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# Cardiovascular disease risk factors

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# Cardiovascular disease and socioeconomic status

**Bruce P. Squires**

*Special supplement*

**Dr. Squires is the former editor-in-chief of *CMAJ*.**

*This article has been peer reviewed.*

Between 1982 and 1992, the Canadian provincial heart health surveys were conducted as part of the Canadian Heart Health Initiative, a collaborative program of the provincial departments of health and Health Canada (then the Department of National Health and Welfare) to provide a database for planning and evaluating demonstration programs to prevent cardiovascular disease (CVD). In this *CMAJ* supplement, Potvin and co-authors (page S5) and Choinière and colleagues (page S13) report the results of analyses conducted to determine the relationship between socioeconomic factors (education, income level and occupation) and the prevalence of risk factors for CVD and the public's ability to identify those risk factors (fat in food, smoking, lack of exercise, excess weight, elevated blood cholesterol and high blood pressure).

The measures of socioeconomic status (SES) are admittedly limited, but the general findings in both analyses are remarkably consistent: people of low socioeconomic status, particularly when educational achievement is considered, not only had the highest prevalence of most risk factors for CVD but also were less able to identify the risk factors. This inverse relationship between SES and prevalence of risk factors was particularly strong for smoking and excess weight, but less obvious for lack of exercise and elevated blood cholesterol levels. Similarly, those who had completed university were more likely than those with only elementary school education to be able to identify CVD risk factors. In spite of the clear differences between those with the most education and those with the least, the prevalence and lack of knowledge about CVD risk factors, even among those at the highest socioeconomic level, is disappointingly high.

The results of these analyses have clear implications for federal and provincial governments and nongovernmental agencies that are charged with addressing CVD and, indeed, for all who provide health care to Canadians. There is an urgent need for effective strategies to reduce the risk of CVD targeted at the least educated and poorest segments of the population, but there is also still a significant need to improve the heart health of all Canadians. The rates of morbidity and death attributed to CVD have been declining in Canada and elsewhere for several decades now, but the battle is not won. The results presented in these 2 papers provide a valuable baseline from which to measure future gains or losses.

# Knowledge of cardiovascular disease risk factors among the Canadian population: relationships with indicators of socioeconomic status

**Louise Potvin; Lucie Richard; Alison C. Edwards**

Abstract

**Background:** We examined the ability of adult Canadians to recall cardiovascular disease risk factors to determine the associations between their ability to recall risk factors for cardiovascular disease and their socioeconomic status.

**Methods:** This study used the database assembled by the Canadian Heart Health Surveys Research Group between 1986 and 1992 — a stratified representative sample comprising 23 129 Canadian residents aged 18 to 74. Nurses administered a standard questionnaire asking respondents to list the major risk factors for cardiovascular disease: fat in food, smoking, lack of exercise, excess weight, elevated blood cholesterol and high blood pressure. Six logistic regressions examined the multivariate associations between ability to recall each risk factor with education, income adequacy, occupation, sex, age, marital status and province of residence.

**Results:** More people knew about the behaviour-related risk factors for cardiovascular disease than about the physiologic risk factors: 60% recalled fat in food, 52% smoking and 41% lack of exercise, but only 32% identified weight, 27% cholesterol and 22% high blood pressure. Education was the socioeconomic status indicator most strongly and consistently associated with the ability to recall risk factors for cardiovascular disease. The odds ratios of reporting an association of the risks between people with elementary education and those with university degrees varied between 0.16 (95% confidence interval 0.12 to 0.22) for lack of exercise to 0.55 (95% confidence interval 0.39 to 0.77) for smoking.

**Interpretation:** People in categories at greater risk of cardiovascular disease, such as those aged 65 or more or those with only elementary education, are less able to recall important cardiovascular disease risk factors.

In Canada, as in many Western countries, the death rate from cardiovascular disease (CVD) for men aged 45 to 64 years has been declining since the beginning of the 1970s.[1] A corresponding decrease in the prevalence of the main CVD risk factors is thought to have contributed to this trend.[2] Prevention trials and information campaigns encouraging people to reduce their risk of developing CVD have been launched during the past 30 years. These programs have focussed primarily on disseminating information about CVD risk factors such as smoking, eating too much fat, not getting enough exercise, being overweight, having high blood pressure and having elevated blood cholesterol levels.[3] We examined the ability of a representative sample of Canadian adults to identify the major CVD risk factors.

Although knowledge alone is insufficient, it is thought to be a prerequisite for making sound decisions about health.[4,5] Indeed, many theories of behaviour modification rely on a person's knowledge or their access to information, such as a person's perceptions of risk and severity in the Health Belief Model,[6,7] self-efficacy beliefs and outcome expectations,[8] and behavioural, normative, control beliefs.[9–11] More specifically, knowledge that a particular condition is a CVD risk factor has been identified as a prerequisite for change and is often targeted by prevention programs.[3,12] Monitoring the population's knowledge of risk factors can help guide public health programs.

*Special supplement*

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Of the few studies that measured how much the general population knows about CVD risk factors, most were done in the context of CVD primary-prevention community trials,[12–20] and only a few used national population samples.[21–26] Although most studies are merely descriptive accounts of what a population knows, some have tried to examine trends in the degree of knowledge people have about CVD risk factors,[17,22–24] and others to identify the correlates of that knowledge. Only 5 have used multivariate analysis techniques.[14–16,18,21,27] The main predictors of whether a person will know the CVD risk factors have been identified in multivariate studies. They are ethnicity,[14,16,18,21] education,[14,16,18,21,27] age,[14,16,21] sex,[14,21,27] income,[21] marital status,[21] source of medical care[21] and geographical region of residence.[21]

One of 2 approaches is generally used to measure a person's knowledge of CVD risk factors. The first uses probes; respondents are asked whether each of a series of actions would place them at risk for CVD. The second approach asks respondents to list everything they can think of that would reduce their risk of CVD or what they think are CVD risk factors. The former method leads to consistently greater estimated levels of knowledge.[22,28]

This study had 2 objectives: to identify segments, particularly socioeconomic segments, of the Canadian population that are not aware of the specific CVD risk factors and to estimate the independent associations between knowing about CVD risk factors and indicators of socioeconomic status (SES) — education, income level, and occupation or main activity. A 1992 study showed that the level of education completed is a stronger predictor of the prevalence of CVD risk factors than either income or occupation.[29]

## Method

Subjects for this study included 23 129 men and women who were interviewed for the Canadian heart health surveys that took place in each Canadian province between 1986 and 1992. Each provincial survey targeted people between the ages of 18 and 74 years who did not live in an institution or on a military base and (except in Manitoba) were not aboriginal and living on a reserve. Each provincial research team designed a stratified 2-stage replicated probability sample selected from the provincial health insurance registry. In each province the targeted sample, with equal numbers of men and women, included 1200 respondents aged 18 to 34 years, 600 respondents aged 35 to 64 years and 400 respondents aged 65 to 74 years.

