

Risk factors for cardiovascular disease in Canada

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BACKGROUND: This paper provides an update of the prevalence of important cardiovascular disease (CVD) risk factors in subgroups of the Canadian population. To improve awareness of the impact of CVD risk factor variations on disease burden, smoking-attributable mortality (SAM) has been estimated for the first time for each health region in Canada.

METHODS: The 2000/01 Canadian Community Health Survey (CCHS) was used to estimate the prevalence of current smoking, obesity, physical inactivity, low income, diabetes and hypertension. Combining smoking prevalence data from the 2000/01 CCHS, mortality data from the 1995 to 1997 Canadian Mortality Database, and relative risk estimates (relating smoking and smoking-associated deaths) from the American Cancer Society's Cancer Prevention Study II, SAM values were generated using population-attributable risk techniques.

RESULTS: Based on self-reported data, the 2000/01 CCHS shows that 26.0% of Canadians currently smoke, 14.9% are obese, 53.5% are physically inactive, 11.3% have low income, 13.0% have hypertension and 4.2% have diabetes. Cardiovascular and all-cause SAM were estimated at 18,209 and 44,271 annual deaths, and contributed to 23% and 22% of total CVD and all-cause mortality in Canada, respectively. There are large variations in the prevalence of CVD risk factors and in SAM estimates between sexes and across age groups and geographic regions.

CONCLUSIONS: The high prevalence of potentially modifiable CVD risk factors and the large variation that exists between subgroups of the Canadian population suggest that the burden of CVD could be reduced through risk factor modification. While prevalence data for risk factors in a population give an initial understanding of some of the contributing causes of a disease, the actual burden of disease caused by a risk factor is also modified by the magnitude of the increased risk to mortality and morbidity, and is best represented by its estimated attributable mortality and morbidity.

Key Words: Hypertension; Obesity; Population health; Prevention; Risk factors; Smoking

Research efforts in recent decades have identified many risk factors that can contribute to the development of cardiovascular disease (CVD). Encouragingly, because many risk factors for CVD such as smoking, physical inactivity, unfavourable lipid cholesterol profile and hypertension are considered to be largely modifiable, many deaths and disabilities due to CVD could be prevented. Other major and potentially modifiable CVD risk factors include obesity, diabetes and low income. Previous Canadian

Facteurs de risque de maladie cardiovasculaire au Canada

CONTEXTE : Cet article présente une mise à jour de la prévalence des facteurs de risque de maladies cardiovasculaires (MCV) importants chez des sous groupes de la population canadienne. Pour mieux faire comprendre l'impact des variations des facteurs de risque de MCV sur le fardeau de la maladie, la mortalité attribuable au tabagisme (MAT) a été estimée pour la première fois dans chacune des régions socio-sanitaires du Canada.

MÉTHODES : L'Enquête sur la santé dans les collectivités canadiennes (ESCC) de 2000-2001 a été utilisée pour estimer la prévalence du tabagisme, de l'obésité, de l'inactivité physique, du faible revenu, du diabète et de l'hypertension. En combinant les données de prévalence du tabagisme de l'ESCC de 2000-2001, les données de mortalité de 1995 à 1997 de la Base canadienne de données sur la mortalité et les estimations du risque relatif (reliant le tabagisme et les décès associés au tabagisme) de la Cancer Prevention Study II de l'American Cancer Society, il a été possible de produire des valeurs de MAT en utilisant les techniques d'évaluation de la fraction étiologique du risque.

RÉSULTATS : S'appuyant sur les données rapportées par les patients, l'ESCC de 2000-2001 révèle ce qui suit : 26,0 % des Canadiens fumaient au moment de l'enquête, 14,9 % étaient obèses, 53,5 % étaient physiquement inactifs, 11,3 % avaient un faible revenu, 13,0 % souffraient d'hypertension et 4,2 % étaient atteints de diabète. Au Canada, la MAT d'origine cardiovasculaire et de toutes causes a été estimée à 18 209 et à 44 271 décès par année, et a contribué à 23 % et à 22 % de la mortalité totale de cause CV et de toutes causes, respectivement. La prévalence des facteurs de risque de MCV et les estimations de la MAT présentent de grandes variations entre les sexes, les différents groupes d'âge et les régions géographiques.

CONCLUSIONS : La prévalence élevée des facteurs de risque de MCV modifiables et l'importante variation qui existe entre les sous groupes de la population canadienne semblent indiquer que le fardeau des MCV pourrait être réduit par une correction des facteurs de risque. Bien que les données de prévalence des facteurs de risque dans une population puissent aider à comprendre certaines des causes d'une maladie, le fardeau de la maladie engendré par un facteur de risque donné est également modifié par l'ampleur de l'accroissement du risque de mortalité et de morbidité, et ce sont les estimations de la mortalité et de la morbidité qui lui sont attribuables qui représentent le mieux ce fardeau.

reports such as the 2003 *Growing Burden of Heart Disease and Stroke in Canada* (1) have outlined differences in the prevalence of these risk factors across the sexes, different age groups and broad geographical regions. In recognizing these differences, health practitioners and program planners may focus their efforts on specific groups of the population that are in greatest need.

This paper updates the prevalence of important CVD risk factors across subgroups of the Canadian population.

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Nationwide prevalence estimates were produced at the health regional level, using the 2000/01 Canadian Community Health Survey (CCHS) (2). Each examined risk factor has implications for morbidity and mortality because it contributes to the increased incidence of cardiovascular and other associated diseases. To illustrate the deleterious effects of a major risk factor for CVD, smoking-attributable cardiovascular and all-cause mortality estimates have been calculated for the first time for each health region. Recognizing that smoking is only one of the many modifiable risk factors for CVD, and that death is but one of the many possible health consequences of a disease, these numbers reveal only a portion of the significant potential health benefits that health care systems may achieve through effective risk management programs at both the population and individual levels.

METHODS

Data sources

Risk factor prevalence estimates for CVD were derived using responses from the 2000/01 CCHS 1.1 conducted by Statistics Canada (2,3). This survey provides cross-sectional estimates of health determinants, health status and health system use at a sub-provincial level (health region or combination of health regions). The target population of the CCHS included household residents in all provinces and territories; the principal exclusions were populations on Indian Reserves, Canadian Forces Bases and some remote areas. There was one randomly selected respondent per household, although planned oversampling of youths resulted in a second member of certain households being interviewed. For the first collection cycle, only those 12 years of age and over were eligible for selection. The CCHS cycle 1.1 began data collection in September 2000 and the total sample size was 131,535 household respondents, representing a response rate of 84.7%. Both computer-assisted personal and telephone interviews were performed. Data from the National Population Health Survey (NPHS), a methodologically similar survey conducted by Statistics Canada in the past, was used for the comparison years of 1996/97 (3). Statistical testing for comparisons of prevalence data was conducted using weighted bootstrap resampling techniques (4-7).

To conduct the calculations for smoking-attributable mortality (SAM), in addition to smoking prevalence estimates from the CCHS, disease-specific mortality counts that were partially attributable to smoking were obtained from the 1995 to 1997 Canadian Mortality Database (8). Disease-specific relative risk estimates for current smokers and former smokers, compared with never smokers, were also required for the calculation of SAM. This information was obtained from the Cancer Prevention Study II (9), a prospective study of 1,185,106 adults over the age of 30 living in the United States (10).

Variable definitions

The prevalences of six risk factors for CVD – smoking, obesity, sedentary lifestyle, low income, diabetes and hypertension – were obtained from the CCHS and the NPHS (2,3). For all comparisons, the CCHS and the NPHS used matching variable definitions. Current smokers were those who reported smoking cigarettes daily or occasionally at the time of the survey. Former smokers, the prevalence of whom (from the CCHS) was used in the calculation of SAM, were those who reported smoking at least 100 cigarettes in their lifetime. Body mass index (BMI) was used

as an indicator of obesity. Following the World Health Organization's guidelines, people with a BMI of at least 30 were considered obese and had an increased risk of developing health problems (11). Sedentary lifestyle was determined using the Physical Activity Index (PAI). PAI took into account the frequency, duration and intensity (using standard metabolic equivalent values) of current leisure activities (12). A person with a calculated PAI less than 1.5 kcal/kg/day was classified as physically inactive. Income questions were asked of respondents aged 15 years and over; low income was defined as less than CDN\$15,000 for households with one or two people, less than CDN\$20,000 for three or four people, and less than CDN\$30,000 for more than five people (12). The prevalence of diagnosed diabetes and hypertension were self-reported.

