Second-hand smoke exposure—who's at risk?

Claudio E. Pérez

Abstract

Objectives

This article examines exposure to second-hand smoke (SHS) in 2003 in various settings by age and sex, and compares exposure indicators by province and health region.

Data source

The data are from the 2000/01 and 2003 Canadian Community Health Survey, conducted by Statistics Canada.

Analytical techniques

Rates of exposure to SHS among non-smokers are calculated by sex, age and location for the household population aged 12 or older. Rates of exposure at work are examined for employed non-smokers aged 15 or older. Smoking prevalence is expressed as a percentage of the household population aged 12 or older.

Main results

In 2003, 33% of non-smokers reported that they were regularly exposed to SHS. The risk of exposure was greatest in public spaces, but regardless of setting, rates of exposure were higher for men than women. Exposure rates varied by age and peaked in young adulthood. However, at home and at work, the younger the non-smokers, the more likely they were to be exposed to SHS. Disparities in SHS exposure by province/territory and by health region were substantial.

Key words

environmental tobacco smoke (ETS), passive smoking, involuntary smoking, secondary smoking

Author

Claudio E. Pérez (613-951-1733; Claudio.Perez@statcan.ca) is with the Health Statistics Division at Statistics Canada, Ottawa, Ontario, K1A 0T6.

The negative health effects of exposure to second-hand smoke (SHS) are well-documented[1-7] and widely recognized. According to Statistics Canada's 1996/97 National Population Health Survey, about three-quarters of Canadians believed that second-hand smoke can cause health problems in non-smokers. Most also agreed that non-smokers should be provided with a smoke-free work environment, an opinion that was shared by a large majority of smokers.[8]

Public health campaigns designed to increase awareness of the dangers of second-hand smoke have proliferated, and many jurisdictions have enacted legislation to restrict smoking in public places and at work.[9] In the context of attitudinal and legislative change, it is useful to determine who remains at risk of SHS exposure and to what extent. This analysis uses data from the 2000/01 and 2003 Canadian Community Health Survey (CCHS) to address these issues (see *Methods* and *Definitions*).

One-third

In 2003, 33 % of non-smokers reported that in the last month they had been exposed to second-hand smoke on most days in at least one of four locations: in public, at work, at home or in private vehicles (Table 1). The most common setting for SHS exposure (respondents could indicate more than one) was public places, reported by 20%, followed by home and work (both 11%) and in private vehicles (10%). For the most part, these exposure rates had not changed from two years earlier (data not shown). The proportion of non-smokers exposed to SHS at work was the exception: in 2000/01, the rate had been higher at 13%.

In all venues, males were more likely than females to be exposed to second-hand smoke (Chart 1). For example, 23% of male non-smokers versus 17% of female non-smokers reported having been exposed to SHS in public places. While differences between the sexes were also statistically significant for exposure at home and in private vehicles, the gaps were narrower.

The most striking contrast in SHS exposure rates by sex was at work. In 2003, 16% of employed men who did not smoke worked in environments where smoking was not restricted, compared with 6% of their female counterparts. Both figures, however, were down from two years earlier when

Methods

Data source

The analysis for this article is based on data from the 2000/01 and 2003 Canadian Community Health Survey (CCHS), conducted by Statistics Canada. The CCHS collects cross-sectional information every two years. The survey covers the household population aged 12 or older in the provinces and territories, except residents of Indian reserves, Canadian Forces bases, and some remote areas.

The first cycle (cycle 1.1) began in September 2000 and continued over 14 months. The majority of interviews were conducted face-to-face. The response rate for the first cycle was 84.7%, yielding a sample of 131,535 respondents. This analysis uses data for the population aged 12 or older living in the provinces and territories. Among the respondents, 95,339 were non-smokers (weighted to represent approximately 19.1 million individuals), and therefore, at risk of exposure to second-hand smoke.

