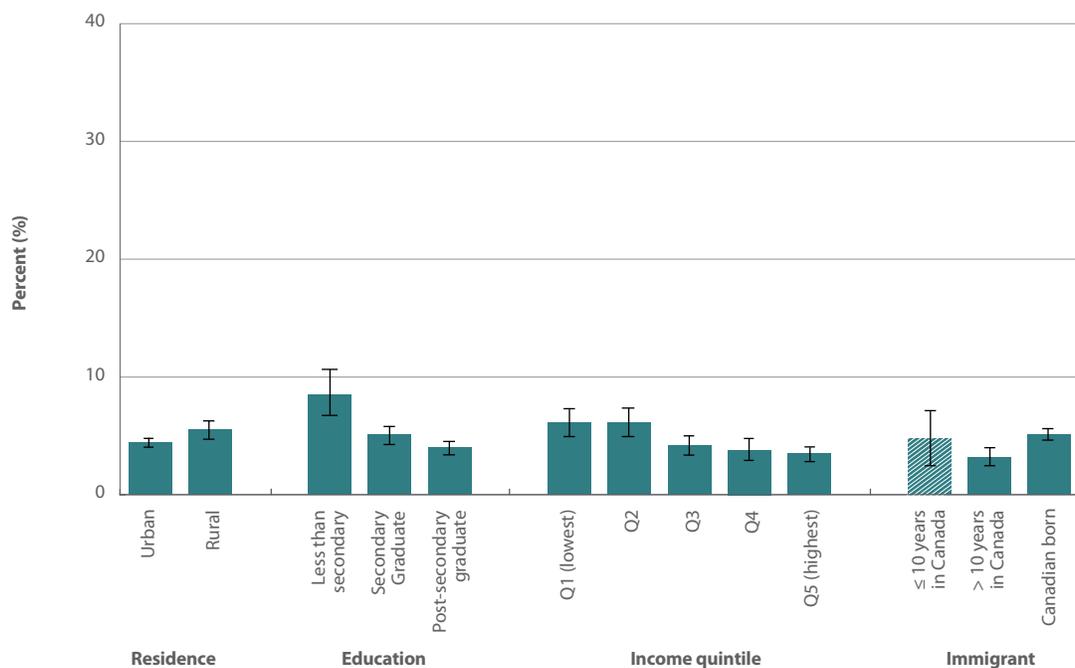
**FIGURE 17.**

Prevalence of second-hand smoke exposure in Ontario adults (aged 30+), by selected socio-demographic factors, 2009–2011 combined

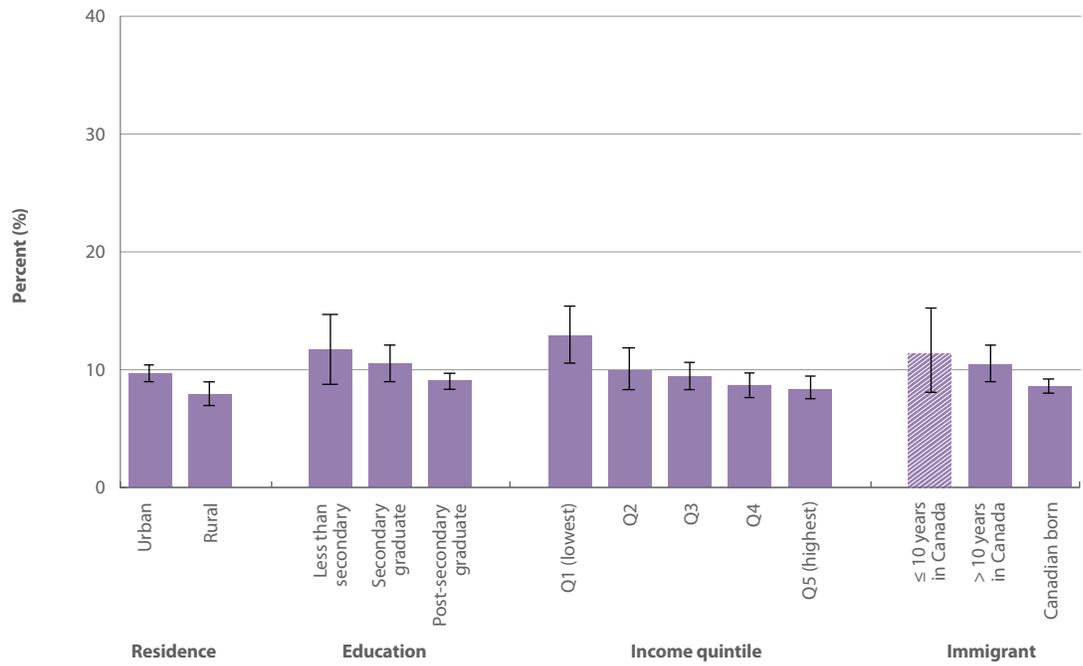
**A) Second-hand smoke exposure at home**



**B) Second-hand smoke exposure in vehicles**



C) Second-hand smoke exposure in public places



**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
 I represent 95% confidence intervals.  
 Interpret estimates denoted with diagonal lines with caution due to high sampling variability.  
**Source:** Canadian Community Health Survey, 2009–2011 (Statistics Canada)

- 
- During 2009–2011, the prevalence of exposure to second-hand smoke at home was similar in urban (3.4%) and rural/small town (3.8%) areas of residence. Exposure to second-hand smoke in a vehicle, was, however, significantly higher among non-smoking adults living in rural/small town areas (5.5%) than those in urban areas (4.4%), while second-hand smoke exposure in public places was significantly higher in urban areas (9.7% urban vs. 7.9% rural) (Figure 17A, B, C; supplementary table S16).
  - Higher rates of exposure to second-hand smoke in public places in urban areas may reflect a greater likelihood of frequenting more densely populated public places where smoking may be allowed, including outdoor spaces, such as public parks.
  - Exposure to second-hand smoke at home and in a vehicle was significantly higher among non-smoking adults with less than a secondary school education (6.3% at home and 8.5% in a vehicle) than post-secondary school graduates (2.7% at home and 4.0% in a vehicle). The prevalence of second-hand smoke exposure in public places did not, however, differ by the highest level of education.
  - Non-smoking adults in the lowest income quintiles had significantly higher prevalence of second-hand smoke exposure at home (4.7%), in a vehicle (6.1% for Q1) and in public places (12.9%) than those in the highest income quintile (2.3% at home, 3.5% in a vehicle, 8.3% in public places).
  - The decreasing gradients in the prevalence of second-hand smoke exposure at home and in a vehicle across increasing levels of education and increasing income quintiles are consistent with the education- and income-related inequalities in current smoking prevalence seen in Ontario.
  - The prevalence of exposure to second-hand smoke at home did not differ according to immigrant status. However, non-smoking immigrants who had been in Canada for more than 10 years had a significantly lower prevalence of second-hand smoke exposure in a vehicle (3.2%) and a significantly higher prevalence of second-hand smoke exposure in public places (10.4%) than non-smoking Canadian-born adults. Higher exposure in public places among immigrants may reflect the fact that they are likely to live in urban areas.
  - During 2009–2011, there was little variation in second-hand smoke exposure at home or in a vehicle among Ontario's LHINs, while the prevalence of second-hand smoke exposure in public places ranged from 7.7% to 18.0% (see supplementary table S17).

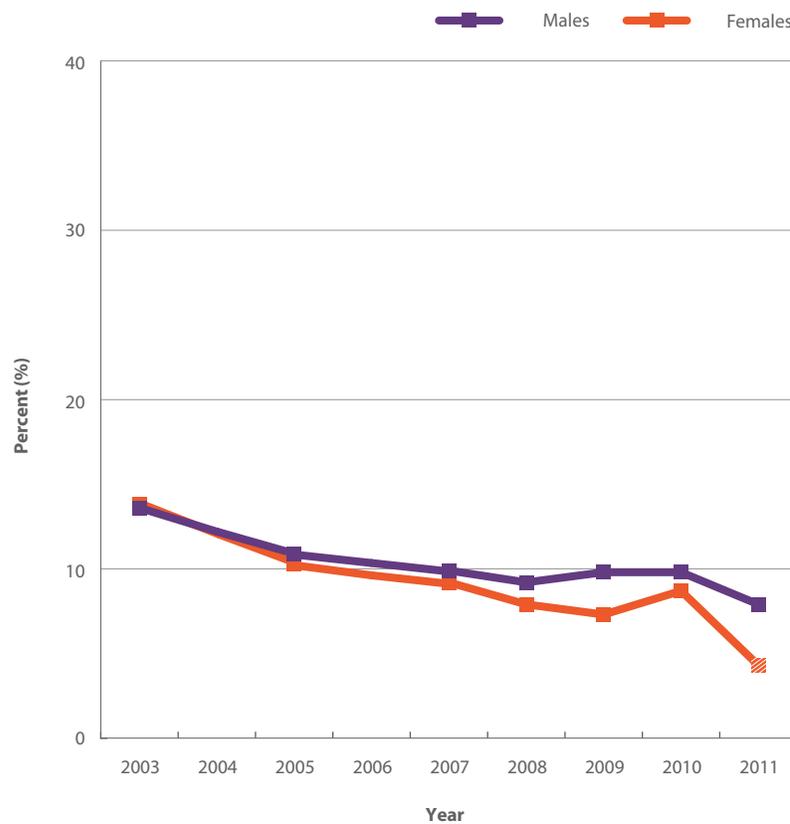


## 3. YOUTH

### 3.1 CURRENT SMOKING

FIGURE 18.