SAM

Smoking-attributable fraction (SAF) estimated the proportion of deaths, due to a given disease, that were caused by smoking in a population. SAF was calculated using Levin's formula for population-attributable risk (13), modified to take into account multiple exposure levels of smoking (14):

$$\text{Smoking Attributable Fraction} = \frac{[(p_0 + p_1 \times RR_1 + p_2 \times RR_2) - 1]}{[p_0 + p_1 \times RR_1 + p_2 \times RR_2]}$$

where p_0 , p_1 and p_2 represented the percentage prevalence of never, current and former smokers, respectively, while RR_1 and RR_2 represented the relative risk of death due to a given disease for current and former smokers, with never smokers as the reference group.

Similarly, SAM estimated the number of excess deaths that resulted from smoking. The calculation for SAM involved multiplying the SAF and mortality count. SAM was calculated for each disease group, k (Appendix A), sex, age group (five-year age groups for those between 35 and 90 years, and 90+), and for each geographic region. The number of all-cause SAM was simply the sum of SAM from all k disease groups, while the number of CVD SAM was the sum of SAM calculated from a subset of CVD related deaths (Appendix A).

Five-year age- and sex-specific relative risk estimates for ischemic heart disease, cerebrovascular disease, lung cancer and chronic obstructive pulmonary disease were used (10). For all other diseases, sex-specific relative risk estimates for adults over 35 years of age were used. Conservatively, all deaths among people under 35 years of age, as well as all deaths due to perinatal conditions, burns and environmental tobacco smoke among people in all age groups, were excluded.

To take into account the lag time that exists between recent changes in the prevalence of current cigarette smoking and present SAM, smoking prevalence estimates from the CCHS were corrected back in time using smoking data from past surveys. For SAFs associated with neoplasms and selected respiratory diseases, this was done by using an adjustment factor calculated as the difference between the national current smoking prevalence estimate from the 2000/01 CCHS and the 1985 General Social Survey (ie, a 15- or 16-year lag time) (15). This factor was applied to CCHS current smoking prevalence estimates at all levels of analyses. For CVD-associated SAFs, data from the 1991 General Social Survey were used (15). For comparison purposes, all region-specific SAM rates were age-sex standardized to the 1991 Canadian population using the direct method.

TABLE 1
Prevalence of risk factors for cardiovascular disease in Canadians aged 12 years and over by province and territory

| Region code | Province or territory | Current smoker (%) | Hypertensive (%) | Diabetic (%) | Obesity (BMI \geq 30.0) (%) | Physically inactive (%) | Low income [†] (%) | Number of risk factors above Canadian averages |
|-------------|---|--------------------|------------------|--------------|-------------------------------|-------------------------|-----------------------------|--|
| | | | | | | | | (# with P<0.05) |
| 1 | Canada | 26.0 | 13.0 | 4.2 | 14.9 | 53.5 | 11.3 | n/a |
| 10 | Newfoundland and Labrador | 29.0* | 15.4* | 5.8* | 19.8* | 59.6* | 18.4* | 6 (6) |
| 11 | Prince Edward Island | 27.9 | 14.0 | 5.0 | 18.5* | 56.4* | 13.0 | 6 (2) |
| 12 | Nova Scotia | 28.2* | 16.2* | 5.2* | 20.8* | 55.3* | 15.0* | 6 (6) |
| 13 | New Brunswick | 26.4 | 14.5* | 5.1* | 20.2* | 61.1* | 15.5* | 6 (5) |
| 24 | Quebec | 29.5* | 12.6 | 4.1 | 12.7* | 58.5* | 13.4* | 3 (3) |
| 35 | Ontario | 24.5* | 14.0* | 4.3 | 15.4 | 53.9 | 9.3* | 4 (2) |
| 46 | Manitoba | 25.1 | 13.5 | 4.0 | 18.1* | 55.8* | 10.9 | 3 (2) |
| 47 | Saskatchewan | 27.7* | 12.6 | 4.0 | 19.2* | 52.5 | 13.5* | 3 (3) |
| 48 | Alberta | 27.7* | 10.5* | 3.4* | 16.3* | 48.0* | 9.3* | 2 (2) |
| 59 | British Columbia | 20.6* | 11.4* | 3.9 | 13.3* | 43.7* | 11.4 | 1 (0) |
| 6001 | Yukon Territory | 33.7* | 8.5* | 3.2 | 18.2 | 36.0* | 8.8 | 2 (1) |
| 6101 | Northwest Territories excluding Nunavut | 46.6* | 8.1* | 2.8* | 22.8* | 55.4 | 16.3* | 4 (3) |
| 6201 | Nunavut | 56.8* | 6.2* | 1.9* | 25.5* | 52.4 | 38.7* | 3 (3) |

Data from 2000/01 Canadian Community Health Survey (3). Bolding represents health region or provincial values that are greater than the Canadian value for the particular risk factor. *P<0.05 for the difference between regional and Canadian average. [†]Respondents aged 15 and over

TABLE 2
Prevalence of risk factors for cardiovascular disease by 10-year age groups

| Risk factor | Category | Sex | Age group (years) | | | | | | | | All ages |
|---------------------|-----------------------|--------|-------------------|----------|----------|----------|----------|----------|----------|-------|----------|
| | | | 12 to 19 | 20 to 29 | 30 to 39 | 40 to 49 | 50 to 59 | 60 to 69 | 70 to 79 | 80+ | |
| Smoking | Current | Male | 17.7 | 37.3 | 33.8 | 34.4 | 26.7 | 18.9 | 12.4 | 7.4 | 28.2 |
| | | Female | 19.9 | 30.9 | 28.7 | 28.0 | 23.2 | 17.6 | 10.9 | 5.5 | 23.8 |
| | Former | Male | 14.7 | 27.0 | 33.5 | 40.4 | 53.0 | 61.6 | 70.4 | 70.3 | 39.7 |
| | | Female | 14.9 | 27.3 | 34.1 | 39.3 | 41.6 | 40.7 | 40.5 | 35.5 | 33.9 |
| Never | Male | 67.6 | 35.7 | 32.7 | 25.2 | 20.3 | 19.6 | 17.3 | 22.3 | 32.1 | |
| | Female | 65.3 | 41.9 | 37.2 | 32.7 | 35.3 | 41.7 | 48.6 | 59.0 | 42.2 | |
| Hypertension | Yes | Male | 0.7 | 1.8 | 4.6 | 9.7 | 19.1 | 31.0 | 37.7 | 34.7 | 11.8 |
| | | Female | 0.6 | 2.1 | 3.5 | 8.8 | 21.9 | 34.1 | 46.4 | 45.8 | 14.2 |
| Diabetes | Yes | Male | 0.3 | 0.6 | 1.5 | 2.8 | 7.2 | 12.7 | 15.8 | 14.0 | 4.4 |
| | | Female | 0.4 | 0.6 | 1.5 | 3.0 | 5.3 | 9.1 | 12.8 | 9.7 | 3.9 |
| Obesity | Obese (BMI \geq 30) | Male | 5.3 | 11.3 | 15.9 | 17.8 | 20.5 | 18.2 | 12.6 | 8.9 | 14.6 |
| | | Female | 5.6 | 11.3 | 15.1 | 16.9 | 21.2 | 19.7 | 17.8 | 12.4 | 15.1 |
| Sedentary lifestyle | Physically inactive | Male | 24.8 | 45.4 | 54.4 | 56.4 | 56.7 | 50.0 | 53.0 | 64.8 | 49.7 |
| | | Female | 38.7 | 53.2 | 57.9 | 59.0 | 59.6 | 58.4 | 68.0 | 80.8 | 57.0 |
| Income | Low income | Male | 12.04 | 9.73 | 7.84 | 7.93 | 7.85 | 10.61 | 8.55 | 13.44 | 9.1 |
| | | Female | 14.21 | 14.12 | 11.37 | 10.03 | 10.41 | 16.02 | 20.81 | 32.37 | 13.5 |