Those selected (29 855) were telephoned and asked to make an appointment for a 40- to 60-minute interview at home; 23 129 (77%) agreed to participate. Fewer men (76%) than women (79%), and fewer people aged 65 years and older (75%) than people aged 18 to 64 years (78%) agreed to participate. A detailed description of the survey method has been published elsewhere.[30]

The questionnaire used in the provincial surveys was developed by a core group of researchers using validated questions from other surveys.[30] A French translation was available. The risk factors used in this study were all derived from respondents' answers to the following question: "Can you tell me the major causes of heart disease or heart problems?" All elements spontaneously listed by the respondents were classified into 15 categories. Our analysis focuses on the ability to identify 6 modifiable risk factors: fat in food (including poor diet, too much fat and too much cholesterol); smoking; lack of exercise; excess weight; elevated blood cholesterol level; and high blood pressure (including hardening of the arteries and arteriosclerosis). Not mentioning a risk factor was interpreted as not knowing its association with heart disease. As noted above, this procedure leads to an underestimation of the level of knowledge. All respondents were asked the question so there are no missing values. The reliability of the answers to this question was not estimated by a test-retest procedure.

Three socioeconomic variables (education, income level and occupation) and 4 sociodemographic variables (sex, age, marital status and place of residence) were used as covariates. There were 3 categories of income level: high, middle and low. (High income is considered to be one person with an income of $25 000 or more or 2 or more people with an income of $50 000 or more; middle income is considered to be one person with an income between $12 000 and $24 999, 2 people with an income between $12 000 and $49 999, or 3 or more people with an income between $25 000 and $49 999; low income is considered to be 1 or 2 people with an income of less than $12 000 or 3 or more people with an income of less than $25 000.)

Because of the complex sampling design of the surveys, standard errors of estimates provided by standard statistical software are all biased. To address this issue, all bivariate and multivariate estimates were jackknifed in an SAS routine to provide exact standard errors (SE) for all estimates.[31–33] Hypothesis testing and computation of confidence intervals (CI) were performed with $\alpha$-level sets at 0.05. All analyses were performed using weighted data. A socioeconomic or sociodemographic characteristic was judged to be associated with knowing a risk factor when the confidence intervals for some categories of that characteristic did not include one. Six multivariate models identifying the individual characteristics associated with knowing the CVD risk factors are presented, one logistic regression for each risk factor. All equations were computed using the complete sample of 23 129 respondents, including a category for covariates with missing values. The odds ratios (OR) associated with missing categories are not reported in the table. Because the bivariate relationships between education, income level and occupation were moderate (all tau-b coefficients [tau-b is a rank correlation coefficient] were between 0.30 and 0.40), there was no multicollinearity when the 3 were included in the same multivariate equation.

## Results

When respondents were asked to name CVD risk factors (Table 1), they mentioned fat in food (60%) most often, followed by smoking (52%), lack of exercise (41%), excess weight (32%), elevated blood cholesterol (27%) and high blood pressure (22%).

There was a bivariate association among 3 variables — education, occupation and region of residence — and knowing each of the 6 risk factors. Income level was not associated with knowing that either excess weight or high blood pressure are risk factors. The sex of the respondents

was associated only with knowing that excess weight is a risk factor. Marital status was not associated with knowing that smoking, elevated blood cholesterol or high blood pressure are CVD risk factors. Age group was not associated with knowing that high blood pressure is a risk factor.

Analysis of the multivariate associations (Table 2) between sociodemographic and socioeconomic variables and identification of CVD risk factors revealed that controlling for the other variables women were more likely than men to know that fat in food (OR 1.2, 95% CI 1.07 to 1.36) and excess weight (OR 1.48, 95% CI 1.20 to 1.83) are CVD risk factors. There was an association between age and knowing each of the risk factors, except high blood pressure. In general, people aged 65 to 74 years were less likely

**Table 1: Weighted percentage (and standard error [SE]) of Canadians* who identified the 6 important risk factors for cardiovascular disease, by sociodemographic and socioeconomic variables**