Cycle 2.1 began in January 2003 and ended in December that year. Most interviews were conducted by telephone. The response rate was 80.6%, yielding a sample of 135,573 respondents. Among the respondents, 102,950 were non-smokers (weighted to represent about 20.4 million individuals).

A description of the CCHS methodology is available in a published report.[10]

Analytical techniques

The prevalence of smoking was expressed as a percentage of the household population aged 12 or older. Prevalence rates for exposure to second-hand smoke were expressed as a percentage of non-smokers. Smoking restrictions at work were examined for the non-smoking employed population aged 15 or older. Answers coded as "refusal," "don't know," "not stated" or "not applicable" were excluded from calculations.

To account for the complex survey design, coefficients of variation and p-values for differences between estimates were calculated using the bootstrap technique.[11-13]

Limitations

The data on which this article is based are self-reported. Respondents may give answers that they consider to be socially acceptable, but that are not accurate descriptions of their behaviour.

The question used to determine exposure at home does not address second-hand smoke directly, but rather asks about the smoking habits of other household members (see *Definitions*). It is possible that people who smoke at home do so only in the absence of the non-smoker, or in isolated areas, such as the garage.

Because the CCHS covers only the population aged 12 or older, this analysis could not examine exposure to second-hand smoke among children younger than 12.

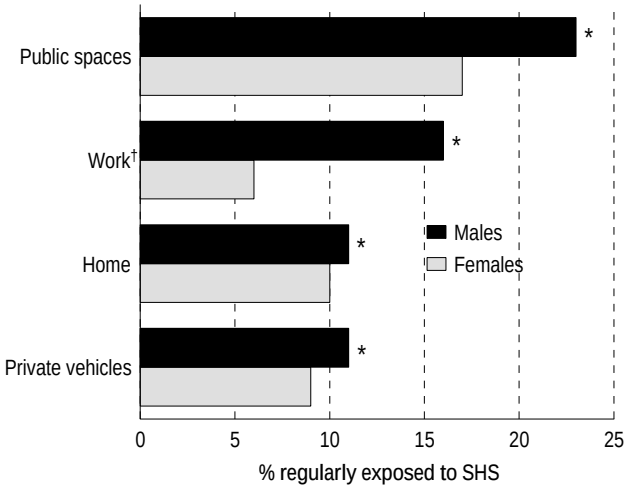
The boundaries of health regions do not necessarily coincide with municipalities that have smoking legislation.

Table 1
Percentage of non-smokers regularly exposed to second-hand smoke in selected locations and smoking prevalence, by province/territory, household population aged 12 or older, 2003

	Second-hand smoke exposure					
	Total (at least one location)	Public spaces	Work†	Home	Private vehicles	Smoking prevalence‡
Canada	33	20	11	11	10	23
Newfoundland	35*	14*	16*	14*	15*	24
Prince Edward Island	34	13*	18*	12	13	24
Nova Scotia	32	16*	14	13	13*	24
New Brunswick	35*	19	16*	13*	12*	25
Québec	41*	27*	11	16*	12*	26*
Ontario	30*	18*	9*	9*	10	22*
Manitoba	33	20	13	11	11	23
Saskatchewan	38*	24*	20*	11	11	24
Alberta	35*	21	15*	9*	10	23
British Columbia	23*	12*	10	6*	7*	19*
Yukon	39*	23	16	13	15	28
Northwest Territories	47*	32*	10	15	18*	37*
Nunavut	40	21	6	15	18	65*

Data source: 2003 Canadian Community Health Survey
† Employed non-smokers aged 15 or older in workplace with few or no smoking restrictions
‡ Daily or occasional
** Significantly different from estimate for Canada*

Chart 1
Percentage of non-smokers regularly exposed to second-hand smoke in selected locations, by sex, household population aged 12 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
† Employed non-smokers aged 15 or older in workplace with few or no smoking restrictions
** Significantly higher than estimate for women ($p < 0.05$)*

18% of male and 8% of female workers who did not smoke reported workplace exposure (data not shown). Male workers' greater SHS exposure reflects their comparatively high representation in occupations such as trades/transport/equipment operation and farming/forestry/fishing/mining (data not shown). Much of this work is performed outdoors where smoking restrictions usually do not apply.