Data from 2000/01 Canadian Community Health Survey (3). All values are percentage prevalence

RESULTS

Obesity

Table 1 shows that 14.9% of Canadians over the age of 12 are obese (BMI of at least 30), while additional analyses estimate that 16.0% of Canadians are overweight (BMI 27.0 to 29.9). The prevalence of overweight and obese Canadians increased with increasing age group, reaching a maximum of 42% in the 50- to 59-year age group (a four-fold increase compared with the youngest age group). The prevalence of obesity in the 50- to 59-year age group was 21% (Table 2). The prevalence of obesity was similar in both sexes.

Sedentary lifestyle

More than half of Canadians over the age of 12 years in 2000/01 were physically inactive (Table 1). The prevalence

of inactivity for both sexes increased with increasing age group, with the exception of a slight increase in physical activity from the 50- to 59- to the 60- to 69-year age group (Table 2). A greater prevalence of physical inactivity was observed for women in all age groups (P<0.05), with the difference being greatest (over 10%) in the youngest and oldest age groups.

Low income

Compared with their male counterparts, Canadian females over the age of 12 years had a higher prevalence of low income (13.5%; 95% CI 13.1% to 14.0% versus 9.1%; 95% CI 8.7% to 9.5%) (Table 2). This trend was observed in each age group (P \leq 0.05), with the greatest differences occurring in the three oldest age groups.

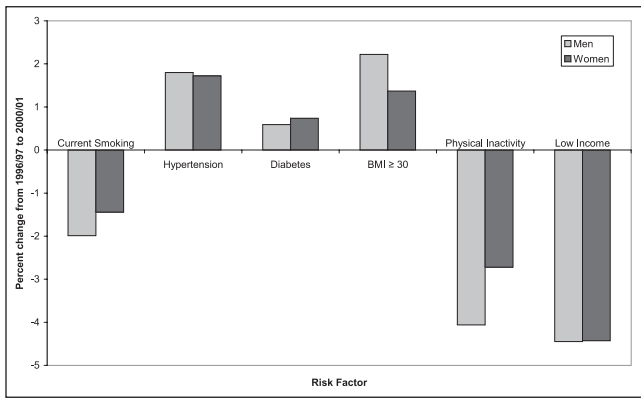


Figure 1 Change in reported prevalence of cardiovascular disease risk factors from 1996 to 2000, both sexes combined, in Canada. 1996 data from the 1996/97 National Population Health Survey (3) and 2000 data from the 2000/01 Canadian Community Health Survey (2)

Diabetes

About 4% of CCHS respondents reported having diabetes (Table 1). Increasing age group was associated with increasing prevalence of self-reported diabetes. Men had a slightly higher prevalence of diabetes than women in the four oldest age groups (P<0.05).

Hypertension

Data from the CCHS showed that 13.0% of Canadians self-reported hypertension (Table 1). Similar to diabetes, the prevalence of hypertension generally increased with increased age (Table 2). Women in the four oldest age groups had a higher prevalence of hypertension, and the difference was magnified with increasing age.

Smoking

Among Canadians over the age of 12, 26% currently smoke (Table 1). Current smoking prevalence was higher for males

(28.2%; 95% CI 27.6% to 28.7%) than females (23.8%; 95% CI 23.3% to 24.3%). This observation was true of all age groups, with the exception of 12- to 19-year-old females, who had a higher smoking prevalence (19.9%; 95% CI 18.8% to 21.0%) than their male counterparts (17.7%; 95% CI 16.6% to 18.8%). For both sexes, the highest prevalence of current smokers was observed in the 20- to 29-year age group (37.3% for males and 30.9% for females).

Secular trends in prevalence of risk factors

The trends in the reported prevalence of CVD risk factors between the 1996/97 NPHS and the 2000/01 CCHS were mixed. While the prevalence of diabetes, hypertension and obesity rose, the prevalence of smoking, physical inactivity and low income declined (P<0.05) (Figure 1).

SAM

Using mortality data between 1995 to 1997 for the Canadian population over 35 years of age, it was estimated that an annual average of 44,271 deaths, or 325 deaths per 100,000 population per year (age-sex standardized), could be attributed to smoking (Table 3). Of these deaths, CVD was the leading cause, contributing an estimated 18,209 smoking-attributable deaths (133 deaths per 100,000 population), or 40.3% of all SAM.

All-cause and CVD SAM were greater in males than females (data not shown). Of the total number of all-cause and CVD SAM, 29,525 (66.7%) and 12,250 (67.2%) were males, respectively. Canadian men experienced double the number of smoking-attributable CVD and all-cause mortality, with annual absolute differences of 6,291 and 14,780 deaths, respectively.

The eastern Canadian provinces of Quebec, Nova Scotia and Prince Edward Island had the highest all-cause SAM rates at 383, 379 and 376 per 100,000 population, respectively. The provinces with the lowest rates were British Columbia, Saskatchewan, Alberta and Ontario with 287, 299, 301 and 303 SAMs per 100,000 population, respectively. The ordering of the provinces was similar for CVD SAM rates, with the

TABLE 3 All-cause and cardiovascular disease smoking attributable mortality (SAM) in household population aged 35 and over, in Canada, provinces and territories

| Region code | Province or territory | All causes | | Cardiovascular disease | |
|-------------|---|------------|-------------|------------------------|-------------|
| | | #SAM | SAM/100,000 | #SAM | SAM/100,000 |
| 00 | Canada | 44,271 | 325 | 18,209 | 133 |
| 10 | Newfoundland and Labrador | 848 | 358 | 403 | 168 |
| 11 | Prince Edward Island | 256 | 376 | 107 | 155 |
| 12 | Nova Scotia | 1752 | 379 | 702 | 150 |
| 13 | New Brunswick | 1280 | 356 | 527 | 145 |
| 24 | Quebec | 12,341 | 383 | 4756 | 146 |
| 35 | Ontario | 15,498 | 303 | 6599 | 129 |
| 46 | Manitoba | 1848 | 315 | 825 | 138 |
| 47 | Saskatchewan | 1700 | 299 | 759 | 131 |
| 48 | Alberta | 3233 | 301 | 1381 | 128 |
| 59 | British Columbia | 5430 | 287 | 2123 | 113 |
| 6001 | Yukon Territory | 31 | 467 | 12 | 197 |
| 6101 | Northwest Territories excluding Nunavut | 30 | 408 | 10 | 127 |
| 6201 | Nunavut | 24 | 788 | 4 | 128 |

Data from 2000/01 Canadian Community Health Survey (2), 1995-1997 Canadian Mortality Database (8) and 1982-1986 Cancer Prevention Study II (9,10). SAM rate age- and sex-standardized to 1991 Canadian population

exception of Newfoundland and Labrador, which had the highest rate among all provinces.

Health regional SAM data are presented on the CCORT website (www.ccort.ca/cvdrisk.asp). The Montréal-Centre region in Quebec had the highest CVD and all-cause SAM crude estimates, despite having 72% of the population size of the most populous health region, the Toronto Public Health Unit in Ontario (16). The Montréal-Centre region was estimated as having 1,460 CVD smoking-attributable deaths (150 deaths per 100,000 population) compared with 1,193 for Toronto (103 deaths per 100,000 population). SAM rates varied quite widely across health regions (Figure 2). It should be noted that for many health regions, estimates should be interpreted with caution because many crude SAM counts were small, reflecting their susceptibility to fluctuating mortality and smoking prevalence rates and sampling variation.