| | | Risk factors | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of participants | Fat in food % (SE) | Smoking % (SE) | Lack of exercise % (SE) | Excess weight % (SE) | Elevated cholesterol % (SE) | High blood pressure % (SE) |
| Total | 23 129 | 60 (0.6) | 52 (1.0) | 41 (0.8) | 32 (1.0) | 27 (0.8) | 22 (0.9) |
| **Sex** | | | | | | | |
| Men | 11 376 | 58 (0.9) | 53 (1.1) | 42 (0.8) | 29 (0.8) | 27 (1.1) | 21 (1.0) |
| Women | 11 753 | 61 (0.8) | 51 (1.2) | 40 (1.0) | 36 (1.9) | 28 (1.1) | 23 (1.0) |
| **Age group, yr** | | | | | | | |
| 18–24 | 3 805 | 63 (1.1) | 53 (1.2) | 43 (1.2) | 26 (1.2) | 31 (0.8) | 22 (0.9) |
| 25–34 | 7 991 | 65 (1.2) | 57 (0.8) | 49 (1.0) | 34 (2.2) | 27 (0.8) | 22 (1.4) |
| 35–44 | 3 243 | 63 (3.0) | 55 (3.9) | 49 (1.5) | 38 (1.8) | 28 (2.4) | 23 (1.1) |
| 45–54 | 2 134 | 56 (1.5) | 55 (2.1) | 37 (1.5) | 32 (3.3) | 31 (1.6) | 22 (1.0) |
| 55–64 | 1 985 | 56 (2.7) | 44 (1.0) | 32 (3.5) | 30 (2.3) | 23 (1.0) | 21 (2.0) |
| 65–74 | 3 971 | 45 (1.0) | 39 (1.1) | 20 (1.3) | 27 (1.1) | 20 (2.2) | 19 (1.3) |
| **Marital status†** | | | | | | | |
| Never married | 5 268 | 63 (0.7) | 53 (1.5) | 45 (1.4) | 28 (0.6) | 28 (0.6) | 20 (1.3) |
| Divorced/separated/widowed | 2 108 | 54 (1.5) | 48 (3.9) | 37 (2.4) | 31 (1.7) | 23 (3.4) | 20 (3.2) |
| Married | 15 737 | 60 (1.0) | 53 (0.8) | 41 (0.7) | 34 (1.2) | 28 (0.9) | 23 (0.8) |
| **Education†** | | | | | | | |
| Elementary school | 1 160 | 34 (2.8) | 24 (3.2) | 12 (1.4) | 12 (1.4) | 10 (1.5) | 10 (1.3) |
| Some secondary school | 7 260 | 49 (0.8) | 53 (0.9) | 24 (1.4) | 31 (2.3) | 23 (0.9) | 21 (1.4) |
| Secondary school completed | 11 072 | 63 (1.3) | 54 (2.0) | 47 (0.9) | 35 (0.6) | 30 (0.8) | 23 (0.8) |
| University degree | 3 586 | 72 (1.8) | 56 (1.3) | 57 (1.4) | 34 (1.7) | 32 (2.2) | 25 (1.2) |
| **Income level** | | | | | | | |
| Low | 4 978 | 51 (1.5) | 47 (3.0) | 29 (1.9) | 30 (2.5) | 22 (0.9) | 20 (1.7) |
| Middle | 10 231 | 60 (1.3) | 51 (1.4) | 42 (0.9) | 33 (1.3) | 27 (1.4) | 23 (0.7) |
| High | 5 594 | 67 (0.8) | 56 (1.1) | 50 (1.6) | 35 (0.7) | 32 (1.3) | 24 (1.1) |
| Missing | 2 326 | 50 (1.1) | 50 (1.2) | 31 (3.0) | 26 (2.5) | 21 (1.3) | 16 (3.0)‡ |
| **Occupation** | | | | | | | |
| Professional/manager | 5 343 | 68 (1.9) | 57 (1.2) | 54 (1.7) | 39 (1.5) | 30 (1.0) | 25 (0.8) |
| Clerk/sales | 3 571 | 60 (0.9) | 56 (1.0) | 41 (1.2) | 34 (1.0) | 31 (2.6) | 21 (2.0) |
| Skilled | 3 010 | 56 (1.2) | 58 (4.4) | 38 (1.7) | 32 (2.6) | 31 (2.5) | 21 (1.8) |
| Nonskilled/other | 5 968 | 52 (1.2) | 51(1.1) | 33 (1.2) | 28 (2.5) | 21 (1.2) | 21 (1.0) |
| Homemaker | 3 438 | 57 (1.6) | 42 (1.9) | 35 (1.9) | 31 (1.7) | 24 (1.9) | 22 (2.9) |
| Other | 1 799 | 59 (1.7) | 37 (2.1) | 37 (1.9) | 21 (2.1) | 23 (2.4) | 18 (1.2) |
| **Region of residence** | | | | | | | |
| BC | 2 394 | 64 (1.3) | 51 (2.0) | 50 (1.6) | 41 (1.8) | 35 (1.5) | 34 (1.3) |
| Prairies | 7 161 | 58 (1.2) | 57 (1.0) | 43 (1.5) | 42 (2.2) | 29 (1.3) | 26 (1.1) |
| Ontario | 2 538 | 58 (1.2) | 62 (2.6) | 39 (1.5) | 34 (2.5) | 31 (2.0) | 21 (2.3) |
| Quebec | 2 353 | 64 (1.2) | 38 (1.0) | 42 (1.1) | 17 (0.8) | 18 (1.0) | 12 (0.7) |
| Atlantic | 8 683 | 51 (1.4) | 46 (1.2) | 33 (1.4) | 42 (0.8) | 27 (0.5) | 35 (0.7) |

*Proportions are weighted to reflect the Canadian population.
†Number of participants does not total 23 129: marital status of 16 respondents and education level of 51 respondents are missing.
‡Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with caution.
Source: Canadian heart health surveys 1986–92.

**Table 2: Logistic regressions (adjusted by region of residence)* of Canadians' knowledge about each cardiovascular disease risk factor by sociodemographic and socioeconomic variables**

| | Risk factors | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fat in food | | Smoking | | Lack of exercise | | Excess weight | | Elevated cholesterol | | High blood pressure | |
| | OR | (95% CI) | OR | (95% CI) | OR | (95% CI) | OR | (95% CI) | OR | (95% CI) | OR | (95% CI) |
| **Sex** | | | | | | | | | | | | |
| Men | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – |
| Women | 1.20 | (1.07–1.36) | 0.99 | (0.85–1.16) | 0.92 | (0.84–1.00) | 1.48 | (1.20–1.83) | 1.10 | (0.94–1.28) | 1.07 | (0.91–1.27) |
| **Age group, yr** | | | | | | | | | | | | |
| 18–24 | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – |
| 25–34 | 0.97 | (0.87–1.08) | 0.98 | (0.81–1.19) | 1.08 | (0.91–1.29) | 1.22 | (0.95–1.58) | 0.70 | (0.62–0.78) | 0.90 | (0.71–1.15) |
| 35–44 | 0.88 | (0.70–1.12) | 0.87 | (0.54–1.41) | 1.10 | (0.96–1.27) | 1.54 | (1.24–1.91) | 0.72 | (0.60–0.87) | 0.99 | (0.84–1.18) |
| 45–54 | 0.77 | (0.63–0.95) | 0.88 | (0.66–1.18) | 0.82 | (0.69–0.96) | 1.20 | (0.82–1.75) | 0.91 | (0.73–1.14) | 1.01 | (0.85–1.20) |
| 55–64 | 0.91 | (0.65–1.27) | 0.62 | (0.46–0.82) | 0.77 | (0.52–1.14) | 1.14 | (0.85–1.54) | 0.68 | (0.58–0.81) | 1.00 | (0.78–1.28) |
| 65–74 | 0.63 | (0.51–0.79) | 0.51 | (0.41–0.62) | 0.44 | (0.34–0.57) | 1.08 | (0.91–1.27) | 0.61 | (0.48–0.78) | 0.91 | (0.75–1.10) |
| **Marital status** | | | | | | | | | | | | |
| Married | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – |
| Divorced/separated/widowed | 0.97 | (0.76–1.24) | 0.98 | (0.71–1.35) | 1.22 | (0.85–1.76) | 0.90 | (0.78–1.04) | 0.86 | (0.62–1.20) | 0.92 | (0.59–1.41) |
| Never married | 0.98 | (0.85–1.13) | 0.87 | (0.67–1.13) | 1.01 | (0.82–1.24) | 0.87 | (0.79–0.96) | 0.92 | (0.81–1.05) | 0.87 | (0.72–1.05) |
| **Education** | | | | | | | | | | | | |
| Elementary school | 0.24 | (0.18–0.33) | 0.55 | (0.39–0.77) | 0.16 | (0.12–0.22) | 0.52 | (0.39–0.69) | 0.40 | (0.28–0.58) | 0.42 | (0.28–0.63) |
| Some secondary school | 0.49 | (0.44–0.55) | 1.16 | (0.96–1.40) | 0.34 | (0.28–0.41) | 1.11 | (0.96–1.28) | 0.71 | (0.57–0.88) | 0.78 | (0.66–0.92) |
| Secondary school completed | 0.71 | (0.60–0.84) | 1.11 | (1.00–1.23) | 0.76 | (0.69–0.85) | 1.36 | (1.16–1.60) | 0.97 | (0.81–1.16) | 0.98 | (0.86–1.11) |
| University degree | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – |
| **Income level** | | | | | | | | | | | | |
| Low | 0.72 | (0.61–0.86) | 0.86 | (0.75–0.98) | 0.68 | (0.48–0.96) | 0.89 | (0.69–1.15) | 0.74 | (0.52–1.06) | 0.81 | (0.71–0.92) |
| Middle | 0.88 | (0.74–1.05) | 0.99 | (0.86–1.14) | 1.02 | (0.80–1.30) | 0.97 | (0.83–1.13) | 0.93 | (0.85–1.01) | 0.96 | (0.81–1.15) |
| High | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – |
| **Occupation** | | | | | | | | | | | | |
| Other | 0.90 | (0.65–1.23) | 0.64 | (0.50–0.83) | 0.78 | (0.61–1.00) | 0.69 | (0.51–0.94) | 1.03 | (0.70–1.52) | 1.11 | (0.91–1.36) |
| Homemaker | 0.88 | (0.68–1.15) | 0.74 | (0.53–1.03) | 0.92 | (0.69–1.22) | 0.68 | (0.58–0.81) | 1.04 | (0.81–1.35) | 1.06 | (0.64–1.74) |
| Nonskilled/other | 0.77 | (0.62–0.96) | 0.91 | (0.81–1.02) | 0.75 | (0.62–0.90) | 0.64 | (0.53–0.76) | 0.82 | (0.67–1.01) | 0.94 | (0.83–1.07) |
| Skilled | 0.84 | (0.62–1.14) | 0.94 | (0.72–1.24) | 0.70 | (0.59–0.82) | 0.71 | (0.55–0.93) | 1.15 | (0.93–1.43) | 0.88 | (0.71–1.08) |
| Clerk/sales | 0.80 | (0.62–1.03) | 1.01 | (0.80–1.26) | 0.76 | (0.67–0.86) | 0.73 | (0.58–0.91) | 1.14 | (0.91–1.43) | 0.86 | (0.61–1.22) |
| Professional/manager | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – | 1.00 | – |