Trends in current smoking prevalence among Ontario teens (aged 12–19), by sex, 2003–2011



Notes: Interpret estimates denoted with diagonal lines with caution due to high sampling variability.

Source: Canadian Community Health Survey, 2003, 2005, 2007–2011 (Statistics Canada)

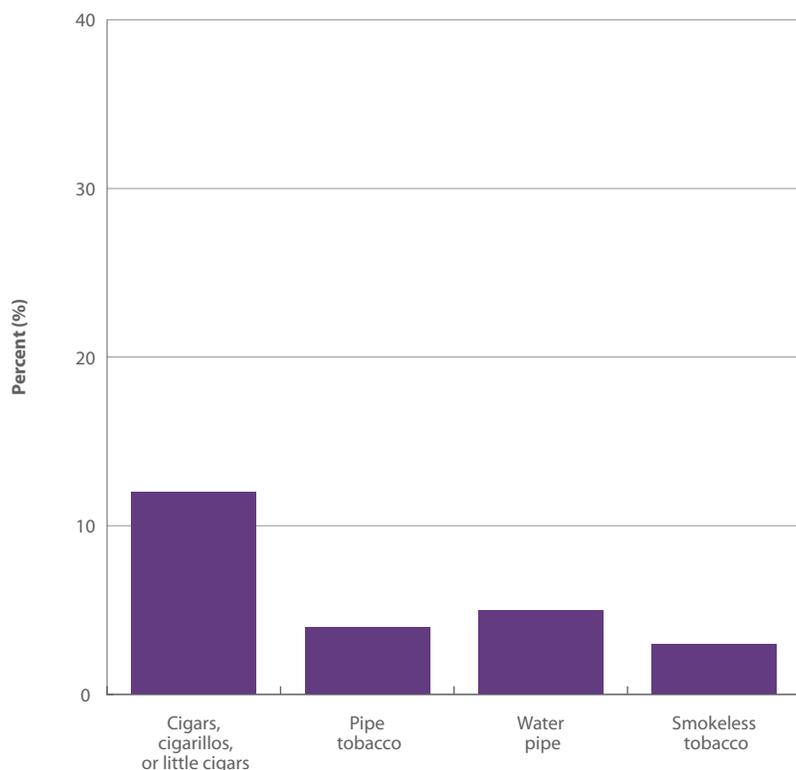
- The prevalence of current smoking (daily or occasional) among Ontario teens ages 12–19 declined significantly between 2003 and 2011 (see supplementary table S18).
- Significant declines in current smoking prevalence occurred in both males and females, with the prevalence in males declining from 13.6% in 2003 to 7.9% in 2011 and in females from 13.8% to 4.3% over that time period, although the 2011 estimate for females should be interpreted with caution due to high sampling variability (Figure 18).
- Unlike the sex-specific estimates seen in adults, current smoking prevalence in male and female teens has been similar since at least as far back as 2003.

- Based on the 2011 Canadian Community Health Survey (CCHS), current smoking prevalence was significantly higher in older teens aged 16–19, with 10.0% reporting daily or occasional smoking, than in teens aged 12–15 (roughly 2%) (see supplementary table S19). This pattern is consistent with data from the Canadian Tobacco Use Monitoring Survey (CTUMS) showing increasing prevalence of current smoking for every year of age from 15 through 19.<sup>17</sup>
- National data from the CTUMS and the Youth Smoking Survey show that youth in grades 6–9 are more likely to be non-daily than daily smokers, while in youth aged 15–19 the proportion of daily smokers is equal to the proportion of non-daily smokers.<sup>17</sup>

### 3.2 SUSCEPTIBILITY TO SMOKING AND USE OF OTHER TOBACCO PRODUCTS

- According to data from the 2010/2011 Youth Smoking Survey as analyzed by the Propel Centre for Population Health Impact, 20% of Ontario students in grades 6–12 had ever-trying a cigarette and 30% of students who had never-smoked were considered susceptible to smoking based on their lack of confidence in remaining smoke-free.<sup>26</sup>

**FIGURE 19.** Prevalence of other tobacco product ever-use among Ontario students grade 6–12, 2010/2011



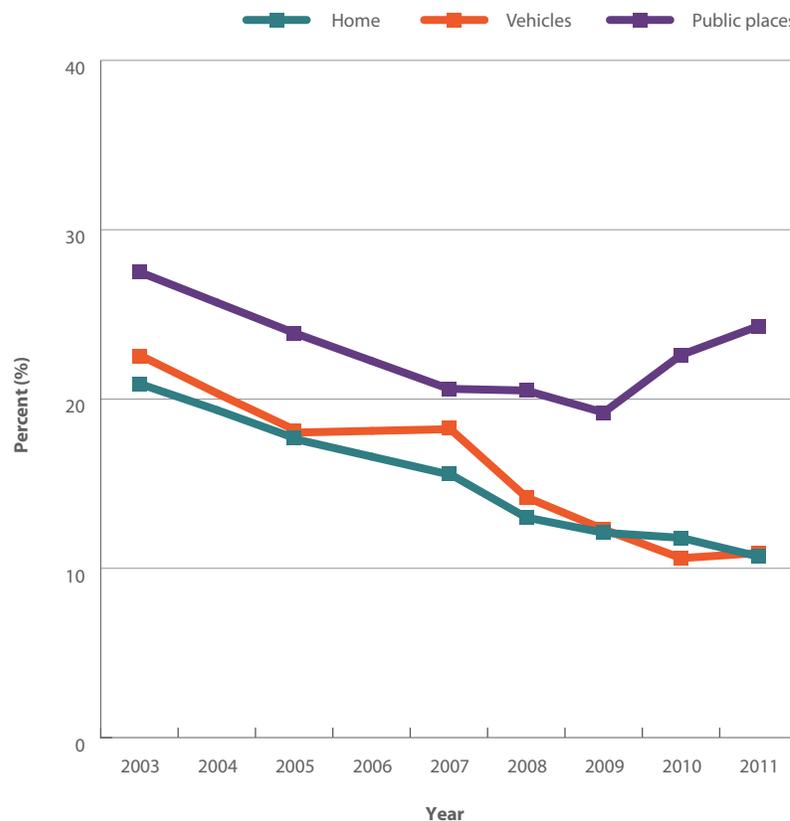
Source: Propel Centre for Population Health Impact (Youth Smoking Survey, 2010/2011)

- Cigars, cigarillos and little cigars were the most common alternate tobacco products Ontario students reported trying, with 12% of students in grade 6–12 having ever-tried one of these products in 2010/2011. A much smaller proportion of students in these grades reported having ever-tried a water pipe (5%), a pipe (4%) or smokeless tobacco (3%) (Figure 19).
- Ever-use of other tobacco products, particularly cigarillos, was much more common among older teens aged 15–19 than in youth in grades 6–9.<sup>17</sup>
- Although not as common as cigarette use, the use of cigars, cigarillos and little cigars among Ontario youth is higher than desirable. Use of these products among youth is of particular concern because a large proportion of current users of cigars and cigarillos/little cigars are not current cigarette users<sup>27</sup> and it has been suggested that youth may incorrectly perceive these alternate tobacco products to be less harmful than cigarettes.<sup>26</sup>

### 3.3 EXPOSURE TO SECOND-HAND SMOKE

**FIGURE 20.**

Trends in second-hand smoke exposure among non-smoking teens (aged 12–19) in Ontario, 2003–2011

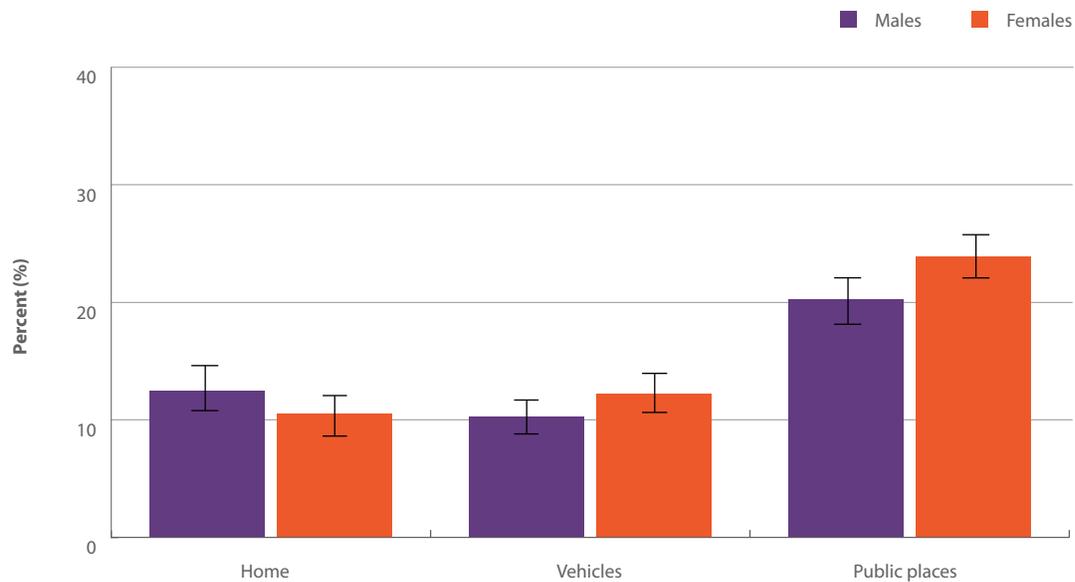


Source: Canadian Community Health Survey, 2003, 2005, 2007–2011 (Statistics Canada)