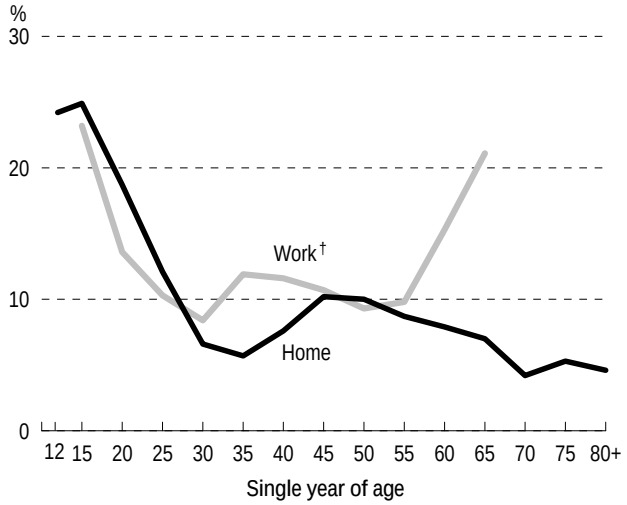
Youth most at risk

Age is closely associated with exposure to second-hand smoke (Chart 2). In 2003, the percentage of non-smokers regularly exposed to SHS in at least one location was 37% at age 12; at age 20, the proportion was 55%. From ages 20 to 30 exposure rates fell sharply to level off around 30%, and remained in that range until about age 60. At older ages, exposure rates dropped even more, and by age 80 were around 10%. This pattern generally reflects the activities in which people engage at different ages and the settings in which they are likely to be, either out of necessity or by choice.

Chart 2
Percentage of non-smokers regularly exposed to second-hand smoke in at least one location,† by single year of age, household population aged 12 or older, Canada, 2003

Data source: 2003 Canadian Community Health Survey
† Public spaces, work, home, private vehicles

Chart 3
Percentage of non-smokers regularly exposed to second-hand smoke at home or work, by single year of age, household population aged 12 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
† Employed non-smokers aged 15 or older in workplace with few or no smoking restrictions

Few options at home

The younger the person, the fewer the options for avoiding second-hand smoke, particularly at home. In 2003, about a quarter of non-smoking 12- to 15-year-olds were regularly exposed to SHS in their home. The percentage declined with advancing age to about 6% among people in their mid-thirties and then rose to about 10% for those in their mid-forties (Chart 3). An almost steady decline thereafter brought the figure down to about 5% at age 70 or older, which may reflect spouses surviving a smoking partner. (Comparable data about SHS exposure for children younger than 12 are not available from the CCHS.)

Exposure at work

The highest rates of workplace second-hand smoke exposure for non-smokers in 2003 were among the youngest and oldest workers. From their mid-teens through their twenties, non-smokers' SHS workplace exposure rates dropped, and thereafter, stabilized. After age 55, SHS workplace exposure rates rose.