Note: OR = odds ratio, CI = confidence interval.
*Results for region of residence are not shown, but were controlled for in all equations.
Source: Canadian heart health surveys 1986–92

to mention a given risk factor than people aged 18 to 24 years.

When the other individual characteristics were controlled for, the strongest and most consistent association was between education and knowing CVD risk factors. However, it was only for lack of exercise, fat in food and, to a lesser extent, elevated cholesterol and high blood pressure that the increment in knowledge increased steadily as education increased. For smoking, the most significant contrast was between those with only elementary school education (OR 0.55, 95% CI 0.39 to 0.77) and those with a university degree. Those who had completed secondary school were most likely to identify excess weight as a risk factor (OR 1.36, 95% CI 1.16 to 1.60) followed by those with a university degree and those with some high school; those with only elementary school education were least likely to identify excess weight (OR 0.52, 95% CI 0.39 to 0.69) as a risk factor. Income level was not associated with knowing that excess weight or elevated blood cholesterol are CVD risk factors. For the other factors, the most significant contrast was between those with high and low income levels. Finally, among the 3 socioeconomic variables, the weakest association was between occupation and knowing about CVD risk factors when controlling for other individual characteristics. Occupation was not associated with knowing that elevated blood cholesterol or high blood pressure are risk factors and was marginally associated with knowing that fat in food and smoking are risk factors. For excess weight, there was a significant contrast between professionals and all other categories of occupation, whereas homemakers (OR 0.92, 95% CI 0.69 to 1.22) and professionals (OR 1) were more likely than other groups to know that lack of exercise is a risk factor.

## Discussion

Two features of these results are most important. First, all segments of the Canadian population are missing some information about the different CVD risk factors. Second, the results of the multivariate analyses clearly identified particular groups of Canadians who still do not know about specific CVD risk factors.

The results presented here clearly show that knowing about the main modifiable CVD risk factors is strongly related to an individual's SES. This observation is supported by previous findings.[14,16,18,21,27] It also corroborates the findings of Choinière and colleagues (page S13) that behavioural CVD risk factors are more prevalent among Canadians of low SES.

After more than a decade of mass-media campaigns, slightly more than half of our sample spontaneously identified eating habits and smoking as CVD risk factors and about 40% mentioned that lack of exercise and CVD are related. In Canadian and American surveys on national samples respondents were usually asked whether or not they thought given behaviours or physiologic states could affect their risk of CVD.[21,22,24] Not surprisingly, people who were asked this question could identify more risk factors than could those who were asked merely to name CVD risk factors. The measures of knowledge used in this study were probably biased by the prominence of the risk factors in the respondents' minds. It should be kept in mind, however, that both probed and unprobed measures of knowledge are widely used and considered to be valid.

Studies that have used unprobed questions about CVD risk factors have been conducted on community samples as part of the evaluation of CVD-prevention community trials. In a sample from the comparison city of the Pawtucket Heart Health Program, a survey done in 1987 and 1988 found rates of knowledge similar to those reported here.[17] Folsom and associates[20] also reported similar results for the 1985 to 1986 baseline survey of the Minnesota Heart Health Program in the Minneapolis metropolitan area. Finally, Avis, McKinlay and Smith[27] reported that many more people knew that exercise and fat in food are risk factors; however, their sample comprised mostly white people from the Boston area. The results of our study clearly indicate that although the situation in Canada is probably comparable to that in other Western countries, large segments of the population are still only aware of some of the CVD risk factors.

Of course, a limitation of this finding is that knowledge was estimated using a general question that treated not *mentioning* a specific risk factor the same as not *knowing* it. This approach certainly underestimates the level of knowledge in the population. However, it does allow us to identify the most commonly known risk factors.

In an attempt to create a summary index of knowledge, the intercorrelations among knowledge items were checked. Most of these correlations were too low to group knowing the risk factors into an overall knowledge index. However, analysing them as different items enabled us to identify gaps in the population's knowledge.

Results presented here clearly identify 2 types of risk factor. The behaviour-related risk factors — fat consumption, smoking and exercise — were mentioned more often than the physiologic ones — high blood pressure and elevated blood cholesterol. The proportion of people that knew that excess weight was a risk factor was mid-way between the proportion that knew that the behaviour-related variables are risk factors and the proportion that knew that the physiologic ones are.