Regional variations in the prevalence of risk factors

Significant differences in the prevalence of CVD risk factors existed between provinces and health regions in Canada (Figure 3, Tables 1 and 4). The four Atlantic provinces – New Brunswick, Prince Edward Island, Nova Scotia, and Newfoundland and Labrador – were the only provinces or territories that reported prevalence estimates higher than the Canadian national average for all six CVD risk factors examined (all six were statistically significant for the latter two provinces). British Columbia and Alberta had the fewest number of risk factors that were significantly above the national average (zero and one, respectively). These rankings were generally also observed for the health regions within the provinces; 13 of the 15 regions with all six risk factors above the national average resided in the Atlantic provinces, and 10 of the 13 regions with one or no risk factors above the national average resided in Alberta or British Columbia. Interpretative caution should be exercised for these findings because they do not take into account the degree to which regional estimates exceeded national figures.

DISCUSSION

A recent report has shown that CVD remains the leading cause of death in Canada, resulting in almost 40% of all deaths (16). In order to identify some of the contributing causes of the burden of CVD disease, this paper outlined the prevalence of major CVD risk factors in Canada. Although previous working groups (eg, the Canadian National Consensus Conference on Population Health Indicators) have confirmed rates of smoking, obesity, physical inactivity and other risk factors as the health indicators of choice for assessing the health of the population (18), knowing how common a risk factor is forms only a part of the information that clinicians and policy makers need. In particular, policy makers benefit from knowing 1) the contribution of different risk factors to CVD health outcomes in their local regions, 2) the extent to which there are available effective interventions both for those targeting individual patients and those based on community health promotion and primary prevention, and 3) the factors that can improve community effectiveness of primary prevention interventions, including patient screening, provider compliance, and patient adherence and persistence. Unfortunately, much of this information is not typically available.

To relate risk factor prevalence to the burden of disease, we estimated SAM for the first time at the regional level. These

estimates showed that 22% of total all-cause and 23% of CVD mortality in Canada are attributable to smoking. These proportions are considerably larger than the worldwide estimates of 9% for all causes and 12% for vascular diseases (19). Because risk factors for CVD are also risk factors for other diseases, prevention efforts may have health benefits beyond those observed for CVD. The large number of SAM from diseases other than CVD highlighted some of this potential.

Table 5 shows the potential contribution of risk factors to CVD mortality and the degree to which these factors are modifiable by health interventions. Future studies should quantify the actual contribution of these factors at the national and regional levels. In addition, there is a need to summarize the potential impact of interventions that modify these risks so that health promotion and primary care can be compared with medical care in the improvement of population CVD outcomes. In the same way that clinicians discuss CVD risks and other medical or surgical interventions with their patients, so too should health planners be able to compare the risks and benefits of different factors and interventions at the level of their planning area. The largest impact of risk factor intervention in the population is likely to occur when a risk factor is highly prevalent and has a high risk for CVD mortality. Under these situations, interventions with even modest effectiveness for modifying community risks can have a large impact on population outcomes (20).

There were persistent gender differences in the prevalence of risk factors for CVD. Similar to the much higher male CVD mortality rates in Canada, men have higher prevalence rates of current smoking, former smoking and self-reported diabetes than women. The annual difference in the Canadian age-standardized CVD SAM between the sexes was 133 per 100,000 (data not shown). The annual difference in the age-standardized CVD death rate for the same years of mortality (1995 to 1997) was 120 per 100,000 (17). This suggests that differences in SAM more than account for the higher observed CVD death rate in males. Holding constant all other factors, Canadian women may actually possess a higher CVD death rate if sex differences in smoking behaviour are eliminated. The large observed variation in the prevalence of CVD risk factors gives an indication of the room for improvement in subgroups of the Canadian population. This variation can be used as a tool for the identification of particular needs for intervention.

Important risk factors not in this report include blood lipid levels and other known CVD risk factors and conditions such as family and personal history of disease and thrombogenic factors (21,22). Many CVD risk factors are interrelated. For example, although obesity may in part act as an independent risk factor for CVD, it is also a risk factor for hypertension, diabetes and an unfavourable lipid profile (23).

For the CCHS and NPHS, respondents self-reported information regarding the presence of risk factors for CVD. In addition to the variability and inaccuracy that results from the subjective nature of self-reported data, conditions such as hypertension and diabetes are often under-reported because self-reports cannot capture conditions that respondents are unaware of (24-30). While the degree of under-reporting may have varied throughout different subgroups of the population, data from the Canadian Heart Health Survey (1986 to 1992) estimate that 42% of Canadians 18 to 74 years of age are unaware they have hypertension (24), while international studies estimate about 20% of their diabetic subjects are

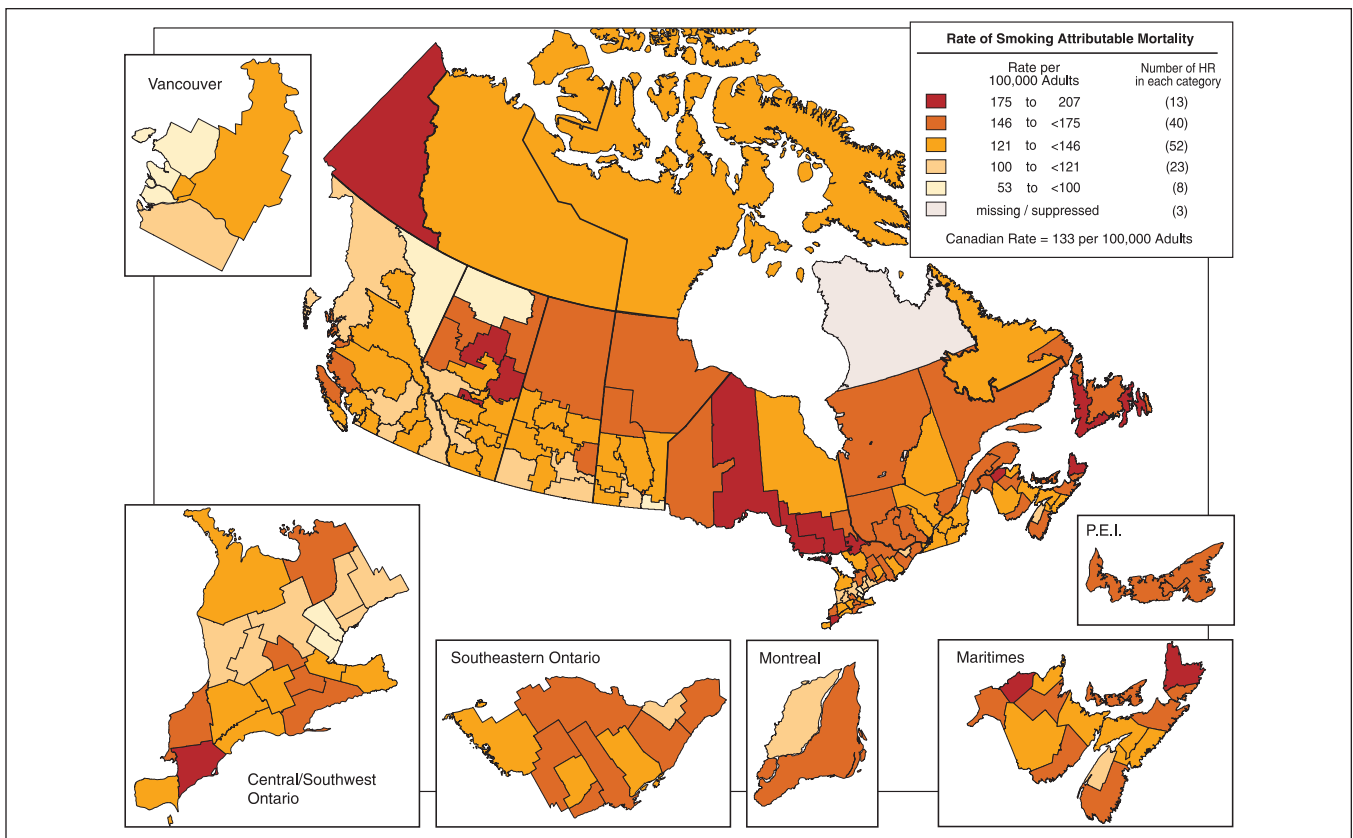


Figure 2) Smoking-attributable mortality rates for cardiovascular disease, by health region (HR). PEI Prince Edward Island