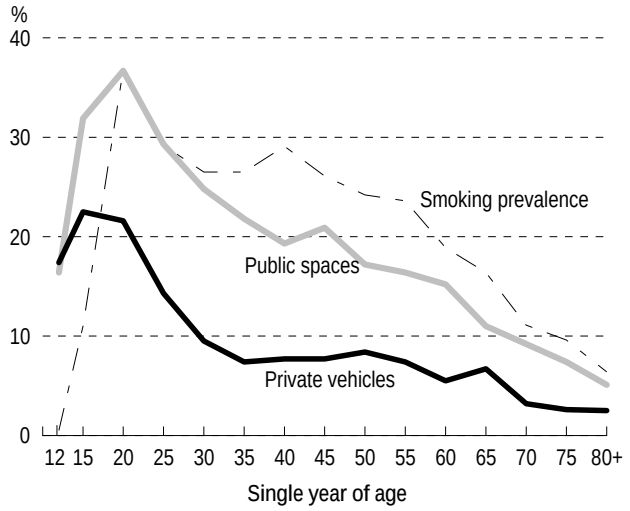
Over half of workers aged 15 to 20 were employed in sales and service, which includes restaurants and bars where smoking may not be restricted (data not shown). Substantial shares of older workers were in sales/service or trades/transport/equipment operation, which have relatively few smoking restrictions.

Going out/Settling down/Getting old

Non-smokers' exposure to second-hand smoke in public spaces and in private vehicles followed roughly the same age patterns, with rates rising through adolescence (Chart 4). In 2003, the proportion of 12-year-olds regularly exposed to SHS in public spaces was 16%, and in private vehicles, 17%; among non-smokers who were aged 19, the corresponding figures were much higher at 37% and 23%. This rise in exposure rates parallels an increase in smoking prevalence throughout the teenage years. Fewer than 1% of 12-year-olds were smokers in 2003, compared with 37% of 20-year-olds. Consequently, even non-smoking teenagers may have friends who smoke. As well, time spent in social situations where smoking may be unrestricted tends to increase.

Non-smokers' SHS exposure in public spaces and private vehicles dropped in their early twenties.

Chart 4
Percentage of non-smokers regularly exposed to second-hand smoke in public spaces or in private vehicles, by single year of age, household population aged 12 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey

Family formation often occurs at these ages, the results of which may be less time in social settings where smoking is allowed, or a spouse changing his or her smoking habits.

The low SHS exposure rates among the elderly may be attributable to even less time spent in venues where smoking is permitted.

Provincial/Territorial differences

Levels of second-hand smoke exposure vary among the provinces and territories. Moreover, the patterns are not always consistent, in that a province with a significantly high rate of exposure in one setting may have a significantly low rate in another (Table 1).

In 2003, Ontario and British Columbia stood out with SHS exposure in public places, at work, at home and in private vehicles either matching or significantly below the national level. These two provinces also had the lowest proportions of daily or occasional smokers. Québec, on the other hand, with a high prevalence of smoking, also had high rates of SHS exposure in public spaces, at home and in private vehicles.

The Atlantic provinces had significantly low exposure rates in public spaces, but significantly high rates in at least one of the other locations. The exception was New Brunswick with an SHS exposure rate in public spaces that matched the national level, and significantly high rates in each of the other three venues.

Among the three Prairie provinces, Manitoba's exposure rates in all settings did not differ significantly from the national figures. Alberta had a high rate of workplace exposure, but a low rate at home. In Saskatchewan, rates were high in public spaces and at work.

In the Northwest Territories, SHS exposure was high in public spaces and in private vehicles. In the Yukon and Nunavut, rates in all locations were similar to those for Canada as a whole, even though Nunavut had the highest proportion of daily and occasional smokers.

Definitions

In cycles 1.1 and 2.1 of the Canadian Community Health Survey, respondents were asked, "At the present time, do you smoke cigarettes daily, occasionally or not at all?" Those who said they smoked daily or occasionally were defined as *current smokers*.

Cycle 1.1 respondents were asked, "Does anyone in this household smoke regularly inside the house?" (Yes/No). In cycle 2.1, the question was, "Including both household members and regular visitors, does anyone smoke inside your home every day or almost every day?"