- 
- The proportion of non-smoking teens regularly exposed to second-hand smoke generally declined between 2003 and 2011 (Figure 20; supplementary table S20).
  - Similar to the patterns in adults, the prevalence of exposure to second-hand smoke among teens was highest in public places. The proportion of teens aged 12–19 regularly exposed in public places appeared to decline from 27.5% in 2003 to 24.3% in 2011, although neither this decline nor the apparent increase observed between 2009 and 2011 were statistically significant. Similar trends were observed among young adults aged 20–29 and to a lesser extent among adults aged 30–44 (data not shown). The latter increase in second-hand smoke exposure may reflect effective indoor smoking restrictions, which can cause smokers to smoke more in outdoor spaces and allow more non-smokers to be exposed (Scott Leatherdale, University of Waterloo, personal communication).
  - Early implementation of smoke-free bylaws by many Ontario municipalities between 2000 and 2004 and the subsequent implementation of the provincial *Smoke-Free Ontario Act* in 2006 likely contributed to this overall downward trend.
  - The prevalence of second-hand smoke exposure both at home and in vehicles among Ontario teens was roughly halved between 2003 and 2011, from 20.9% for home exposure and 22.5% for exposure in vehicles in 2003 to roughly 11% for each in 2011.
  - Declines in teen exposure to second-hand smoke at home and in a vehicle likely reflect an increasing adoption of voluntary smoke-free homes, increasing awareness of the harms associated with second-hand smoke, and the 2009 implementation of the *Smoke-Free Ontario Act* amendment banning smoking in vehicles when children under age 16 are present.
  - Despite promising declines observed since the early 2000s, a substantially higher proportion of teens than adults continue to be exposed to second-hand smoke at home and in vehicles. Higher prevalence of exposure among teens may be partly because they have less control in preventing their exposure to second-hand smoke than adults.<sup>28</sup> Teen second-hand smoke exposure is of particular concern because youth exposed to second-hand smoke are more likely to start smoking themselves<sup>29</sup> and face a number of health effects in the short and long term, including a potentially increased risk of lung cancer during adulthood.<sup>3</sup>

**FIGURE 21.**

Prevalence of second-hand smoke exposure among non-smoking teens (aged 12–19) in Ontario, by sex, 2009–2011 combined



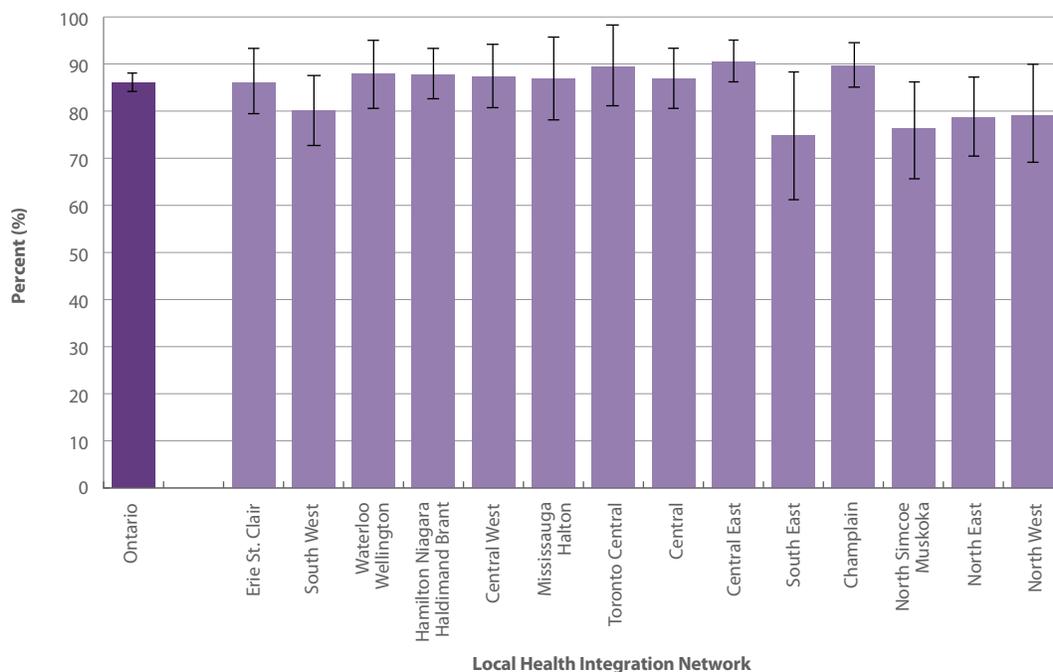
**Notes:** Data from CCHS cycles 2009, 2010 and 2011 combined to increase sample size for analyses of second-hand smoke exposure. I represent 95% confidence intervals.

**Source:** Canadian Community Health Survey, 2009–2011 (Statistics Canada)

- In 2009–2011, the prevalence of second-hand smoke exposure in public places was significantly higher for male and female Ontario teens than second-hand exposure at home and in a vehicle.
- Similar proportions of non-smoking males and female teens were regularly exposed to second-hand smoke at home (12.5% males vs. 10.5% females), in a vehicle (10.3% males vs. 12.2% females) and in public places (20.3% males vs. 23.9% females) during 2011 (Figure 21; supplementary table S21).

**FIGURE 22.**

Smoking abstinence among Ontario teens (aged 12–19), by Local Health Integration Network, 2011



Notes: I represent 95% confidence intervals.

Source: Canadian Community Health Survey, 2011 (Statistics Canada)

- Due to small sample sizes and the relatively small number of teen smokers included in the CCHS, the prevalence of current smoking among teens cannot be precisely estimated at the Local Health Integration Network (LHIN) level. Teen smoking abstinence (i.e., the proportion of teens who have never tried a cigarette) can instead be used to examine teen tobacco use across LHINs.
- In 2011, teen smoking abstinence was generally lower in the northern regions of the province.
- While none of the LHIN estimates differed significantly from the provincial estimate of 86.1%, the proportion of teens aged 12–19 who abstained from smoking ranged from a low of 74.8% in the South East LHIN to a high of 90.4% in the Central East LHIN (Figure 22; supplementary table S22).



## 4. ABORIGINAL PEOPLES (OFF-RESERVE)

Please note that the results presented for Aboriginal Peoples in this report only include off-reserve populations because the Canadian Community Health Survey (CCHS) does not include First Nation reserves. Results specific for Inuit are not presented due to small sample sizes but this group is included in the analyses of all Aboriginal groups combined.

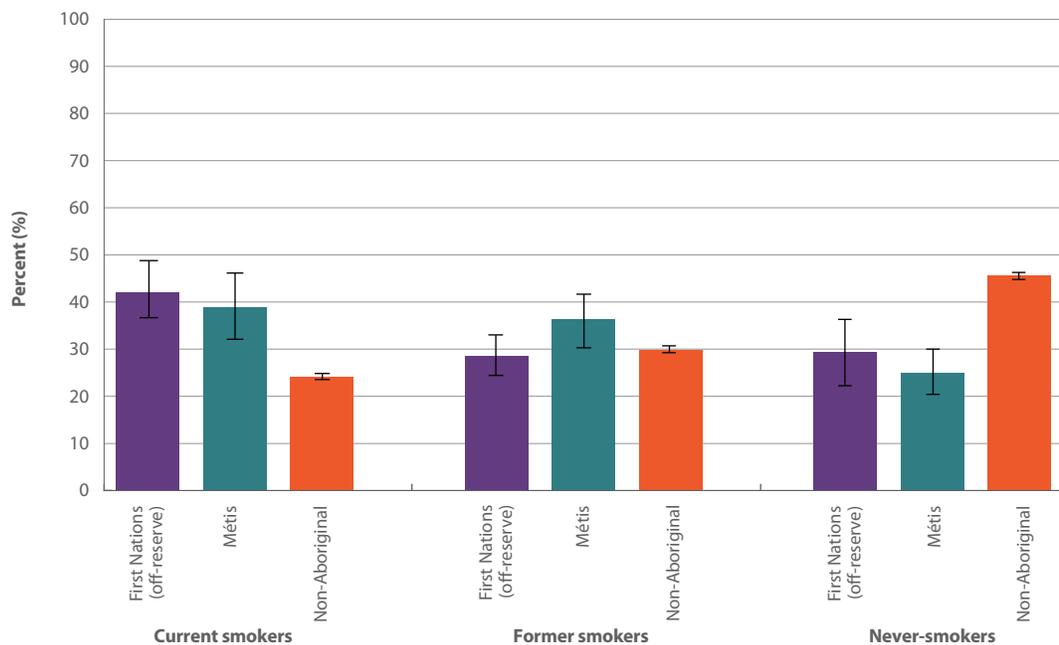
### 4.1 SMOKING STATUS

- Larger proportions of off-reserve First Nations and Métis males were current smokers (42.1% and 38.8%, respectively), compared with 24.2% of non-Aboriginal males (Figure 23A; supplementary table S23).
- Never-smokers made up smaller proportions of off-reserve First Nations males (29.4%) and Métis (24.9%) males than of non-Aboriginal males (45.6%).
- Estimates of former smokers were higher for Métis males (36.3%) than for non-Aboriginal males (29.9%). There were 28.5% off-reserve First Nations males who were former smokers.
- Compared to non-Aboriginal females (16.8%), a larger proportion of off-reserve First Nations (41.0%) and Métis (32.5%) females were current smokers (Figure 23B).
- Smaller proportions of off-reserve First Nations (29.5%) and Métis (42.0%) females were never-smokers compared to their non-Aboriginal counterparts (60.6%).
- There were more former smokers among First Nations females (29.4%) than among non-Aboriginal females (22.4%); Métis women had an intermediate proportion of former smokers (25.6%) that was not statistically significantly different from the other two groups.
- Higher rates of current smoking among First Nations and Métis males and females compared to their non-Aboriginal counterparts persist after adjusting for other factors than age (education, income and urban vs. rural residence), suggesting that the elevated smoking rates among Ontario's Aboriginal peoples are not related solely to socio-demographic inequalities (Unpublished data, Cancer Care Ontario).