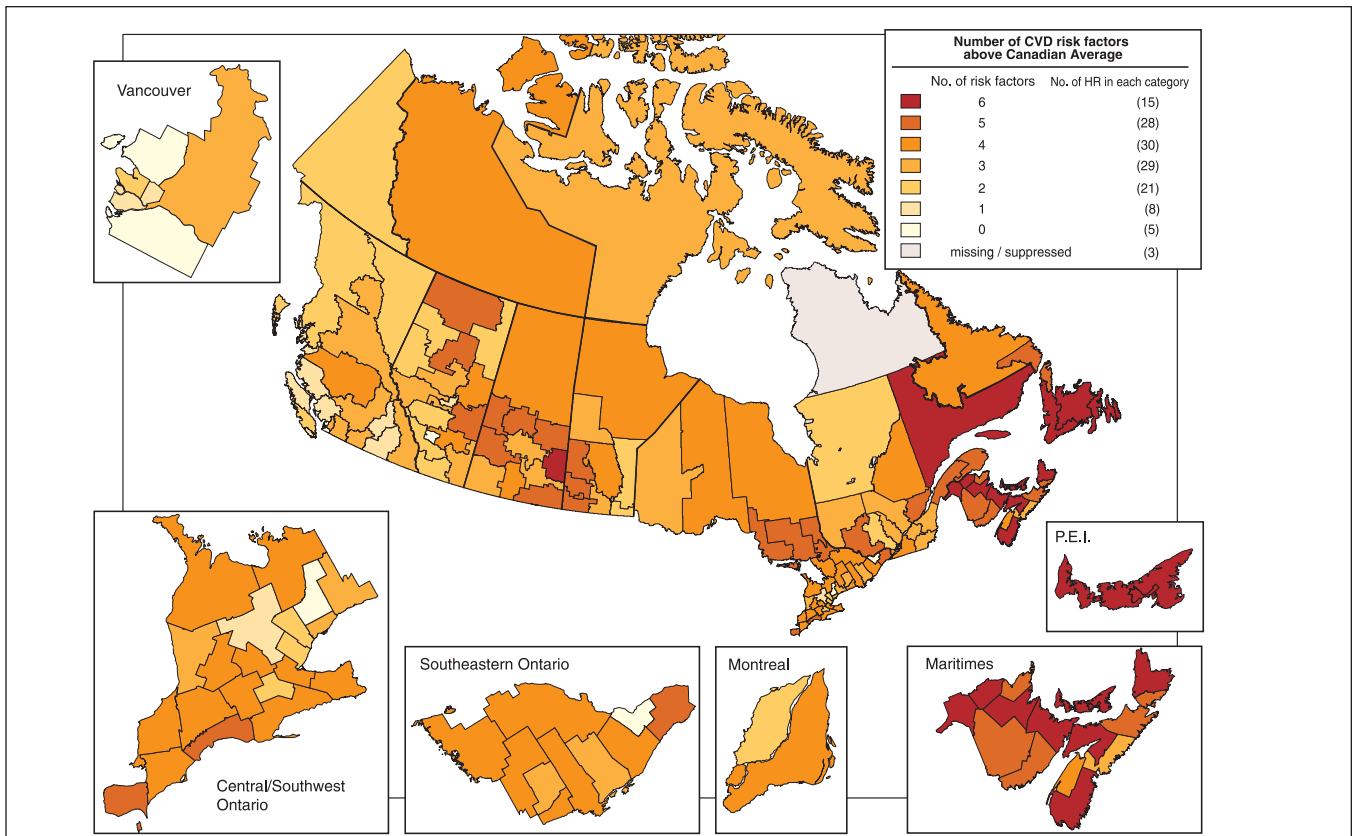


Figure 3) Number of cardiovascular (CVD) risk factors per health region (HR) with a prevalence rate greater than the national average, 2000/01. PEI Prince Edward Island

TABLE 4

Prevalence of risk factors for cardiovascular disease in Canadians aged 12 years and older by health region, 2000/01