Respondents aged 12 or older were asked, "In the past month, were you exposed to second-hand smoke every day or almost every day:

... in a car or other private vehicle?" (Yes/No)

... in public places (such as bars, restaurants, shopping malls, arenas, bingo halls, bowling alleys)? (Yes/No)

Respondents aged 15 or older who were employed were asked, "At your place of work, what are the restrictions on smoking?" The choices read to the respondent were:

1. Restricted completely
2. Allowed in designated areas (smokers must go to specific areas because smoking is generally not allowed)
3. Restricted only in certain places (for instance, where flammable materials are stored)
4. Not restricted at all

Respondents who indicated either of the first two choices were defined as having *smoking restrictions at work*.

While rates of second-hand smoke exposure in specific venues may be significantly high or low at the provincial level, this is not necessarily the case in every health region within that province. A single province may contain health regions where rates of SHS exposure were significantly high and other health regions where rates were low (Appendix Table A).

Legislation designed to curb SHS exposure obviously cannot extend to homes or private vehicles, but hundreds of municipalities have laws that restrict smoking in public places and at work.[14-20] However, bylaws and regulations vary in scope, and levels of compliance differ across communities.[21] Low rates of SHS exposure in public spaces and in the workplace generally tend to be more common in larger urban areas, and high rates, in rural or northern areas where substantial numbers of residents are engaged in primary industries.

Concluding remarks

Despite steady declines in the prevalence of smoking, widespread awareness of the hazards of second-hand smoke, and legislative efforts to curb exposure, in 2003, 20% of non-smokers were regularly exposed to second-hand smoke in public spaces, and 11% of employed non-smokers worked in environments without smoking restrictions.

SHS exposure rises through adolescence to peak in young adulthood. However, exposure varies with the venue, and parallels activities that tend to occur at different ages. Exposure also reflects different degrees of choice.

In some instances, non-smokers have no options. For example, a 12-year-old living in a household where parents smoke, or a worker employed in an environment where smoking is not restricted, has little control. In other cases, SHS exposure may be voluntary. Teenagers may spend time in social situations where smoking is permitted or drive with friends who smoke.

The relationship between age and SHS exposure at home is striking. In 2003, the percentage of 12-year-olds regularly exposed to SHS in their home exceeded the percentage exposed in public spaces: 24% versus 16%.

Legislation does not cover smoking in private locales such as homes or vehicles. Nonetheless, the increasing restrictions on smoking in public places and in the workplace suggest that awareness of the potential harm is growing. Restrictions on smoking in these locations may ultimately affect behaviour in private settings.[22,23]

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Appendix

Table A
Percentage of non-smokers regularly exposed to second-hand smoke in public spaces and at work and smoking prevalence, by health region, household population aged 12 or older, 2003