Fewer people knew that physiologic factors are associated with an increased risk of heart disease than knew that behavioural risk factors are associated with it. About 1 in 5 Canadians reported that high blood pressure is associated with an increased risk of CVD, slightly more than 1 in 4 knew that elevated blood cholesterol increases the risk of

CVD, and slightly less than 1 in 3 knew that excess weight is associated with CVD. Again these figures are quite similar to those found in the recent literature.[27]

There is no easy way to explain why behaviour-related risk factors are more likely to be identified than physiologic ones. One can speculate that the behavioural risk factors of CVD are much simpler to disseminate through mass media than the more complex physiologic risk factors. The latter may be more effectively delivered by health care professionals in a clinical setting.[34] Further studies are needed to determine whether the generally low number of people who knew about the physiologic risk factors can be attributed to physicians transmitting that information only to people who actually have one of those risk factors, or whether only a few physicians are systematically informing all their patients about CVD risk factors. Another explanation may be that behaviour-related risk factors are more easily understood than physiologic ones. Previous research has shown that people are not likely to conduct an extensive search for information when making health-related decisions;[5] they are more likely to select the most accessible or familiar option.[5] It is also possible that people learn the easily accessible behavioural information and make no effort to process other information. Or, it might be attributed to the emphasis put on making the public aware of the behavioural risk factors since the middle of the 1970s.

The second important feature of these results is that they identify segments of the population that are less likely to know about CVD prevention. People of low SES and older people were less likely than younger people or people of high SES to identify CVD risk factors. Women were more likely than men to identify association between either weight or fat in food and CVD. Clearly, the segments of the population that are at the greatest risk of developing CVD are those who have received or retained the least amount of information about its prevention.

Results of research on communicating information[5,35,36] are useful in the study of associations between sociodemographic characteristics and knowledge. Individual characteristics, particularly those related to age, sex and SES, have been consistently shown to influence the way a person seeks information as well as their level of knowledge. Other factors, such as having a special interest in health because of a previous illness, could also play important roles.[37]

Another interesting aspect of our results is that the relationship between SES and risk factor is not the same for each of the risk factors. Adler and colleagues[38] have suggested that even if education, income and occupation are interrelated indicators of SES, they do not completely overlap. One might speculate that education is a reflection of living conditions and access to resources during the early part of a person's life, whereas income reflects actual conditions and opportunities. As well, occupation provides cultural environments and access to information that are different from the family and neighbourhood culture and access to information. Our results suggest that all 3 aspects influence a person's knowledge of CVD risk factors. However, because education is a reflection of living conditions during the early part of a person's life, and because education is the indicator most consistently associated with knowing CVD risk factors, then conditions during early life are likely to be most predictive of access to and retrieval of health information.

One finding evident from our work is that health-promotion campaigns should consider individual differences and include distinct messages for subgroups of the population, at least those defined by age and education level. Other variables identified as determinants in the communication process (e.g., method of disseminating information or source of information) should also be considered. It seems that CVD awareness programs have been successful in reaching some segments of the population, but programs need to be developed for the most disadvantaged sectors of the population. Ultimately, we should also recognize the limit of an approach based strictly on persuasive communication and acknowledge that other strategies aiming, for example, at modifying the social or political components of a person's environment should be an integral part of interventions targeting disadvantaged sectors of the population.[39–42]

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# Distribution of cardiovascular disease risk factors by socioeconomic status among Canadian adults

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Abstract

**Background:** This study was designed to describe the distribution of risk factors for cardiovascular disease by socioeconomic status in adult men and women across Canada using the Canadian Heart Health Surveys Database.

**Methods:** The data were derived from provincial cross-sectional surveys done between 1986 and 1992. Data were obtained through a home interview and a clinic visit using a probability sample of 29 855 men and women aged 18–74 years of whom 23 129 (77%) agreed to participate. The following risk factors for cardiovascular disease were considered: elevated total plasma cholesterol (greater than 5.2 mmol/L), regular current cigarette smoking (one or more daily), elevated diastolic or systolic blood pressure (140/90 mm Hg), overweight (body mass index and lack of leisure-time physical activity [less than once a week in the last month]). Education and income adequacy were used as measures of socioeconomic status and mother tongue as a measure of cultural affiliation.

**Results:** For most of the risk factors examined, the prevalence of the risk factors was inversely related to socioeconomic status, but the relationship was stronger and more consistent for education than for income. The inverse relationship between socioeconomic status and the prevalence of the risk factors was particularly strong for smoking and overweight, where a gradient was observed: 46% (standard error [SE] 1.4) of men and 42% (SE 4.3) of women who had not completed secondary school were regular smokers, but only 12% (SE 1.0) of men and 13% (SE 0.9) of women with a university degree were regular smokers. Thirty-nine percent (SE 1.4) of men and 19% (SE 3.8) of women who had not completed secondary school were overweight, compared with 26% (SE 2.6) of male and 19% of female university graduates. The prevalence of leisure-time physical inactivity and elevated cholesterol was highest in both men and women in the lowest socioeconomic category, particularly by level of education.

**Interpretation:** The differences in the prevalence of risk factors for cardiovascular disease between socioeconomic groups are still important in Canada and should be considered in planning programs to reduce the morbidity and mortality from cardiovascular disease.

Behaviour-related risk factors such as being a regular smoker, having high blood pressure, having an elevated cholesterol level, being overweight, being physically inactive and consuming excessive amounts of alcohol can increase the risk of cardiovascular disease (CVD).[1–18] About 70% of premature deaths related to CVD can be prevented by controlling these risk factors.[19]

The death rate from CVD is inversely related to socioeconomic status (SES).[1–3,20–24] In 1986 in urban Canada, the number of CVD-related deaths of men in the poorest income quintile was 35% higher than it was for men in the richest quintile. For women, the number was 11% higher. Between 1971 and 1986 there was little change in the differences in the CVD death rate among income quintiles.[20]

The prevalence of CVD risk factors is also inversely related to SES.[1,2,4–9,25–35] Studies in Canada and the United States have illustrated the relationship between SES and regular smoking,[1,2,4–7,9,28,29,31] between SES and high blood pressure,[2,5,7,8,27,32]

*Special supplement*

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between SES and obesity [2,4,5,29–31,33] and between SES and physical inactivity.[2,4,6,9,28,29,30,34] The findings of an association between SES and elevated cholesterol levels have been inconsistent. Some studies in the US have found no relationship, others have found a weak positive relationship and still others have found an inverse relationship;[4,5,7,29–31,35] previous surveys in Canada indicate no clear pattern.[1,9]

The objective of this study was to determine the relationship between CVD risk factors and SES in Canada using the Canadian heart health database. This survey has 4 interesting features: the data are population-based; the main risk factors for CVD are all analysed at the same time; it is one of the few surveys presenting clinical measures for Canada, particularly by SES; and 2 SES measures — education and income adequacy — are used.

The relationship between each of 5 risk factors — having an elevated total plasma cholesterol level, being a regular cigarette smoker, having elevated diastolic (DBP) or systolic blood pressure (SBP), being overweight and being physically inactive — and SES for men and women are analysed by age group, region of residence and mother tongue. The prevalence rates for having diabetes mellitus and consuming excessive amounts of alcohol were not analysed because they were too low. Education and income adequacy were used as measures of SES, and mother tongue was used as a measure of cultural affiliation.