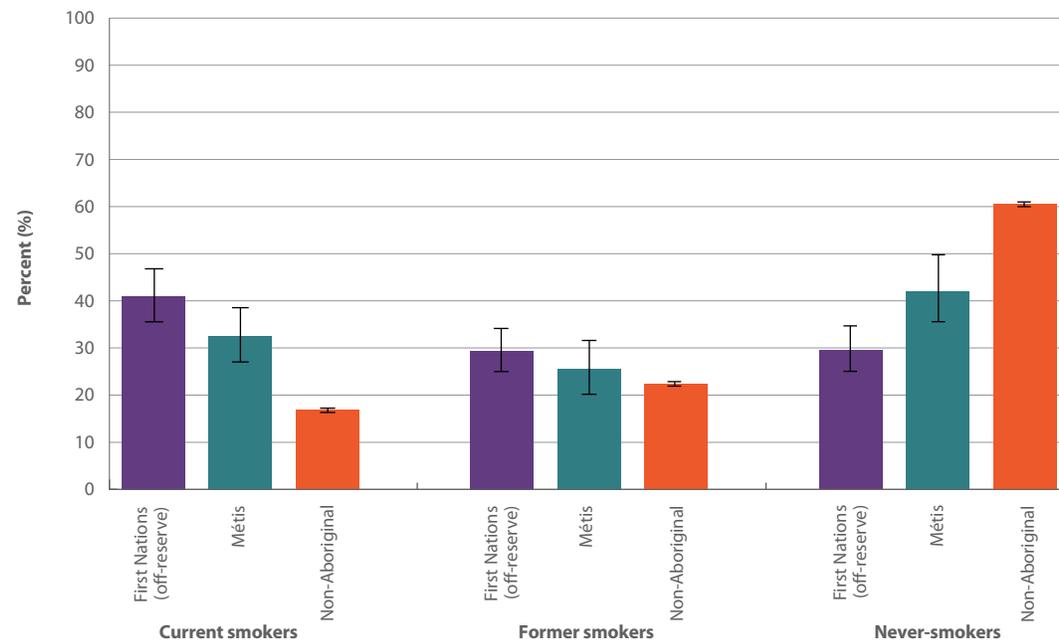
**FIGURE 23.**

Smoking status of Ontario adults (aged 20+), by Aboriginal identity (off-reserve), 2007–2011 combined

**A) Male smoking status**



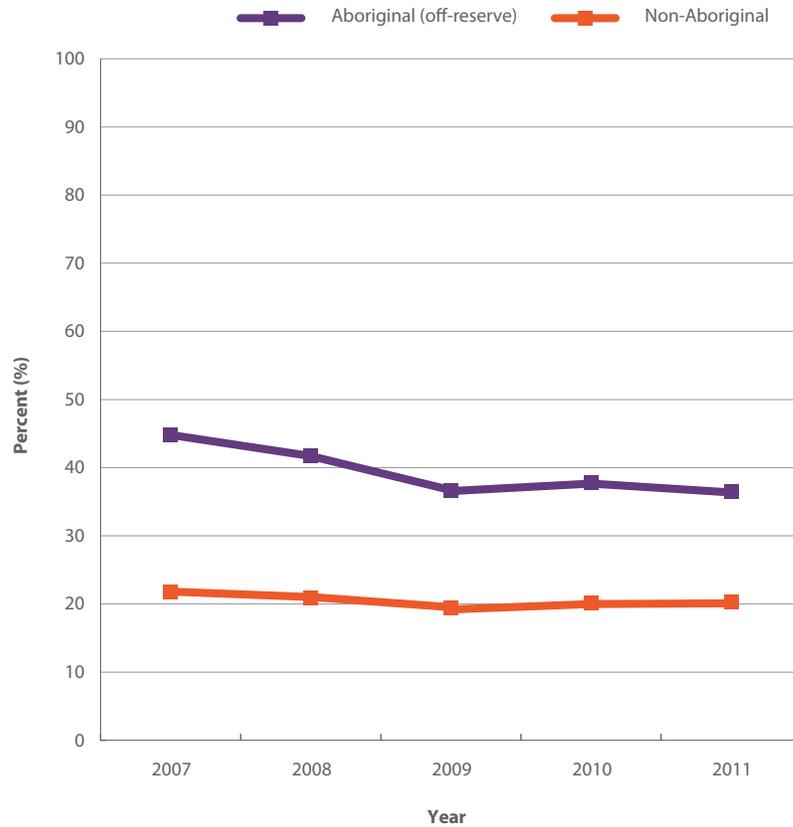
**B) Female smoking status**



**Notes:** Estimates are age-standardized to the 2006 Canadian population. I represent 95% confidence intervals.  
 Data from CCHS cycles 2007 through 2011 combined to increase sample size for analyses by Aboriginal identity.  
**Source:** Canadian Community Health Survey, 2007–2011 (Statistics Canada)

**FIGURE 24.**

Trends in current smoking prevalence among Ontario adults (aged 20+), by Aboriginal identity (off-reserve), 2007–2011



**Notes:** Estimates are age-standardized to the 2006 Canadian population.

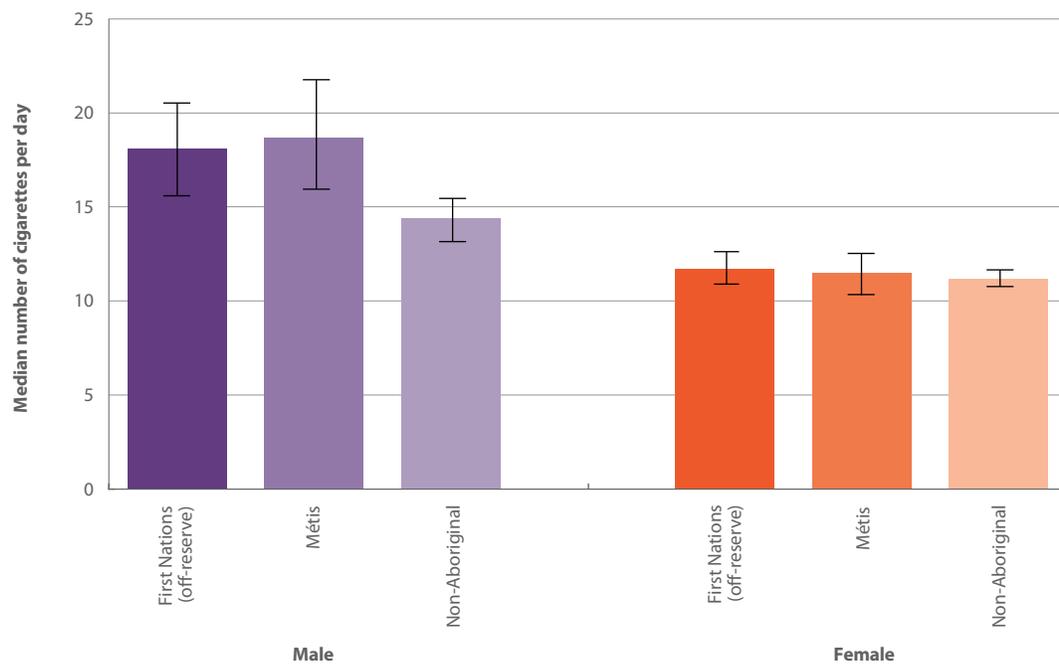
**Source:** Canadian Community Health Survey, 2007–2011 (Statistics Canada)

- In 2011, 36.5% of off-reserve Aboriginal adults aged 20 and over were current daily or occasional smokers, while 20.3% of non-Aboriginal adults were smokers (Figure 24; supplementary table S24).
- From 2007 to 2011, the smoking prevalence in the off-reserve Aboriginal population was consistently higher than prevalence in the non-Aboriginal population.
- No significant change was observed for either Aboriginal or non-Aboriginal smoking prevalence estimates in 2011 compared to 2007.

## 4.2 CIGARETTE CONSUMPTION

FIGURE 25.

Median cigarette consumption among adult (aged 20+) daily smokers in Ontario, by sex and Aboriginal identity (off-reserve), 2007-2011 combined



Notes: I represent 95% confidence intervals.