| Region code | Health region | Current smoker (%) | Hypertensive (%) | Diabetic (%) | Obesity (BMI ≥30.0) (%) | Physically inactive (%) | Low income† (%) | Number of risk factors above Canadian averages (# with P<0.05) |
|-------------|---|--------------------|------------------|--------------|-------------------------|-------------------------|-----------------|--|
| 1 | Canada | 26.0 | 13.0 | 4.2 | 14.9 | 53.5 | 11.3 | n/a |
| 1001 | HCS St John's region, NF | 29.1 | 13.9 | 5.4 | 15.8 | 58.7* | 13.7 | 6 (1) |
| 1002 | HCS eastern region, NF | 26.7 | 15.7* | 6.1* | 21.4* | 59.5* | 24.0* | 6 (5) |
| 1003 | HCS central region, NF | 28.1 | 18.8* | 7.4* | 25.1* | 61.7* | 18.6* | 6 (5) |
| 1004 | HCS western region, NF | 30.4 | 14.4 | 5.1 | 17.1 | 62.0* | 21.4* | 6 (2) |
| 1005 | Grenfell Regional Health Services Board, NF | 29.2 | 15.1 | 3.8 | 24.5* | 61.8* | 18.4* | 5 (3) |
| 1006 | Health Labrador Corporation, NF | 38.6* | 13.4 | 4.0 | 24.6* | 47.6* | 13.6 | 4 (2) |
| 1101 | Urban Health Region, PEI | 28.2 | 13.0 | 4.7 | 15.8 | 57.4* | 12.8 | 6 (1) |
| 1102 | Rural Health Region, PEI | 27.6 | 15.0* | 5.3 | 20.9* | 55.4 | 13.1 | 6 (2) |
| 1201 | Zone 1, NS | 30.9* | 18.8* | 6.6* | 26.9* | 62.8* | 18.1* | 6 (6) |
| 1202 | Zone 2, NS | 29.8 | 12.8 | 4.6 | 8.6* | 51.9 | 17.8* | 4 (2) |
| 1203 | Zone 3, NS | 29.9 | 18.5* | 7.0* | 20.5* | 56.5 | 18.0* | 6 (4) |
| 1204 | Zone 4, NS | 23.7 | 16.5* | 6.9 | 22.1* | 54.4 | 17.0* | 5 (3) |
| 1205 | Zone 5, NS | 29.6* | 21.7* | 5.9* | 22.3* | 56.2 | 22.3* | 6 (5) |
| 1206 | Zone 6, NS | 27.3 | 13.6 | 3.6 | 18.5* | 53.1 | 9.6 | 3 (1) |
| 1301 | Region 1, NB | 27.6 | 15.5* | 5.0 | 21.9* | 61.6* | 14.1 | 6 (3) |
| 1302 | Region 2, NB | 23.4 | 15.5* | 4.5 | 19.6* | 62.1* | 13.3 | 5 (3) |
| 1303 | Region 3, NB | 27.0 | 11.5 | 5.5 | 20.7* | 62.4* | 16.4* | 5 (3) |
| 1304 | Region 4, NB | 27.2 | 13.8 | 5.3 | 18.0 | 60.2* | 15.0 | 6 (1) |
| 1305 | Region 5, NB | 33.7* | 18.8* | 6.5 | 20.2 | 55.4 | 15.4 | 6 (2) |
| 1306 | Region 6, NB | 23.9 | 13.4 | 4.5 | 16.6 | 58.1* | 21.2* | 5 (2) |
| 1307 | Region 7, NB | 29.0 | 17.4* | 6.1 | 23.8* | 61.6* | 16.0 | 6 (3) |
| 2401 | Bas-Saint-Laurent, QC | 29.4 | 13.2 | 4.2 | 11.8* | 60.8* | 17.7* | 5 (2) |
| 2402 | Saguenay-Lac-Saint-Jean, QC | 32.4* | 14.6 | 3.5 | 12.5* | 64.0* | 14.1 | 4 (2) |
| 2403 | Québec, QC | 27.8 | 13.6 | 5.2 | 9.8* | 55.2 | 12.4 | 5 (0) |
| 2404 | Mauricie et Centre-du-Québec, QC | 31.0* | 12.4 | 3.1* | 13.4 | 57.1 | 13.5* | 3 (2) |
| 2405 | Estrie, QC | 29.7 | 12.2 | 3.6 | 12.7 | 64.0* | 13.3 | 3 (1) |
| 2406 | Montréal-Centre, QC | 26.9 | 12.7 | 4.3 | 12.5* | 61.0* | 17.3* | 4 (2) |
| 2407 | Outaouais, QC | 39.3* | 11.8 | 4.4 | 15.0 | 55.9 | 14.7* | 5 (2) |
| 2408 | Abitibi-Témiscamingue, QC | 32.2* | 13.4 | 3.2* | 12.4* | 53.3 | 13.6 | 3 (1) |
| 2409 | Côte-Nord, QC | 35.9* | 15.8 | 5.1 | 18.3 | 56.5 | 13.6 | 6 (1) |
| 2410 | Nord-du-Québec, QC | 35.4* | 9.7* | 2.8* | 16.3 | 43.0* | 9.7 | 2 (1) |
| 2411 | Gaspésie-Îles-de-la-Madeleine, QC | 32.8* | 14.4 | 4.6 | 14.0 | 55.1 | 18.8* | 5 (2) |
| 2412 | Chaudière-Appalaches, QC | 26.4 | 10.7* | 3.1* | 12.3* | 65.6* | 14.4* | 3 (2) |
| 2413 | Laval, QC | 27.7 | 12.2 | 3.9 | 13.8 | 60.0* | 7.2* | 2 (1) |
| 2414 | Lanaudière, QC | 33.3* | 12.4 | 4.3 | 13.4 | 58.0* | 9.5 | 3 (2) |
| 2415 | Laurentides, QC | 31.2* | 9.5* | 3.9 | 11.9* | 53.4 | 12.5 | 2 (1) |
| 2416 | Montérégie, QC | 29.1* | 13.0 | 4.3 | 13.0* | 56.1 | 9.8 | 4 (1) |
| 3526 | Algoma PHU, ON | 30.4* | 20.0* | 6.2* | 20.2* | 47.9* | 17.9* | 5 (5) |
| 3527 | Brant PHU, ON | 29.8 | 11.6 | 3.6 | 18.9 | 47.3* | 8.0* | 2 (0) |
| 3530 | Durham PHU, ON | 27.6 | 11.6 | 3.8 | 15.5 | 53.7 | 7.7* | 3 (0) |
| 3531 | Elgin-St Thomas PHU, ON | 27.8 | 16.1* | 5.1 | 16.8 | 58.8* | 6.0* | 5 (2) |
| 3533 | Bruce-Grey-Owen Sound PHU, ON | 24.5 | 16.0* | 5.6 | 16.5 | 56.7 | 10.7 | 4 (1) |
| 3534 | Haldimand-Norfolk PHU, ON | 28.1 | 15.5* | 4.6 | 19.5* | 52.7 | 10.1 | 4 (2) |
| 3535 | Haliburton-Kawartha-Pine Ridge PHU, ON | 26.5 | 15.7* | 5.4 | 17.2 | 40.8* | 9.1* | 4 (1) |
| 3536 | Halton PHU, ON | 23.6 | 13.7 | 3.4 | 16.4 | 48.6* | 3.7* | 2 (0) |
| 3537 | Hamilton PHU, ON | 26.7 | 17.2* | 5.4 | 18.9* | 49.3* | 10.7 | 4 (2) |
| 3538 | Hastings and Prince Edward PHU, ON | 27.5 | 16.7* | 3.9 | 17.3 | 53.9 | 9.2 | 4 (1) |
| 3539 | Huron PHU, ON | 21.4* | 16.5* | 7.4* | 17.3 | 45.4* | 8.2* | 3 (2) |
| 3540 | Kent-Chatham PHU, ON | 27.2 | 14.3 | 4.2 | 19.6* | 51.4 | 9.6 | 4 (1) |
| 3541 | Kingston-Frontenac-Lennox and Addington PHU, ON | 24.7 | 14.5 | 5.3 | 17.8 | 48.9 | 11.1 | 3 (0) |
| 3542 | Lambton PHU, ON | 27.2 | 14.1 | 5.5 | 20.7* | 47.3* | 10.5 | 4 (1) |
| 3543 | Leeds-Grenville-Lanark PHU, ON | 30.1* | 14.0 | 4.4 | 20.5* | 45.1* | 10.1 | 4 (2) |

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TABLE 4 - continued
Prevalence of risk factors for cardiovascular disease in Canadians aged 12 years and older by health region, 2000/01