## Methods

The prevalence of each of the 5 CVD risk factors was derived from 10 provincial heart health surveys conducted between 1986 and 1992. Each provincial survey targeted people between the ages of 18 and 74 years who did not live in an institution or on a military base and (except in Manitoba) were not aboriginal and living on a reserve. Data from each of the 10 provinces were combined to form the Canadian heart health database. Details of the survey methods are described elsewhere by MacLean and colleagues[36] In brief, a probability sample of 29 855 people was selected using health insurance registration files from each province, and these people were invited to participate; 23 129 (77%) agreed. Specially trained nurses administered a standard questionnaire and recorded 2 blood pressure measurements during a home visit. Within 2 weeks, participants visited a survey clinic where 2 more blood pressure measurements were recorded, anthropometric measurements were taken and a fasting blood specimen was taken for plasma lipid determination.

We defined most risk factors described in this paper according to criteria used in a preliminary profile of the Canadian heart health surveys[18,36–40] but used a modified definition of high blood pressure. Elevated cholesterol was defined as total plasma cholesterol of 5.2 mmol/L or more[18,37] in people who had fasted 8 hours or more.[37] Those who either did not provide a blood specimen or who had fasted for fewer than 8 hours were excluded from the analysis of cholesterol levels. People were considered to be "regular smokers" if they reported smoking at least one cigarette every day.[18,38] People were considered to have high blood pressure if they had a DBP ≥ 90 mm Hg (using the 5th Korotkoff sound, or the 4th if the sound did not disappear when the pressure reached 0.0 mm Hg), an SBP ≥ 140 mm Hg, or they were being treated (either pharmacologically or non-pharmacologically [salt restriction or weight reduction]) for high blood pressure.[18,39] Blood pressure values were the mean of the 2 measurements taken during the home visit and the 2 measurements taken during the clinic visit. The mean of the 2 measurements taken during the home interview[39] was used for those who did not come to the clinic. The body mass index (BMI, kg/m$^2$) was used; people with a BMI of 27 or more were considered to be overweight.[40] People were considered to be physically inactive if they had not engaged in leisure-time physical activity at least once a week during the previous month.[38]

Three categories of income adequacy were defined: high, middle and low income. These are based on rough approximations of the ratio of household income to the 1990 Statistics Canada low-income cut-offs for each family size, using the 4 income categories available for all surveys. (High income is considered to be one person with an income of $25 000 or more, or 2 or more people with an income of $50 000 or more; middle income is considered to be one person with an income between $12 000 and $24 999, 2 people with an income between $12 000 and $49 999, or 3 or more people with an income between $25 000 and $49 999; low income is considered to be 1 or 2 people with an income of less than less than $12 000 or 3 or more people with an income of less than $25 000.)

The provincial surveys were carried out between 1986 (in Nova Scotia) and 1992 (in Ontario). Since only 4 income categories were available for all surveys it was not possible to adjust the cut-offs for inflation during those years. As a result, the extent of low income is overreported in the earliest surveys (Atlantic provinces) and underreported in the latest surveys (Quebec and Ontario). Caution should be used therefore when comparing regions, although the income adequacy measures are meaningful for Canada as a whole.

Education was also used as a measure of SES. Level of education was determined by asking, "What is the highest grade or year of school you have completed?"[41]

Mother tongue (English, French, other) refers to the first language learned in childhood and was used as a measure of cultural affiliation.

All prevalence rates (except those broken down by age) were age-standardized using the 1986 Canadian population (including both sexes) as the reference population. Because of the complex sampling design of the survey, standard statistical packages could not be used to provide estimates of standard errors or to calculate test statistics. The formulae used to calculate these quantities in such packages are based on the assumption that samples are selected by simple random sampling with replacement. To obtain standard error (SE) estimates of quantities of interest that take into account the design of the survey, a module written in SAS[42] was developed to produce variance estimates specifically for this survey, using the jackknife approach.[41,43,44] Weighted standard deviation was used to describe the distribution of variables.

The small number of primary sampling units selected in most provinces necessitated that some of the categories be regrouped to obtain efficient jackknife estimates. Three categories of education were retained (secondary school not completed, secondary school completed and university degree obtained), as well as 3 income categories (low, middle and high). Three age groups were also retained (18 to 34, 35 to 64 and 65 to 74 years). The sample size of each provincial survey was not large enough to support an analysis of SES by province so the provinces were grouped into 3 regions:

Atlantic (Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick), Central (Quebec and Ontario) and Western (Manitoba, Saskatchewan, Alberta and British Columbia).

## Results

Details of the sample sizes for each risk factor for men and women are provided in Appendix 1. Details about the exact sample sizes for both sexes by age group, region, mother tongue, education and income adequacy are presented in Appendices 2A and 3A. For each of the 5 CVD risk factors, men were generally more likely to have the risk factor than women, no matter what their age, region or mother tongue.

### *Education level*

The prevalence of the 5 CVD risk factors by education level (Table 1) is consistently highest among men and women who have not completed secondary school, with one exception. Men who have completed secondary school are most likely to have high blood pressure. Men and women who have university degrees are least likely to have each of the risk factors, with one exception. Men who have a university degree and men who have completed secondary school are equally unlikely to be physically inactive. The gradient in prevalence from the lowest to the highest level of education varies for each risk factor. For example, 46% (SE 1.4) of men and 42% (SE 4.3) of women who have not completed secondary school are regular smokers, whereas only 12% (SE 1.0) of men and 13% (SE 0.9) of women with university degrees are regular smokers. But 46% (SE 1.5) of men and 43% (SE 1.5) of women who have not completed secondary school have elevated cholesterol levels, as opposed to 38% (SE 1.2) of men and 35% (SE 2.6) of women with university degrees. The prevalence of regular smokers varied inversely with age and education level and was highest in the Atlantic region (34%, SE 0.8; Appendix 2B) and in those whose mother tongue was French (32%, SE 1.5; Appendix 2B). The inverse association between smoking and education was most pronounced in the 18 to 34-year age group (Appendix 2B); in this age group, the prevalence of men who were regular smokers and had not completed secondary school was 62% (SE 2.4) and of women was 58% (SE 5.7).

There was no clear association between level of education and high blood pressure (Appendix 2C). However, more men had high blood pressure than women, and high blood pressure became more prevalent with age. Geographically, men in the Atlantic region were most likely to have high blood pressure (30%, SE 1.2). Men whose mother tongue was French were less likely to have high blood pressure than men whose mother tongue was not French. These differences were observed in all education levels, except that men whose mother tongue was French or anything other than English were equally unlikely to have high blood pressure.