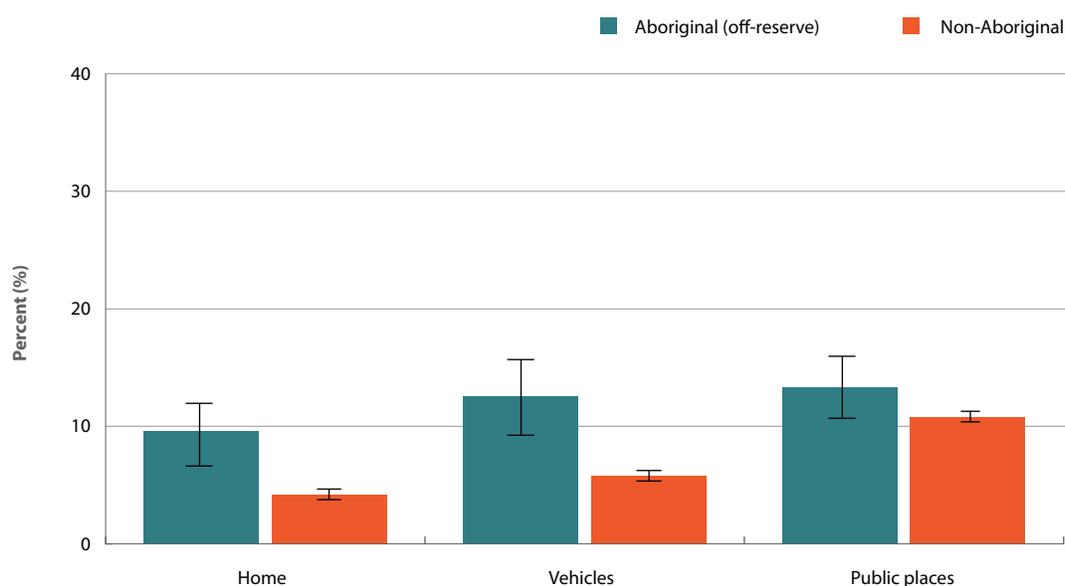
Source: Canadian Community Health Survey, 2007–2011 (Statistics Canada)

- Male daily smokers had higher daily median cigarette consumption than females in all three groups: off-reserve First Nations, Métis and non-Aboriginals (Figure 25 ; supplementary table S25).
- First Nations and Métis adult males had higher daily median cigarette consumption (18.1 and 18.7, respectively), compared to 14.4 for non-Aboriginal males.
- There were essentially no differences in median daily cigarette consumption by women in the three groups: off-reserve First Nations (11.7), Métis (11.5) and non-Aboriginal (11.2).

### 4.3 EXPOSURE TO SECOND-HAND SMOKE

**FIGURE 26.**

Prevalence of second-hand smoke exposure in adults (aged 20+) in Ontario, by Aboriginal identity (off-reserve), 2007–2011 combined



**Notes:** Estimates are age-standardized to the 2006 Canadian population.  
I represent 95% confidence intervals.

**Source:** Canadian Community Health Survey, 2007–2011 (Statistics Canada)

- A larger proportion of the off-reserve Aboriginal population reported second-hand smoke exposure at home (9.6%) and in a vehicle (12.6%), compared to the non-Aboriginal population (4.2% home, 5.8% vehicle) (Figure 26; supplementary table S26).
- There were no statistically significant differences for estimates of second-hand smoke exposure in public places between off-reserve Aboriginal (13.3%) and non-Aboriginal (10.8%) survey respondents.
- National data from the First Nations Regional Health Survey show even higher rates of smoking among the First Nations population living on-reserve (56.9% in 2008/2010)<sup>30</sup>, suggesting that Ontario's on-reserve First Nations population also has a particularly high prevalence of smoking.

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- Greater burden of tobacco exposure—active tobacco smoking, median cigarette consumption and second-hand smoke exposure—among Ontario’s off-reserve Aboriginal populations and the probably even higher smoking rates on Ontario reserves highlights the need for culturally appropriate tobacco control measures focused in these populations, such as those being initiated by Cancer Care Ontario’s Aboriginal Tobacco Program.
  - Given the high prevalence of smoking among the off-reserve Aboriginal populations, it is likely that in the near future these populations will also experience a larger tobacco-related cancer burden than Ontario’s non-Aboriginal population, if they do not already. Specifically, the higher prevalence of smoking means that a higher estimated proportion of cancers in the Aboriginal populations would be attributable to cigarette smoking than the estimates for the general population of Ontario included in the “Context” section of this report.

## REFERENCES

- <sup>1</sup> U.S. Department of Health and Human Services. The health consequences of smoking: A report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.
- <sup>2</sup> Cancer Care Ontario, Ontario Agency for Health Protection and Promotion (Public Health Ontario). Taking action to prevent chronic disease: recommendations for a healthier Ontario. Toronto: Queen's Printer for Ontario; 2012.
- <sup>3</sup> International Agency for Research on Cancer. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 100E. A review of human carcinogens. Part E: Personal habits and indoor combustions. Lyon: International Agency for Research on Cancer; 2012. Report No.: 100.
- <sup>4</sup> Cancer Care Ontario. Cancer risk factors in Ontario: Evidence summary. Toronto: Cancer Care Ontario; 2013.
- <sup>5</sup> Peto R, Darby S, Deo H, Silcocks P, Whitley E, Doll R. Smoking, smoking cessation, and lung cancer in the UK since 1950: combination of national statistics with two case-control studies. *BMJ* 2000 Aug 5; 321(7257):323–9.
- <sup>6</sup> Jha P, Ramasundarahettige C, Landsman V, Rostron B, Thun M, Anderson RN, et al. 21st-century hazards of smoking and benefits of cessation in the United States. *N Engl J Med* 2013 Jan 24; 368(4):341–50.
- <sup>7</sup> Ontario Tobacco Research Unit. Smoke-Free Ontario Strategy evaluation report [Internet]. Toronto: Ontario Tobacco Research Unit; 2012 [cited 2012 Dec 21]. Available from: [http://otru.org/wp-content/uploads/2012/12/OTRU\\_SER\\_2012.pdf](http://otru.org/wp-content/uploads/2012/12/OTRU_SER_2012.pdf).
- <sup>8</sup> Ontario Ministry of Health and Long-term Care. Ontario's Action Plan for Health Care [Internet]. Toronto: Queen's Printer for Ontario; 2012 [cited 2013 Jul 10]. Available from: [http://health.gov.on.ca/en/ms/ecfa/healthy\\_change/docs/rep\\_healthychange.pdf](http://health.gov.on.ca/en/ms/ecfa/healthy_change/docs/rep_healthychange.pdf).
- <sup>9</sup> Tobacco Strategy Advisory Group. Building on our gains, taking action now: Ontario's Tobacco Control Strategy for 2011–2016 [Internet]. Toronto: Ministry of Health Promotion and Sport; 2010 [cited 2013 Jul 10]. Available from: <http://www.mhp.gov.on.ca/en/smoke-free/TSAG%20Report.pdf>.
- <sup>10</sup> Cancer Care Ontario. Aboriginal Tobacco Program [Internet]. [updated 2012 Jun 26; cited 2013 Jul 10]. Available from: <https://www.cancercare.on.ca/about/programs/aborstrategy/aborigtobac/>.
- <sup>11</sup> Parkin DM. 2. Tobacco-attributable cancer burden in the UK in 2010. *Br J Cancer* 2011 Dec 6;105 Suppl 2:S6–S13.
- <sup>12</sup> Holowaty E, Chin Cheong S, Di Cori S, Garcia J, Luk R, Lyons C, et al. Tobacco or health in Ontario. Toronto: Cancer Care Ontario; 2002.
- <sup>13</sup> Gandini S, Botteri E, Iodice S, Boniol M, Lowenfels AB, Maisonneuve P, et al. Tobacco smoking and cancer: a meta-analysis. *Int J Cancer* 2008 Jan 1;122(1):155–64.
- <sup>14</sup> Ezzati M, Henley SJ, Lopez AD, Thun MJ. Role of smoking in global and regional cancer epidemiology: current patterns and data needs. *Int J Cancer* 2005 Oct 10;116(6):963–71.
- <sup>15</sup> Bondy SJ, Victor JC, Diemert LM, Mecredy GC, Chaiton M, Brown KS, et al. Transitions in Smoking Status Over Time in a Population-Based Panel Study of Smokers. *Nicotine Tob Res* 2013 Feb 12.
- <sup>16</sup> Ialomiteanu A.R., Adlaf E.M., Hamilton H., and Mann R.E. CAMH Monitor eReport: Addiction and mental health indicators among Ontario adults, 1977–2011 (CAMH Research Document Series No. 35) [Internet]. Toronto: Centre for Addiction and Mental Health; 2012 [cited 2013 Mar 1]. Available from: [http://www.camh.ca/en/research/news\\_and\\_publications/Pages/camh\\_monitor.aspx](http://www.camh.ca/en/research/news_and_publications/Pages/camh_monitor.aspx).
- <sup>17</sup> Reid J.L, Hammond D., Burkhalter R., Rynard V.L., Ahmed R. Tobacco use in Canada: Patterns and trends, 2013 edition. Waterloo, ON: Propel Centre for Population Health Impact, University of Waterloo; 2013.
- <sup>18</sup> Ontario Tobacco Research Unit. Tobacco Informatics Monitoring System (TIMS) [Internet]. 2013 [cited 2013 Jul 31]. Available from: <http://tims.otru.org>.
- <sup>19</sup> Vangeli E, Stapleton J, Smit ES, Borland R, West R. Predictors of attempts to stop smoking and their success in adult general population samples: a systematic review. *Addiction* 2011 Dec;106(12):2110–21.
- <sup>20</sup> Shields M.A. A step forward, a step back: Smoking cessation and relapse [Internet]. Ottawa: Statistics Canada; 2004 [cited 2013 Jul 10]. Available from: [http://www5.statcan.gc.ca/access\\_acces/archive.action?loc=/pub/82-618-m/2004001/pdf/4193620-eng.pdf](http://www5.statcan.gc.ca/access_acces/archive.action?loc=/pub/82-618-m/2004001/pdf/4193620-eng.pdf).
- <sup>21</sup> Corsi DJ, Lear SA, Chow CK, Subramanian SV, Boyle MH, Teo KK. Socioeconomic and geographic patterning of smoking behaviour in Canada: a cross-sectional multilevel analysis. *PLoS One* 2013;8(2):e57646.