| Region code | Health region | Current smoker (%) | Hypertensive (%) | Diabetic (%) | Obesity (BMI ≥30.0) (%) | Physically inactive (%) | Low income [†] (%) | Number of risk factors above Canadian averages (# with P<0.05) |
|----------------|-------------------------------------|-----------------------|---------------------|-----------------|-------------------------------|-------------------------------|--------------------------------|--|
| | | | | | | | | |
| 3544 | Middlesex-London PHU, ON | 22.4* | 14.3 | 4.6 | 15.9 | 51.8 | 11.5 | 4 (0) |
| 3545 | Muskoka-Parry Sound PHU, ON | 27.5 | 18.7* | 4.0 | 17.2 | 47.4* | 12.2 | 4 (1) |
| 3546 | Niagara PHU, ON | 24.9 | 16.1* | 5.6 | 17.3 | 56.8 | 9.7 | 4 (1) |
| 3547 | North Bay PHU, ON | 27.4 | 14.7 | 5.4 | 21.4* | 45.4* | 13.3 | 5 (1) |
| 3549 | Northwestern PHU, ON | 30.4* | 16.5* | 3.8 | 23.9* | 43.8* | 8.9 | 3 (3) |
| 3551 | Ottawa PHU, ON | 21.1* | 11.3* | 3.3 | 14.3 | 48.2* | 9.5 | 0 (0) |
| 3552 | Oxford PHU, ON | 26.0 | 14.7 | 4.4 | 19.8* | 52.7 | 6.4* | 4 (1) |
| 3553 | Peel PHU, ON | 21.2* | 13.5 | 4.1 | 13.3* | 60.0* | 6.4* | 2 (1) |
| 3554 | Perth PHU, ON | 24.1 | 13.6 | 4.8 | 14.0 | 64.3* | 5.2* | 3 (1) |
| 3555 | Peterborough PHU, ON | 23.4 | 14.5 | 6.3* | 15.7 | 40.9* | 8.5* | 3 (1) |
| 3556 | Porcupine PHU, ON | 29.5 | 15.8* | 4.3 | 23.0* | 47.0* | 9.7 | 4 (2) |
| 3557 | Renfrew PHU, ON | 27.5 | 17.4* | 4.8 | 19.1* | 45.0* | 10.0 | 4 (2) |
| 3558 | Eastern Ontario PHU, ON | 31.6* | 13.3 | 4.3 | 20.6* | 45.9* | 12.2 | 5 (2) |
| 3568 | Windsor-Essex PHU, ON | 26.7 | 15.4* | 6.1* | 18.2* | 54.2 | 8.3* | 5 (3) |
| 3570 | York PHU, ON | 23.0* | 12.0 | 3.8 | 11.8* | 49.2* | 4.1* | 0 (0) |
| 3595 | Toronto PHU, ON | 21.6* | 13.0 | 3.5 | 11.4* | 62.9* | 11.8 | 3 (1) |
| 4610 | Winnipeg, MB | 25.2 | 13.6 | 3.4 | 16.3 | 55.8 | 9.9* | 3 (0) |
| 4615 | Brandon, MB | 26.0 | 13.2 | 4.6 | 17.3 | 50.8 | 12.6 | 5 (0) |
| 4620 | North Eastman, MB | 24.2 | 15.4 | 3.1 | 20.2* | 47.2 | 8.6 | 2 (1) |
| 4625 | South Eastman, MB | 21.8* | 11.8 | 3.4 | 19.6* | 61.4* | 8.0* | 2 (2) |
| 4630 | Interlake, MB | 28.8 | 16.5* | 7.0* | 24.6* | 53.2 | 10.6 | 4 (3) |
| 4640 | Central, MB | 23.1 | 10.4* | 4.1 | 18.4* | 64.1* | 13.7 | 3 (2) |
| 4650 | Marquette, MB | 20.0* | 13.7 | 5.4 | 20.3* | 56.2 | 13.2 | 5 (1) |
| 4655 | South Westman, MB | 19.4* | 13.9 | 5.2 | 18.1 | 60.5* | 19.4* | 5 (2) |
| 4660 | Parkland, MB | 24.8 | 14.7 | 5.6 | 23.5* | 53.5 | 16.7* | 5 (2) |
| 4670 | Norman, MB | 26.1 | 12.2 | 5.3 | 26.2* | 38.4* | 9.9 | 3 (1) |
| 4680 | Burntwood/Churchill, MB | 43.4* | 10.9 | 2.5* | 24.7* | 55.0 | 13.5 | 4 (2) |
| 4701 | Weyburn SA, SK | 25.4 | 14.5 | 5.2 | 19.7* | 59.7* | 13.3 | 5 (2) |
| 4702 | Moose Jaw SA, SK | 25.4 | 15.7* | 4.1 | 18.7 | 55.6 | 14.7 | 4 (1) |
| 4703 | Swift Current SA, SK | 23.8 | 12.3 | 4.6 | 18.5* | 55.2 | 9.6 | 3 (1) |
| 4704 | Regina SA, SK | 28.1 | 11.7 | 2.9* | 17.0 | 51.6 | 11.9 | 3 (0) |
| 4705 | Yorkton SA, SK | 26.0 | 19.1* | 5.2 | 23.4* | 58.3 | 19.4* | 6 (3) |
| 4706 | Saskatoon SA, SK | 26.6 | 10.6* | 3.5 | 18.2* | 49.7* | 12.1 | 3 (1) |
| 4707 | Rosetown SA, SK | 27.6 | 13.0 | 4.9 | 20.2* | 57.8 | 16.4 | 5 (1) |
| 4708 | Melfort SA, SK | 25.6 | 14.4 | 4.7 | 20.8* | 55.2 | 19.9* | 5 (2) |
| 4709 | Prince Albert SA, SK | 31.1* | 13.9 | 6.5 | 26.5* | 48.8* | 14.5* | 5 (3) |
| 4710 | North Battleford SA, SK | 33.3* | 12.7 | 4.2 | 18.9* | 55.1 | 12.0 | 5 (2) |
| 4711 | Northern Health Services Branch, SK | 41.4* | 9.0* | 4.4 | 19.4* | 41.4* | 24.7* | 4 (3) |
| 4801 | Chinook RHA, AB | 25.4 | 12.1 | 4.1 | 20.0* | 57.2 | 9.8 | 2 (1) |
| 4802 | Palliser HA, AB | 28.2 | 12.9 | 4.6 | 17.5 | 53.3 | 7.9* | 3 (0) |
| 4803 | Headwaters HA, AB | 26.6 | 10.1* | 2.0* | 16.6 | 45.0* | 5.9* | 2 (0) |
| 4804 | Calgary RHA, AB | 25.2 | 8.7* | 3.1* | 14.2 | 46.9* | 9.5* | 0 (0) |
| 4805 | HA #5, AB | 27.5 | 7.2* | 4.2 | 16.9 | 55.8 | 9.9 | 4 (0) |
| 4806 | David Thompson RHA, AB | 29.5 | 11.6 | 2.6* | 19.6* | 52.6 | 9.3 | 2 (1) |
| 4807 | East Central HA, AB | 32.6* | 14.0 | 3.1 | 21.6* | 57.2 | 12.5 | 5 (2) |
| 4808 | Westview RHA, AB | 27.2 | 9.6* | 4.3 | 21.4* | 44.0* | 9.2 | 3 (1) |
| 4809 | Crossroads RHA, AB | 30.3 | 13.4 | 3.5 | 18.7 | 47.9* | 8.9* | 3 (0) |
| 4810 | Capital HA, AB | 28.3 | 11.3* | 3.3 | 14.6 | 44.8* | 9.5* | 1 (0) |
| 4811 | Aspen RHA, AB | 28.6 | 11.7 | 4.4 | 20.0* | 53.2 | 7.8* | 3 (1) |
| 4812 | Lakeland RHA, AB | 31.4* | 12.0 | 4.3 | 19.5* | 47.0* | 11.4 | 4 (2) |
| 4813 | Mistahia RHA, AB | 31.2* | 10.1* | 3.5 | 17.1 | 46.3* | 5.4* | 2 (1) |
| 4814 | Peace RHA, AB | 31.6 | 10.3 | 2.4* | 17.5 | 46.9* | 9.8 | 2 (0) |
| 4815 | Keeweenaw Lakes RHA, AB | 39.7* | 13.2 | 5.3 | 22.2* | 44.4* | 12.8 | 5 (2) |
| 4816 | Northern Lights RHA, AB | 33.2* | 8.0* | 3.6 | 18.9* | 47.1* | 3.4* | 2 (2) |

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TABLE 4 - continued

Prevalence of risk factors for cardiovascular disease in Canadians aged 12 years and older by health region, 2000/01