Health region (code)	Second-hand smoke exposure		Smoking prevalence[‡]
	Public spaces	Work[†]	
	%		
Canada	20	11	23
Newfoundland	14*	16*	24
Health and Community Services St. John's Region (1001)	15	9[E1]	22
Health and Community Services Eastern Region (1002)	13*	17	26
Health and Community Services Central Region (1003)	12*	20	22
Health and Community Services Western Region (1004)	14	25*	26
Grenfell Regional Health Services Board (1005)	8[E2]*	36[E1]*	23
Health Labrador Corporation (1006)	20	8[E2]	34
Prince Edward Island	13*	18*	24
West Prince (1101)	14[E1]	28[E1]	28
East Prince (1102)	17	22	24
Queens (1103)	12*	11[E1]	22
Kings (1104)	9[E1]*	26*	26
Nova Scotia	16*	14	24
Zone 1 (1201)	14	28*	26
Zone 2 (1202)	12*	21[E1]	28
Zone 3 (1203)	11*	20[E1]	28
Zone 4 (1204)	8[E1]*	15[E1]	23
Zone 5 (1205)	18	12[E1]	28
Zone 6 (1206)	19	9[E1]	19
New Brunswick	19	16*	25
Region 1 (1301)	15	12	25
Region 2 (1302)	24	16	23
Region 3 (1303)	13*	14[E1]	26
Region 4 (1304)	22	24[E1]	31
Region 5 (1305)	26	18[E1]	27
Region 6 (1306)	25	25*	26
Region 7 (1307)	17[E1]	21[E1]	27
Québec	27*	11	26*
Région du Bas-Saint-Laurent (2401)	32*	10[E1]	22
Région du Saguenay - Lac-Saint-Jean (2402)	34*	12[E1]	27
Région de Québec (2403)	26*	7*	25
Région de la Mauricie et du Centre-du-Québec (2404)	30*	11[E1]	23
Région de l'Estrie (2405)	25	11[E1]	24
Région de Montréal-Centre (2406)	24*	7*	27*
Région de l'Outaouais (2407)	24	11	26
Région de l'Abitibi-Témiscamingue (2408)	30*	14[E1]	27
Région de la Côte-Nord (2409)	32*	21[E1]	29
Région du Nord-du-Québec (2410)	39*	14[E1]	29
Région de la Gaspésie - Îles-de-la-Madeleine (2411)	28	17	27
Région de la Chaudière-Appalaches (2412)	27*	17[E1]	24
Région de Laval (2413)	28*	10	28
Région de Lanaudière (2414)	29*	14	28*
Région des Laurentides (2415)	32*	12	28
Région de la Montérégie (2416)	26*	12	25
Région des Terres-Cries-de-la-Baie-James (2418)	33*	17	46*
Ontario	18*	9*	22
District of Algoma Health Unit (3526)	27	9[E1]	27
Brant County Health Unit (3527)	14	9[E1]	26
Durham Regional Health Unit (3530)	21	9	25
Elgin-St Thomas Health Unit (3531)	18	15[E1]	24
Grey Bruce Health Unit (3533)	7[E1]*	13[E1]	19
Haldimand-Norfolk Health Unit (3534)	22	29*	29
Haliburton, Kawartha, Pine Ridge District Health Unit (3535)	22	13[E1]	22
Halton Regional Health Unit (3536)	14*	8[E1]	21
City of Hamilton Health Unit (3537)	17	11	23
Hastings and Prince Edward Counties Health Unit (3538)	19	13[E1]	22
Huron County Health Unit (3539)	21	24[E1]	22
Chatham-Kent Health Unit (3540)	18	13[E1]	26
Kingston, Frontenac and Lennox and Addington Health Unit (3541)	18	12	26
Lambton Health Unit (3542)	18	15[E1]	24
Leeds, Grenville and Lanark District Health Unit (3543)	18	14[E1]	27
Middlesex-London Health Unit (3544)	16	10	20
Muskoka-Parry Sound Health Unit (3545)	16	20[E1]	22
Niagara Regional Area Health Unit (3546)	20	11	24
North Bay and District Health Unit (3547)	23	10[E1]	25
Northwestern Health Unit (3549)	25	11[E1]	27
City of Ottawa Health Unit (3551)	14*	5[E1]*	20
Oxford County Health Unit (3552)	16	15	24
Peel Regional Health Unit (3553)	19	8	21
Perth District Health Unit (3554)	14[E1]	10[E1]	23
Peterborough County-City Health Unit (3555)	18	15[E1]	24
Porcupine Health Unit (3556)	27	17	31*
Renfrew County and District Health Unit (3557)	17	18	28
Eastern Ontario Health Unit (3558)	17	12	25
Simcoe County District Health Unit (3560)	20	14	25
Sudbury and District Health Unit (3561)	18	7[E1]	25
Thunder Bay District Health Unit (3562)	28*	9[E1]	29
Timiskaming Health Unit (3563)	25	17[E1]	29
Waterloo Health Unit (3565)	12*	10	23
Wellington-Dufferin-Guelph Health Unit (3566)	17	13[E1]	21
Windsor-Essex County Health Unit (3568)	19	8[E1]	21
York Regional Health Unit (3570)	18	8*	21
City of Toronto Health Unit (3595)	19	7*	20
Manitoba	20	13	23
Winnipeg Regional Health Authority (4610)	19	8	22
Brandon Regional Health Authority (4615)	6[E2]*	9[E1]	23
North Eastman Regional Health Authority (4620)	14[E1]	17[E1]	21