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- <sup>22</sup> Adkison SE, O'Connor RJ, Bansal-Travers M, Hyland A, Borland R, Yong HH, et al. Electronic nicotine delivery systems: international tobacco control four-country survey. *Am J Prev Med* 2013 Mar; 44(3):207–15.
- <sup>23</sup> Ayers JW, Ribisl KM, Brownstein JS. Tracking the rise in popularity of electronic nicotine delivery systems (electronic cigarettes) using search query surveillance. *Am J Prev Med* 2011 Apr; 40(4):448–53.
- <sup>24</sup> Popova L, Ling PM. Alternative tobacco product use and smoking cessation: a national study. *Am J Public Health* 2013 May; 103(5):923–30.
- <sup>25</sup> Mills AL, Messer K, Gilpin EA, Pierce JP. The effect of smoke-free homes on adult smoking behavior: a review. *Nicotine Tob Res* 2009 Oct; 11(10):1131–41.
- <sup>26</sup> Propel Centre for Population Health Impact. 2010/2011 Youth Smoking Survey: Results profile for Ontario. Waterloo, ON: University of Waterloo; 2012 May.
- <sup>27</sup> Leatherdale ST, Rios P, Elton-Marshall T, Burkhalter R. Cigar, cigarillo, and little cigar use among Canadian youth: are we underestimating the magnitude of this problem? *J Prim Prev* 2011 Aug; 32(3-4):161–70.
- <sup>28</sup> Ashley MJ, Ferrence R. Reducing children's exposure to environmental tobacco smoke in homes: issues and strategies. *Tob Control* 1998; 7(1):61–5.
- <sup>29</sup> Bettcher D.W., Peruga A., Fishburn B., Baptiste J., El-Awa F., Nikogosian H., et al. Exposure to secondhand smoke among students aged 13–15 years-worldwide, 2000–2007. *MMWR Morb Mortal Wkly Rep* 2007 May 25; 56(20):497–500.
- <sup>30</sup> The First Nations Information Governance Centre. First Nations Regional Health Survey (RHS) phase 2 (2008/10) national report on adults, youth and children living in First Nations communities. Ottawa: The First Nations Information Governance Centre; 2012.

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# APPENDIX A: DATA SOURCES

## CANADIAN COMMUNITY HEALTH SURVEY (CCHS), ONTARIO SHARE FILES

The Canadian Community Health Survey (CCHS) is a population-based cross-sectional survey conducted by Statistics Canada that collects information on health status, healthcare utilization, and determinants of health for the Canadian population aged 12 years and older living in private dwellings. Individuals living on First Nation Reserves and other Aboriginal settlements, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions are excluded from the CCHS. It is representative of 98% of the Canadian population aged 12+ and produces reliable estimates at the health region level.

The CCHS began in 2000/2001 and was initially designed to be administered every two years, sampling approximately 130,000 respondents (39,000 in Ontario) in each cycle. In 2007, this format changed to its current iteration where approximately 65,000 respondents (20,000 in Ontario) are sampled annually.

For this report, CCHS full survey waves 2003 and 2005 and half-survey annual waves 2007 to 2011 were used in most analyses. CCHS cycle 1.1, administered in 2000/2001, was used to obtain historic estimates of smoking prevalence to estimate the burden of cancer in Ontario that could be attributed to tobacco.

## YOUTH SMOKING SURVEY (YSS)

The Youth Smoking Survey (YSS) is a cross-sectional survey conducted by the Propel Centre for Population Health Impact that collects information on tobacco use, social and demographic factors, attitudes and beliefs about smoking, and experience with alcohol and drugs in school-aged children (grades 6–9 and 10–12).

In this report, results based on YSS data were extracted from:

Youth Smoking Survey: Propel Centre for Population Health Impact, 2012. 2010/2011 Youth Smoking Survey: Results Profile for Ontario. Waterloo (ON): University of Waterloo, 1–21. Available at [http://www.yss.uwaterloo.ca/results/yss10\\_EN\\_Provincial%20Report\\_Ontario\\_20120514.pdf](http://www.yss.uwaterloo.ca/results/yss10_EN_Provincial%20Report_Ontario_20120514.pdf).

## ONTARIO CANCER REGISTRY (OCR)

The Ontario Cancer Registry (OCR) is operated by Cancer Care Ontario and registers all newly diagnosed cases of invasive neoplasia, except for basal and squamous cell skin cancers. Electronic records are linked at the person level and then “resolved” into incident cases of cancer using computerized medical logic. Major data sources are:

1. Cancer-related hospital discharge and day surgery records from the Canadian Institute for Health Information
2. Cancer-related pathology reports, received mostly electronically from hospital and community laboratories
3. Consultation and treatment records of patients referred to one of 14 Regional Cancer Centres
4. Death certificates with cancer identified as the underlying cause of death, received from the Ontario Registrar General

The OCR was used to obtain the number of new cancer cases diagnosed in 2009 for the analysis of population attributable fractions (PAF) calculated for tobacco. It was also the source of the lung cancer incidence rates calculated by public health unit (PHU) for the period 2007–2009.

# APPENDIX B: INDICATOR DEFINITIONS

## CURRENT SMOKING

**Definition:** Percentage of Ontario adults aged 20 years and older (or teens aged 12–19) who report smoking cigarettes daily or occasionally.

**Method of Calculation:**

$$\frac{\text{Weighted number of adults aged 20+ who smoke cigarettes daily or occasionally}}{\text{Weighted total population aged 20+ years}} \times 100$$

$$\frac{\text{Weighted number of teens aged 12-19 who smoke cigarettes daily or occasionally}}{\text{Weighted total population aged 12-19}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey question were excluded.

**Survey Questions:**

- At the present time, do you smoke cigarettes daily, occasionally or not at all?

## SMOKING ABSTINENCE

**Definition:** Percentage of Ontario teens aged 12–19 who have always abstained from smoking (i.e., never smoked a whole cigarette).

**Method of Calculation:**

$$\frac{\text{Weighted number of teens aged 12–19 who reported never smoking a whole cigarette}}{\text{Weighted total population aged 12–19}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

**Survey Questions:**

- Have you ever smoked a whole cigarette?

## FORMER SMOKING

**Definition:** Percentage of Ontario adults aged 20 years and older who do not smoke cigarettes at the present time but have smoked at least 100 cigarettes in their lifetime.

**Method of Calculation:**

$$\frac{\text{Weighted number of adults aged 20+ who used to smoke daily or occasionally}}{\text{Weighted total population aged 20+}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

**Survey Questions:**

- In your lifetime, have you smoked a total of 100 or more cigarettes (about 4 packs)?
- At the present time, do you smoke cigarettes daily, occasionally or not at all?

## CIGARETTE CONSUMPTION

**Definition:** Median number of cigarettes smoked per day among adults aged 20 years and older who are current daily smokers.

**Method of Calculation:**

Weighted median number of cigarettes smoked per day among daily adult smokers aged 20+

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

**Survey Questions:**

- At the present time, do you smoke cigarettes daily, occasionally or not at all?
- How many cigarettes do you smoke each day now?

## OTHER TOBACCO PRODUCTS

**Definition:** Percentage of Ontario adults aged 20 years and older that used tobacco products other than cigarettes (cigars, pipes, snuff, or chewing tobacco) in the last month.

**Method of Calculation:**

$$\frac{\text{Weighted number of adults aged 20+ who used tobacco products other than cigarettes in the last month}}{\text{Weighted total population aged 20+}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

**Survey Questions:**

- In the past month, have you smoked cigars?
- In the past month, have you smoked a pipe?
- In the past month, have you used snuff?
- In the past month, have you used chewing tobacco?

## RECENT QUIT RATIO (SMOKING CESSATION)

**Definition:** Percentage of recent smokers (i.e., current smokers and former smokers who have quit smoking in the last year) aged 20 years and older who quit smoking in the last year.

**Method of Calculation:**

$$\frac{\text{Weighted number of adults aged 20+ who quit smoking in the last year}}{\text{Weighted number of adults who are current smokers or have quit smoking in the last year aged 20+}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

**Survey Questions:**

- In your lifetime, have you smoked a total of 100 or more cigarettes (about 4 packs)?
- At the present time, do you smoke cigarettes daily, occasionally or not at all?
- When did you stop smoking [and] how many years ago was it?

## LONG-TERM QUIT RATIO (SMOKING CESSATION)

**Definition:** Percentage of ever-smoking adults aged 20 years and older who quit smoking completely at least 1 year ago.

### Method of Calculation:

$$\frac{\text{Weighted number of adults aged 20+ who quit smoking at least 1 year ago}}{\text{Weighted population of ever smokers aged 20+}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

### Survey Questions:

- In your lifetime, have you smoked a total of 100 or more cigarettes (about 4 packs)?
- At the present time, do you smoke cigarettes daily, occasionally or not at all?
- When did you stop smoking [and] how many years ago was it?

## SECOND-HAND SMOKE EXPOSURE

**Definition:** Percentage of non-smoking adults aged 20 years and older (or teens ages 12–19) who were regularly (every day or almost every day) exposed to second-hand smoke in their home, in a vehicle or in public places (e.g., bars, restaurants, shopping malls, arenas).