Men were more likely to be overweight than women, and men and women in the Atlantic region were more likely to be overweight than people in the Central or Western regions (Appendix 2D). Differences between mother tongues were not very large. Men in the 35 to 64-year age group who had not completed secondary school were most likely to be overweight. For both men and women, the likelihood of being overweight decreased as level of education increased. In the 18 to 34- and 35 to 64-year age groups, there was a clear relationship between weight and level of education. For men and women in the 65 to 74-year age group, people who had completed secondary school were the least likely to be overweight. In all regions, women with higher levels of education were less likely to be overweight. Differences between lin-

**Table 1: Age-standardized percentage of men and women in Canada with each of 5 cardiovascular disease risk factors by education level**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Risk factor | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) |
| Regular smoker* | 46 (1.4) | 26 (1.0) | 12 (1.0) | 28 (1.3) | 42 (4.3) | 23 (1.0) | 13 (0.9) | 26 (1.3) |
| High blood pressure† | 26 (1.8) | 28 (1.1) | 21 (3.4) | 25 (1.1) | 20 (0.7) | 15 (1.2) | 12 (2.7)** | 17 (0.8) |
| Overweight‡ | 39 (1.4) | 33 (1.3) | 26 (2.6) | 34 (1.1) | 32 (1.6) | 27 (2.2) | 19 (3.8) | 27 (2.4) |
| Physical inactivity§ | 47 (4.4) | 37 (3.0) | 37 (1.2) | 39 (2.1) | 42 (2.4) | 33 (1.8) | 31 (4.9) | 35 (1.8) |
| Elevated cholesterol¶ | 46 (1.5) | 45 (2.2) | 38 (1.2) | 44 (1.0) | 43 (1.5) | 42 (1.1) | 35 (2.6) | 41 (0.8) |

Note: SE = standard error.
*One or more cigarettes per day.
†Mean systolic blood pressure (SBP) ≥ 140 mm Hg or mean diastolic blood pressure (DBP) ≥ 90 mm Hg or treatment (pharmacologic or non-pharmacologic).
‡Body mass index (kg/m$^2$) ≥ 27.
§Leisure time exercise less than once a week during the previous month.
¶Total plasma cholesterol ≥ 5.2 mmol/L after fasting 8 h or more.
**Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
Source: Canadian heart health surveys 1986–92.

guistic groups were small. For each mother tongue, the likelihood of being overweight decreased as education level increased, except for men whose mother tongue was neither English nor French. In this group, men who had completed secondary school were least likely to be overweight.

More men than women reported being physically inactive for each education level. The highest rates are found in men in the middle age group (44%, SE 1.7; Appendix 2E) and in women in the middle (39%, SE 1.3) and upper (39%, SE 2.4) age groups, in the Atlantic region (44%, SE 1.3 for both men and women) and among those having neither English nor French as their mother tongue (47%, SE 6.1 for men, 42%, SE 2.3 for women). Men in each income (Appendix 3E) and education level (Appendix 2E) were more likely to be physically inactive than women. Physical inactivity was highest in the group with the least education whatever age, region or mother tongue, with 2 exceptions. For women in the 65 to 74-year age group, women with a university degree were most likely to be physically inactive, and for men whose mother tongue was neither English nor French, those who had completed secondary school were most likely to be physically inactive.

Men and women with a university degree were less likely to have elevated cholesterol levels than those with no university degree. The prevalence of elevated total blood cholesterol increased with age (Appendix 2F). People whose mother tongue was French were most likely to have elevated cholesterol levels. For men, the highest rates of elevated cholesterol were in the Atlantic region, whereas for women the highest rates were in Central Canada.

### *Income adequacy*

When the prevalence of risk factors for CVD was examined by level of income adequacy (Table 2) there was a marked inverse relationship between being a cigarette smoker and income level in both men and women, particularly in the 18 to 34-year age group (Appendix 3B). There was also an inverse relationship between smoking and income level by region and mother tongue with one exception, although not as dramatic as that found when analysed by education level. The exception was that in the group of women whose mother tongue was neither English nor French, those in the middle-income group were more likely to be regular smokers. There was no clear association between income level and high blood pressure in either sex. Predictably, high blood pressure was most common in the older age group in both men and women (Appendix 3C) and in both men and women in the Atlantic region. In men, those whose mother tongue was French were least likely to have high blood pressure (20%, SE 1.2).

Although men and women in the low-income group were most likely to be overweight, the gradient between low and high income was smaller than that demonstrated between lower and upper levels of education (Tables 1 and 2). Men and women in the Atlantic region were more likely to be overweight (Appendix 3D), but income level seemed to have little effect on the likelihood of being overweight. Men and women in the low-income group were most likely to be physically inactive (43%, SE 5.1 for men; 37%, SE 5.0, for women; Appendix 3E). Both men and women in the Atlantic region, and men and women who did not have English or French as their mother tongue were most likely to be physically inactive. The gradient in the rates of physical inactivity between low and high income is very small. Men and women in the oldest age group were the most likely to have high cholesterol levels (Appendix 3F), but when income level was analysed, no

**Table 2: Age-standardized percentage of men and women in Canada with each of 5 cardiovascular disease risk factors by income adequacy level**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Risk factor | Low income; % (SE)* | Middle income; % (SE) | High income; % (SE) | Total; % (SE) | Low income; % (SE) | Middle income ; % (SE) | High income ; % (SE) | Total; % (SE) |
| Regular smoker* | 40 (2.3) | 28 (1.7) | 22 (2.1) | 28 (1.3) | 34 (2.2) | 27 (0.9) | 19 (1.7) | 26 (1.3) |
| High blood pressure† | 27 (2.8) | 26 (1.3) | 25 (3.6) | 25 (1.1) | 17 (0.9) | 17 (0.8) | 14 (1.4) | 17 (0.8) |
| Overweight‡ | 36 (2.4) | 33 (1.0) | 33 (1.7) | 34 (1.1) | 30 (2.1) | 29 (2.2) | 23 (2.6) | 27 (2.4) |
| Physical inactivity§ | 43 (5.1) | 41 (1.7) | 36 (0.9) | 39 (2.1) | 37 (5.0) | 33 (0.9) | 34 (2.2) | 35 (1.8) |
| Elevated cholesterol¶ | 43 (2.2) | 43 (1.1) | 46 (1.3) | 44 (1.0) | 42 (3.2) | 40 (0.9) | 43 (2.7) | 41 (0.8) |

Note: SE = standard error.
*One or more cigarettes per day.
†Mean systolic blood pressure (SBP) ≥ 140 mm Hg or mean diastolic blood pressure (DBP) ≥ 90 mm Hg or treatment (pharmacologic or non-pharmacologic).
‡Body mass index (kg/m$^2$) ≥ 27.
§Leisure time exercise less than once a week during the previous month.
¶Total plasma cholesterol ≥ 5.2 mmol/L after fasting 8 h or more.
Source: Canadian heart health surveys 1986–92.

discernible pattern was evident between income level and cholesterol level.