Health region (code)	Second-hand smoke exposure: Public spaces	Second-hand smoke exposure: Work[†]	Smoking pre-valence[‡]
		%	
South Eastman Regional Health Authority (4625)	25	21	23
Interlake Regional Health Authority (4630)	22	18[E1]	23
Central Regional Health Authority (4640)	18	24*	22
Assiniboine Regional Health Authority (4645)	20	25*	20
Parkland Regional Health Authority (4660)	27	28*	23
Norman Regional Health Authority (4670)	33*	20[E1]	29
Burntwood/Churchill Regional Health Authority[§] (4680)	40*	15[E1]	44
Saskatchewan	24*	20*	24
Sun Country Regional Health Authority (4701)	26	33*	24
Five Hills Regional Health Authority (4702)	32*	22	24
Cypress Regional Health Authority (4703)	24	25	19
Regina Qu'Appelle Regional Health Authority (4704)	22	13	24
Sunrise Regional Health Authority (4705)	30*	29*	24
Saskatoon Regional Health Authority (4706)	24	15	24
Heartland Regional Health Authority (4707)	16	36*	19
Kelsey Trail Regional Health Authority (4708)	26	26[E1]	21
Prince Albert Parkland Regional Health Authority (4709)	24	27*	25
Prairie North Regional Health Authority (4710)	20	29*	26
Athabasca/Keewatin/Mamawetan Regional Health Authority[††] (4714)	30	19[E1]	42
Alberta	21	15*	23
Chinook Regional Health Authority (4820)	17	20	20
Palliser Health Region (4821)	20	20	28
Calgary Health Region (4822)	22	12	20
David Thompson Regional Health Authority (4823)	20	23*	27
East Central Health (4824)	27	29*	23
Capital Health (4825)	19	10	23
Aspen Regional Health Authority (4826)	30*	29*	28
Peace Country Health (4827)	26	22*	25
Northern Lights Health Region (4828)	26	19	30
British Columbia	12*	10	19*
East Kootenay (5911)	10[E1]*	15[E1]	22
Kootenay-Boundary (5912)	20[E1]	16[E1]	21
Okanagan (5913)	12*	15	22
Thompson/Cariboo (5914)	9*	14	20
Fraser East (5921)	13*	16	19
Fraser North (5922)	12*	10	18
Fraser South (5923)	12*	8[E1]	15
Richmond (5931)	15	7[E1]	14*
Vancouver (5932)	14*	7[E1]	19*
North Shore/Coast Garibaldi (5933)	12*	6[E1]	15*
South Vancouver Island (5941)	8*	8[E1]	18
Central Vancouver Island (5942)	13	6[E2]*	23
North Vancouver Island (5943)	13	20	22
Northwest (5951)	14[E1]	13[E2]	26
Northern Interior (5952)	12*	15	24
Northeast (5953)	19	13[E1]	22
Yukon Territory (6001)	23	16	28
Northwest Territories (6101)	32*	10[E1]	37*
Nunavut (6201)	21[E1]	F	65

Data source: 2003 Canadian Community Health Survey
† Employed non-smokers aged 15 or older in workplace with few or no smoking restrictions
‡ Daily or occasional
§ Churchill Regional Health Authority (4690) is combined with Burntwood Regional Health Authority (4680).
†† Athabasca Health Authority (4713), Mamawetan Churchill River Regional Health Authority (4711) and Keewatin Yatthé Regional Health Authority
** Significantly different from estimate for Canada ($p < 0.05$).*
E1 Coefficient of variation 16.6% to 25.0%
E2 Coefficient of variation 25.1% to 33.3%
F Coefficient of variation greater than 33.3%