### Method of Calculation:

#### Second-hand smoke exposure at home:

$$\frac{\text{Weighted number of non-smoking adults aged 20+ exposed to second hand smoke at home}}{\text{Weighted number of non-smoking adults aged 20+}} \times 100$$

$$\frac{\text{Weighted number of non-smoking teens aged 12–19 exposed to second hand smoke at home}}{\text{Weighted number of non-smoking teens aged 12–19}} \times 100$$

#### Second-hand smoke exposure in a vehicle:

$$\frac{\text{Weighted number of non-smoking adults aged 20+ exposed to second hand smoke in a vehicle}}{\text{Weighted number of non-smoking adults aged 20+}} \times 100$$

$$\frac{\text{Weighted number of non-smoking teens aged 12–19 exposed to second hand smoke in a vehicle}}{\text{Weighted number of non-smoking teens aged 12–19}} \times 100$$

#### Second-hand smoke exposure in public places:

$$\frac{\text{Weighted number of non-smoking adults aged 20+ exposed to second hand smoke in public places}}{\text{Weighted number of non-smoking adults aged 20+}} \times 100$$

$$\frac{\text{Weighted number of non-smoking teens aged 12–19 exposed to second hand smoke in public places}}{\text{Weighted number of non-smoking teens aged 12–19}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

### Survey Questions:

- Including both household members and regular visitors, does anyone smoke inside your home every day or almost every day?
- In the past month, were you exposed to second-hand smoke every day or almost every day in a car or other private vehicle?
- In the past month, were you exposed to second-hand smoke every day or almost every day in public places (such as bars, restaurants, shopping malls, arenas, bingo halls, bowling alleys)?

## SMOKE-FREE HOMES

**Definition:** Percentage of Ontario households (or households with children 17 years old and younger) where smokers are asked to refrain from smoking in the house.

### Method of Calculation:

$$\frac{\text{Weighted number of households where smokers were asked to refrain from smoking in the house}}{\text{Weighted total number of households}} \times 100$$

$$\frac{\text{Weighted number of households with children aged 17 years and younger where smokers were asked to refrain from smoking in the house}}{\text{Weighted total number of households with children aged 17 years and younger}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

### Survey Questions:

- Is smoking allowed inside your home?
- The derived variables DHHYKD (persons ages ≤15) and DHHOKD (persons ages 16 and 17) were used to identify homes with kids 17 years and younger.

## DEFINITION OF CANCER TYPES ASSOCIATED WITH TOBACCO SMOKING

CANCER TYPE	ICD-O-3 SITE/HISTOLOGY TYPE CODE*
Lip, oral cavity and pharynx	C00–C06, C10, C12–C14
Nasal cavity, nasal sinuses, nasopharynx	C11, C30.0–C30.1, C31.0–C31.9
Esophagus	C15
Stomach	C16
Colon and rectum	C18–C20, C26.0
Liver	C22.0–C22.1
Pancreas	C25
Larynx	C32
Lung and bronchus	C34
Cervix uteri	C53
Ovary	C56.9
Kidney (excluding renal pelvis)	C64.9
Lower urinary tract (bladder, ureter, renal pelvis)	C65.9, C66.9, C67
Acute myeloid leukemia	9840, 9861, 9866, 9867, 9871–9874, 9895–9897, 9910, 9920

\* ICD-O-3 refers to the Third Edition of the International Classification of Diseases for Oncology (2000). ICD-O-3 site/histology codes were based on the SEER site recode definition. See [http://seer.cancer.gov/siterecode/icdo3\\_d01272003/](http://seer.cancer.gov/siterecode/icdo3_d01272003/).

# APPENDIX C: ANALYTIC METHODS

## TOBACCO-RELATED PREVALENCE ESTIMATES

- Most estimates were age-standardized to the age distribution of the 2006 Canadian population using the age groups from the Canadian Community Health Survey (CCHS) person-level sampling strategy: 20–29, 30–44, 45–64 and 65+. The exceptions were age-specific estimates and estimates for youth and median cigarette consumption, for which unadjusted estimates were provided.
- Bootstrapping techniques were used to obtain variance estimates and 95% confidence intervals of all estimates.<sup>1</sup>
- Time periods varied according to the availability of CCHS content for a given indicator or population:

**2000/2001:** Used in the population attributable fraction analyses and the correlation between historic smoking rates and lung cancer incidence rates among public health units (PHUs) to provide the greatest lag time between smoking exposure and cancer outcome.

**2011:** Used for most analyses because it is the most current CCHS data available when writing this report.

**2003–2011:** Used to examine time trends; estimates from the 2000/2001 CCHS cycle were excluded because a change in the administration of the survey beginning in 2003 affected some smoking estimates.<sup>2</sup>

**2009–2011 combined:** Pooled data used for second-hand smoke exposure indicators to increase the survey sample to a size that is acceptable for the release of these indicators stratified by several socio-demographic characteristics and by Local Health Integration Network (LHIN) without introducing a high degree of sampling variability.

**2007–2011:** Used for analyses of the off-reserve Aboriginal population because the period during which the CCHS question used to ascertain Aboriginal identity remained constant; survey years were combined to increase the sample size where necessary.

- Socio-demographic characteristics were analyzed for adults aged 30+ to restrict the sample to those who have likely completed their education and reached their adult socio-demographic status. These factors were defined as follows:  
**Urban/rural residence:** Respondents living within any census metropolitan area (CMA) or census agglomeration (CA) were considered “urban residents” and those living outside of any CMA or CA were classified as “rural residents.”

**Income quintile:** Sorts respondents’ derived household income into quintiles based on the ratio of household income to the low-income cut-off (LICO) for the household size and community. Starting in 2011, Statistics Canada imputed all missing household incomes to account for the one-third of missing responses to the income question.

**Education:** Highest level of education attained by the respondent, according to three categories: less than secondary school graduation, secondary school graduation or some post-secondary education, and post-secondary graduation.

**Immigration status:** Distinguishes immigrants, according to time since immigration, from the Canadian-born population based on three categories: Canadian-born, immigrant > 10 years in Canada and immigrant ≤ 10 years in Canada. The years since immigration refers to the first time the respondent arrived in Canada (excluding holidays) to live as a landed immigrant by claiming refugee status, with a work permit or with a study permit.

**Aboriginal identity (off-reserve):** Distinguishes respondents who self-identify as Aboriginal (First Nations, Métis or Inuk/Inuit) and were born in Canada, the United States or Germany, from those who do not identify themselves as Aboriginal or were not born in the specified countries, based on CCHS derived variable socio-demographic characteristics for Aboriginal identity (SDCDABT). Aboriginal (off-reserve) respondents were further subdivided based on self-identification with any of First Nations, Métis or Inuk/Inuit groups. Self-identified off-reserve First Nations (Status and Non-Status Indians) were categorized as First Nations if they had not also identified as Métis, while those identifying as Métis at any time were categorized as Métis. Respondents identifying as only Inuk/Inuit were excluded from further sub-group analysis due to a small sample size, but were included in the analyses of all Aboriginal groups combined.

- Estimates for LHINs were analyzed using survey weights that were calibrated to the LHIN geographic boundaries, which do not correspond to the standard population weights at the public health unit (PHU) level.
- Statistically significant differences in risk factor prevalence between a given LHIN and Ontario and between categories of a given socio-demographic factor were tested by comparing the absolute difference between the two estimates with the square root of the sum of the margin of error (i.e., the upper 95% confidence limit minus the estimate) squared for each estimate being compared. If the difference between the estimates was greater than the square root of the sum of the squares of the two margin of errors then the estimates were considered significantly different (approximately  $p < 0.05$ ).
  - Socio-demographic factors were compared against the following reference variables: urban areas for analyses by urban/rural residence, income quintile 5 (Q5) for analyses by income quintile, post-secondary graduate for analyses by education status, and Canadian born for analyses by immigration status.
- Limitations to analyses that used CCHS data include:
  - The relatively short time period available to examine time-trends in prevalence estimates.
  - The use of self-reported data, where socially-undesirable behaviours such as tobacco-use are likely to be under-reported by respondents.
  - The presentation of prevalence estimates that were adjusted for age only and did not adjust for other important factors (e.g., socioeconomic status) that may contribute to differences in prevalence estimates between groups.

## REFERENCES:

- 1 Statistics Canada. 2005. *Bootvar: User Guide (Bootvar 3.1 – SAS version)*. Ottawa, Ontario. [http://prod.library.utoronto.ca/datalib/codebooks/cstdli/gss/gss18/sasbootdoc\\_eng.pdf](http://prod.library.utoronto.ca/datalib/codebooks/cstdli/gss/gss18/sasbootdoc_eng.pdf) (accessed March 6, 2013).
- 2 St-Pierre M. and Béland Y. Mode effects in the Canadian Community Health Survey: A comparison of CAPI and CATI, 2004 Proceedings of the American Statistical Association Meeting, Survey Research Methods. Toronto, Canada: American Statistical Association; 2004.

## POPULATION ATTRIBUTABLE FRACTIONS (PAF) FOR TOBACCO SMOKING

- Population attributable fraction (PAF) for tobacco smoking was calculated using the following formula:

$$PAF = \frac{[(P1(RR1 - 1) + P2(RR2 - 1))]}{[1 + (P1(RR1 - 1) + P2(RR2 - 1))]}$$

Where P1 is the prevalence of current smokers, P2 is the prevalence of former smokers, RR1 is relative risk of cancer for current smokers vs. never-smokers, RR2 is the relative risk of cancer for former smokers vs. never-smokers.

- For each cancer type associated with tobacco smoking, the PAF was calculated for each sex and age group combination, using sex-specific relative risk estimates for current and former smokers and sex- and age-specific prevalence estimates of current and former smoking. Sex- and age-specific PAFs were summed for each cancer type and sex to obtain an overall PAF for that particular cancer.