| Region code | Health region | Current smoker (%) | Hypertensive (%) | Diabetic (%) | Obesity (BMI ≥30.0) (%) | Physically inactive (%) | Low income† (%) | Number of risk factors above Canadian averages (# with P<0.05) |
|-------------|---|--------------------|------------------|--------------|-------------------------|-------------------------|-----------------|--|
| 4817 | Northwestern RHA, AB | 27.4 | 13.5 | —‡ | 30.0* | 55.2 | 6.1* | 5 (1) |
| 5901 | East Kootenay, BC | 26.4 | 11.4 | 4.0 | 18.4 | 36.2* | 11.7 | 3 (0) |
| 5902 | West Kootenay-Boundary, BC | 24.7 | 11.7 | 4.1 | 16.1 | 38.4* | 14.9* | 2 (1) |
| 5903 | North Okanagan, BC | 17.7* | 11.1 | 3.0* | 14.1 | 48.0* | 13.6 | 1 (0) |
| 5904 | South Okanagan Similkameen, BC | 24.6 | 15.6 | 4.5 | 13.6 | 45.3* | 9.9 | 2 (0) |
| 5905 | Thompson, BC | 25.9 | 10.6* | 4.4 | 16.1 | 41.5* | 17.8* | 3 (1) |
| 5906 | Fraser Valley, BC | 25.2 | 12.7 | 5.4 | 16.1 | 42.5* | 11.9 | 3 (0) |
| 5907 | South Fraser Valley, BC | 16.8* | 10.0* | 3.0* | 14.5 | 44.8* | 9.1 | 0 (0) |
| 5908 | Simon Fraser, BC | 19.6* | 11.7 | 4.5 | 15.8 | 55.5 | 9.0* | 3 (0) |
| 5909 | Coast Garibaldi, BC | 21.6* | 10.3* | 3.0 | 15.7 | 35.0* | 7.7* | 1 (0) |
| 5910 | Central Vancouver Island, BC | 24.9 | 12.1 | 4.1 | 14.9 | 44.4* | 12.9 | 2 (0) |
| 5911 | Upper Island/Central Coast, BC | 20.8* | 12.8 | 5.2 | 14.1 | 35.3* | 11.0 | 1 (0) |
| 5912 | Cariboo, BC | 24.3 | 14.1 | 6.3* | 17.3 | 40.1* | 12.5 | 4 (1) |
| 5913 | North West, BC | 25.3 | 11.7 | 5.1 | 21.0* | 38.9* | 10.6 | 2 (1) |
| 5914 | Peace Liard, BC | 26.7 | 9.8* | 2.9* | 18.5 | 40.1* | 9.2 | 2 (0) |
| 5915 | Northern Interior, BC | 30.4* | 10.0* | 3.5 | 17.4 | 47.5* | 12.6 | 3 (1) |
| 5916 | Vancouver, BC | 19.6* | 10.5* | 4.2 | 9.3* | 45.0* | 15.0* | 2 (1) |
| 5917 | Burnaby, BC | 18.0* | 10.1* | 3.6 | 9.4* | 45.6* | 14.3 | 1 (0) |
| 5918 | North Shore, BC | 16.1* | 9.1* | 2.6* | 9.6* | 32.1* | 7.4* | 0 (0) |
| 5919 | Richmond, BC | 14.0* | 11.0 | 3.3 | 7.7* | 48.9* | 11.4 | 1 (0) |
| 5920 | Capital, BC | 18.7* | 13.7 | 3.5 | 10.0* | 38.0* | 9.3* | 1 (0) |
| 6001 | Yukon Territory | 33.6* | 8.5* | 3.2 | 18.2 | 36.0* | 8.8 | 2 (1) |
| 6101 | Northwest Territories excluding Nunavut | 46.6* | 8.1* | 2.8* | 22.8* | 55.4 | 16.3* | 4 (3) |
| 6201 | Nunavut | 56.8* | 6.2* | 1.9* | 25.5* | 52.4 | 38.7* | 3 (3) |

Data from the 2000/01 Canadian Community Health Survey (CCHS) (2). **Bolding** represents health region or provincial values that are greater than the Canadian value for the particular risk factor. *P<0.05 for difference between regional and Canadian average. †Respondents aged 15 and over. ‡Data with a coefficient of variation greater than 33.3% was suppressed due to extreme sampling variability. AB Alberta; BC British Columbia; BMI Body mass index; HA Health authority; HCS Health and community services; MB Manitoba; NB New Brunswick; NF Newfoundland and Labrador; NS Nova Scotia; ON Ontario; PEI Prince Edward Island; PHU Public health unit; QC Quebec; RHA Regional health authority; SA Service areas; SK Saskatchewan

TABLE 5
Burden and modifiability of cardiovascular disease (CVD) risk factors

| Risk factor | Prevalence (trend)* | Increased risk of CVD mortality† | Attribution to total CVD mortality‡ | Modifiability through primary prevention (30,31) | Modifiability through 2° and 3° prevention (30,31) |
|---|---------------------|----------------------------------|-------------------------------------|--|--|
| Current smoking | +++ (↓) | ++ | +++ | ++++ | ++ |
| Obesity (BMI ≥30) or overweight (BMI >27) | +++ (↑) | +++ | ++++ | ++ | + |
| Sedentary lifestyle | ++++ (↑) | — | ++++ | +++ | — |
| Low income | ++ (↓) | — | +++ | — | — |
| Diabetes | + (↑) | +++ | + | ++ | +++ |
| Hypertension | ++ (↑) | +++ | +++ | + | ++++ |
| Age | — | ++++ | — | — | — |
| Sex (male) | — | ++ | — | — | — |
| New emerging CVD risk factors§ | ? | ? | ? | ? | ? |

*Prevalence data obtained from the 2000/01 Canadian Community Health Survey (2). Trend in prevalence was determined through comparison to data from the 1996/97 National Population Health Survey, and were all significant with P<0.05. †Rating derived from the number of points given for each risk factor in the assessment of cardiovascular risk in the Framingham study (33); ‡Determined using population-attributable risk estimates, considering the prevalence of the risk factor and the increase in risk of CVD mortality due to the presence of the risk factor (32). §Includes thrombogenic factors, homocysteine, markers of inflammation, infection and genetics (20). BMI Body mass index; 2° Secondary; 3° Tertiary

TABLE 5 Legend

| Rating | Prevalence | Increased risk to CVD: Global risk score | Attribution to total CVD mortality | Modifiability through primary prevention (30,31) | Modifiability through 2° and 3° prevention (30,31) |
|--------|------------|--|------------------------------------|---|--|
| + | 0 to 10% | 0 to 1 | 0% to 20% | Weak plausibility and evidence of modifiability | |
| ++ | 10% to 20% | 1 to 2 | 20% to 25% | Moderate plausibility and evidence of modifiability | |
| +++ | 20% to 35% | 2 to 5 | 25% to 30% | Strong plausibility or evidence of modifiability | |
| ++++ | >35% | >5 | >30% | Strong plausibility and evidence of modifiability. | |

2° Secondary; 3° Tertiary

unaware (26,29), and validation of self-reported diabetes from the NPHS suggested an unquantified level of under-reporting (30). Regional, age and sex comparisons of risk factor prevalence should be done cautiously because the large number of comparisons may have led to differences caused by chance alone. It should also be noted that age-sex standardization was not conducted for any of the prevalence estimates presented. Although standardization would allow fair comparisons between regions, crude estimates allow better assessment of the actual burden of disease in each population. There are several limitations and interpretative cautions for the calculation of SAM estimates resulting from error and variability for prevalence, mortality and relative risk data.

CONCLUSIONS

As advances in medical and public health further our understanding of CVD, our views on its risk factors and the role of individual and community interventions have broadened beyond genetic, health care and lifestyle factors to aspects of the social and economic environments. Previous reports such as the 2003 *Growing Burden of Heart Disease and Stroke in Canada* (1) have, however, indicated the complexity of preventing CVD. A successful prevention program requires coordination of primary, secondary and tertiary prevention, in addition to primordial prevention that addresses underlying conditions (including social and economic concerns) that lead to exposure to causative factors.

APPENDIX A

International Classification of Diseases, Ninth Revision [ICD-9] codes signifying most responsible underlying condition on death certificate (used for smoking-attributable mortality calculations)

| Disease group (k) | Cause of death | ICD-9-CM code |
|--------------------------------|------------------------------------|---------------|
| Neoplasms | | |
| 1 | Lip, oral cavity, pharynx | 140 to 149 |
| 2 | Esophagus | 150 |
| 3 | Pancreas | 157 |
| 4 | Larynx | 161 |
| 5 | Trachea, lung, bronchus | 162 |
| 6 | Cervix uteri | 180 |
| 7 | Urinary bladder | 188 |
| 8 | Kidney, other urinary | 189 |
| Cardiovascular diseases | | |
| 9 | Rheumatic heart disease | 390 to 398 |
| 10 | Hypertension | 401 to 404 |
| 11 | Ischemic heart disease | 410 to 414 |
| 12 | Pulmonary heart disease | 415 to 417 |
| 13 | Cardiac arrest/other heart disease | 420 to 429 |
| 14 | Cerebrovascular disease | 430 to 438 |
| 15 | Atherosclerosis | 440 |
| 16 | Aortic aneurysm | 441 |
| 17 | Other arterial disease | 442 to 448 |
| Respiratory diseases | | |
| 18 | Respiratory tuberculosis | 010 to 012 |
| 19 | Pneumonia, influenza | 480 to 487 |
| 20 | Bronchitis, emphysema | 490 to 492 |
| 21 | Asthma | 493 |
| 22 | Chronic airway obstruction | 496 |

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