- Relative risk estimates for current and former smokers were primarily obtained from a large meta-analysis published by Gandini S et al, 2008. Ovarian cancer and colorectal cancer were not included in this meta-analysis. Relative risk estimates for these cancers were supplemented from more recent studies as noted in the table below.
- Prevalence data were obtained from the 2000/2001 Canadian Community Health Survey (CCHS), the earliest year for which data on tobacco smoking could be easily extracted, instilling a latent period between the time of exposure to tobacco smoke to cancer diagnosis of approximately 10 years. The age groups used to generate age-specific prevalence estimates were 20–29, 30–44, 45–64 and 65+, consistent with the age group sampling strategy of the CCHS. Based on this 10-year latency, the age groups used for extracting cancer incidence data were 30–39, 40–54, 54–74 and 75+.

## REFERENCES:

- 1 Gandini S, Botteri E, Iodice S, Boniol M, Lowenfels AB, Maisonneuve P, et al. Tobacco smoking and cancer: a meta-analysis. *Int J Cancer* 2008 Jan 1;122(1):155–64.
- 2 Liang PS, Chen TY, Giovannucci E. Cigarette smoking and colorectal cancer incidence and mortality: systematic review and meta-analysis. *Int J Cancer* 2009;124(10):2406–15.
- 3 Collaborative Group on Epidemiological Studies of Ovarian Cancer. Ovarian cancer and smoking: individual participant meta-analysis including 28,114 women with ovarian cancer from 51 epidemiological studies. *Lancet Oncol* 2012 Sep;13(9):946–56.

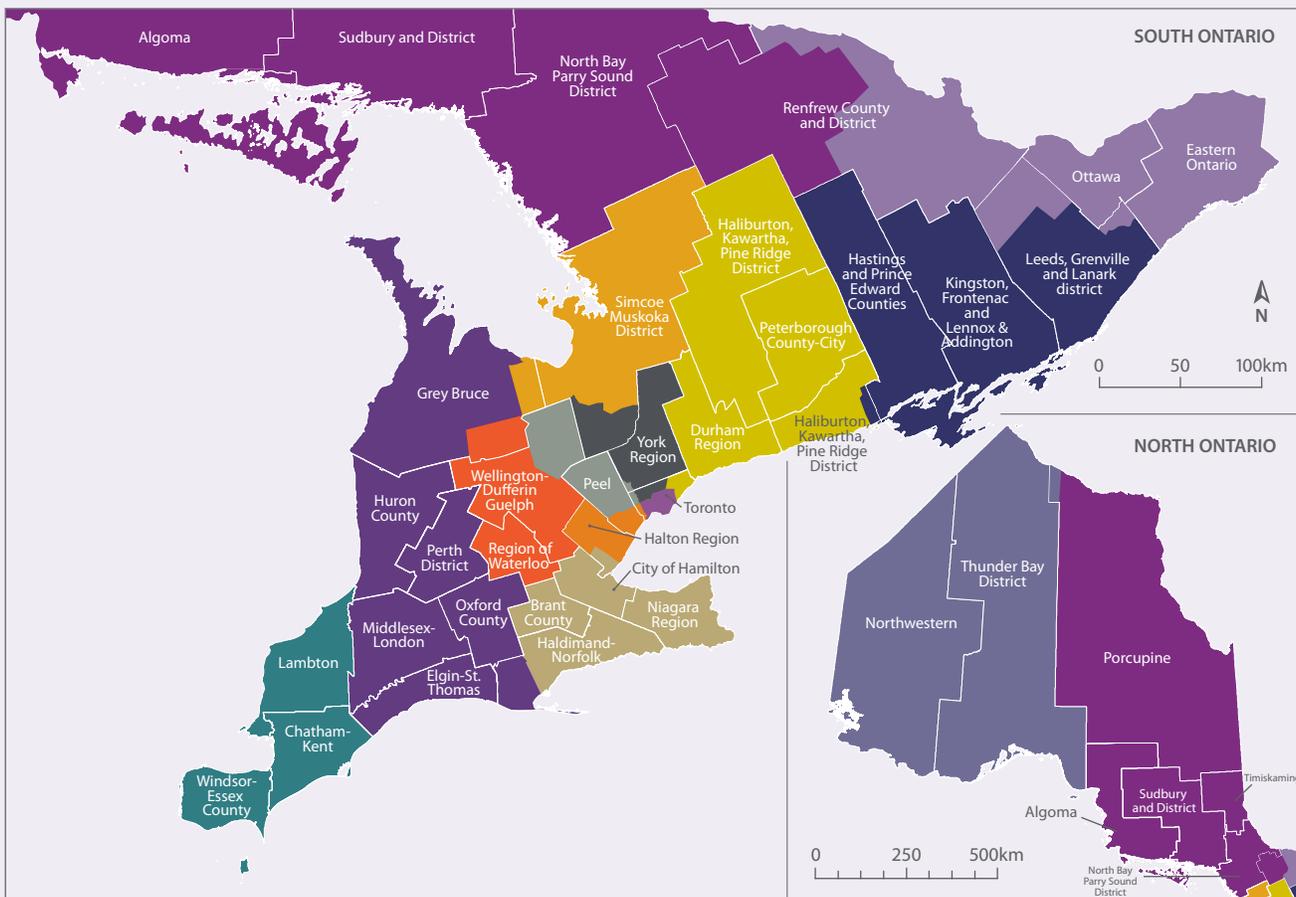
## RELATIVE RISK ESTIMATES FOR TOBACCO-RELATED CANCERS, CURRENT AND FORMER CIGARETTE SMOKERS

CANCER TYPE	RELATIVE RISK			
	CURRENT SMOKER		FORMER SMOKER	
	MALES	FEMALES	MALES	FEMALES
Lip, oral cavity and pharynx	3.52	3.8	1.18	1.18
Nasal-sinuses, nasopharynx	1.95	1.95	1.39	1.39
Esophagus	2.52	2.28	2.03	2.03
Stomach	1.74	1.45	1.31	1.31
Colon and rectum <sup>a</sup>	1.17	1.17	1.25	1.25
Liver	1.85	1.49	1.49	1.49
Pancreas	1.63	1.73	1.18	1.18
Larynx	6.98	6.98	4.65	4.65
Lung and bronchus	9.87	7.58	3.85	3.85
Cervix	–	1.83	–	1.26
Ovary (mucinous) <sup>b</sup>	–	1.49	–	1.08
Kidney	1.59	1.35	1.25	1.25
Lower urinary tract (renal pelvis, bladder, ureter)	2.8	1.73	1.72	1.72
Myeloid leukemia	1.09	1.09	1.27	1.27

Source: Gandini et al. 2008 (except a Liang et al., 2009 and b Collaborative Group on Epidemiological Studies of Ovarian Cancer, 2012)

# APPENDIX D: MAP OF ONTARIO'S LHINS AND PHUS

Ontario Local Health Integration Network (LHIN) and public health unit (PHU) correspondence map



- |              |                     |                                  |                      |
|--------------|---------------------|----------------------------------|----------------------|
| PHU boundary | <b>LHIN regions</b> | Erie St. Clair                   | Central              |
|              |                     | South West                       | Central East         |
|              |                     | Waterloo Wellington              | South East           |
|              |                     | Hamilton Niagara Haldimand Brant | Champlain            |
|              |                     | Central West                     | North Simcoe Muskoka |
|              |                     | Mississauga Halton               | North East           |
|              |                     | Toronto Central                  | North West           |

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## For more information:

*Cancer Risk Factors in Ontario: Evidence Summary*, published 2013, is the first in a series of publications designed to support Cancer Care Ontario's priority to reduce chronic disease through prevention. This report summarizes the epidemiologic evidence for a wide range of cancer risk factors.

Please see [www.cancercare.on.ca/riskfactor](http://www.cancercare.on.ca/riskfactor)

**Ontario Cancer Facts** are short, monthly fact sheets intended to increase knowledge about cancer and its risk modifiers in Ontario. Data typically originate from several sources including the Ontario Cancer Registry, Cancer Care Ontario publications, and Canadian, provincial or regional health surveys. Readers may subscribe to receive Ontario Cancer Facts by e-mail.

Please see [www.cancercare.on.ca/cancerfacts](http://www.cancercare.on.ca/cancerfacts)

The Cancer Quality Council of Ontario is an advisory council to Cancer Care Ontario and the Ministry of Health and Long-Term Care established in 2002 to guide quality improvement efforts and monitor and publicly report on the performance of Ontario's Cancer System. One mechanism by which this is achieved is the **Cancer System Quality Index**, an interactive web-based tool released annually since 2005, that reports on a variety of evidence-based indicators covering every aspect of cancer control, from cancer prevention to recovery and end-of-life care, and tracks Ontario's progress against seven dimensions of quality.

Please see [www.csqi.on.ca](http://www.csqi.on.ca)

Cancer Care Ontario's **Aboriginal Tobacco Program (ATP)** aims to reduce high smoking rates among Ontario's First Nation, Inuit, and Métis (FNIM) populations by enhancing the Aboriginal community's knowledge, skills, capacity and behaviour through the delivery of programming that is aligned with the tobacco control objectives of the renewed Smoke-Free Ontario Strategy. The primary goal is to build capacity toward Tobacco-Wise FNIM communities among FNIM and non-FNIM policy-makers, healthcare administrators, and social and healthcare practitioners.

Please see [www.tobacchowise.com](http://www.tobacchowise.com)



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