## Discussion

The likelihood of having any of the 5 CVD risk factors would be expected to be lower in the high income and education groups. The results obtained from the Canadian heart health database show that for most of the risk factors, the prevalence did vary as expected. Moreover, as was observed from the Stanford 5-year project in the US,[7] the pattern of distribution was more consistent for education than for income.[7] These results are similar to those found in previous surveys conducted in Canada and in the US.[1,2,4–9,27–34]

The likelihood of being physically inactive or having an elevated cholesterol level varied by SES, particularly according to education level, but the gradient was less obvious from low to high levels of education or income. The 1991 General Social Survey also indicated a greater likelihood of physical inactivity among those who had not completed secondary school.[6] When income adequacy was considered, this contrast was less evident.

Men and women with a university degree were less likely to have an elevated cholesterol level than those with no university degree, but no difference was found among income levels. Previous surveys conducted in Canada indicate no clear relationship between cholesterol level and education level.[6] The relationship between elevated cholesterol levels and SES varies in the literature.[4,5,7,29–31,35]

Finally, the results of our survey showed no clear pattern between SES and the prevalence of high blood pressure. Previous Canadian surveys also indicated no clear relationship between high blood pressure and education level.[6,45] A study conducted among British men showed that the prevalence of high blood pressure was lower in the highest social classes than it was in the rest of the population.[2]

The relationship between education and CVD risk factors was stronger for women than for men, except between education and the likelihood of being a regular smoker. Also, for each of the 5 risk factors, men had higher prevalence rates than women. For both men and women, level of education had the greatest effect on whether a person was a regular smoker or overweight.

In general for men and women the highest prevalence rates for each of the 5 CVD risk factors were found in the Atlantic region. CVD death rates showed the same pattern; the Atlantic provinces have consistently higher rates than other provinces.[46] Within each region, there was an inverse relationship between SES and being a regular smoker, being overweight and being physically inactive. Differences among regions did not vary much from one education level to another.

People whose mother tongue was French were most likely to have an elevated cholesterol level and be a regular smoker, whereas people whose mother tongue was English were most likely to be physically inactive. This pattern was still present among the linguistic groups when analysed by level of income and education. Thus, differences among linguistic groups cannot be explained solely by SES. Canada's Health Promotion Survey of 1985 showed that French-speaking people were most likely of the 3 linguistic groups to be regular smokers and physically inactive.[28]

Although the prevalence of CVD risk factors and death rates have declined sharply during the last decade, the differences between SES are still important. Over time, reducing the differences in the prevalence of CVD risk factors between the low and high SES groups would diminish SES disparities in CVD mortality and reduce CVD mortality for the population as a whole. Smoking is the single most preventable cause of premature death.[47–49] These findings show that smoking prevalence rates vary greatly with SES. Moreover, 50% of all premature deaths each year would be preventable through control of smoking, blood pressure and cholesterol levels, diabetes and alcohol abuse.[50] Studies show that increases in life expectancy that arise from changes in prevalence rates of CVD risk factors are more substantial to individuals at risk than for the population as a whole.[48] These facts should be considered when planning health promotion programs.

This study has several limitations. The data were obtained through surveys conducted between 1986 and 1992 and any changes in prevalence of the risk factors that occurred during that period will not be evident. Furthermore, the effects of inflation may bias the data on income level, depending on when each provincial survey was done. Finally, using only 3 levels of education and income provides a relatively crude estimate of SES. Nevertheless, the differences in the prevalence of CVD risk factors between high and low levels of SES are still obvious and point to the continuing need to focus on programs designed to lower morbidity and mortality from CVD.

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**Appendix 1: Number of men and women in each sample for 5 cardiovascular disease risk factors**

| Risk factor | Response | Men | Women |
|---|---|---|---|
| Regular smoker* | No | 8023 | 8500 |
| | Yes | 3350 | 3252 |
| High blood pressure† | No | 8350 | 9412 |
| | Yes | 3026 | 2341 |
| Overweight‡ | No | 6090 | 7035 |
| | Yes | 3705 | 3011 |
| Physical inactivity§ | No | 7038 | 7336 |
| | Yes | 4338 | 4416 |
| Elevated cholesterol¶ | No | 5167 | 5671 |
| | Yes | 4059 | 3786 |

*One or more cigarettes per day

†Mean systolic blood pressure (SBP) ≥ 140 mm Hg or mean diastolic blood pressure (DBP) ≥ 90 mm Hg or treatment (pharmacologic or non-pharmacologic).

‡Body mass index (kg/m$^2$) ≥ 27.

§Leisure time exercise less than once a week during the previous month.

¶Total plasma cholesterol ≥ 5.2 mmol/L after fasting 8 h or more.

Source: Canadian heart health surveys 1986–92.

**Appendix 2A: Number of men and women according to education level, by age group, region and mother tongue**

| Age/region/ language | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Secondary school not completed | Secondary school completed | University degree obtained | Secondary school not completed | Secondary school completed | University degree obtained |
| **Age group, yr** | | | | | | |
| 18–34 | 1467 | 3254 | 1030 | 1238 | 3814 | 987 |
| 35–64 | 1586 | 1285 | 737 | 1573 | 1646 | 516 |
| 65–74 | 1342 | 479 | 170 | 1214 | 594 | 146 |
| **Region** | | | | | | |
| Atlantic | 2073 | 1640 | 562 | 1852 | 2104 | 446 |
| Central | 699 | 1193 | 513 | 694 | 1368 | 415 |
| Western | 1623 | 2185 | 862 | 1479 | 2582 | 788 |
| **Mother tongue** | | | | | | |
| English | 2590 | 3325 | 1312 | 2245 | 4022 | 1122 |
| French | 694 | 826 | 221 | 668 | 976 | 200 |
| Other | 597 | 488 | 272 | 646 | 535 | 217 |

Source: Canadian heart health surveys 1986–92.

**Appendix 2B: Age-standardized percentage of men and women in Canada smoking one or more cigarettes per day according to education level, by age group, region and mother tongue**

| Age/region/ language | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) |
| Total | 46 (1.4) | 26 (1.0) | 12 (1.0) | 28 (1.3) | 42 (4.3) | 23 (1.0) | 13 (0.9) | 26 (1.3) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 62 (2.4) | 31 (1.0) | 10 (1.3) | 33 (1.5) | 58 (5.7) | 28 (1.0) | 16 (1.3) | 30 (1.2) |
| 35–64 | 33 (2.4) | 26 (2.3) | 16 (1.7) | 27 (1.7) | 32 (3.7) | 22 (1.4) | 15 (2.2) | 24 (1.7) |
| 65–74 | 20 (2.2) | 13 (1.6) | 7 (2.8)† | 17 (1.4) | 16 (1.1) | 13 (3.5)* | 7 (3.5)† | 15 (1.7) |
| **Region** | | | | | | | | |
| Atlantic | 46 (1.6) | 26 (1.8) | 15 (2.1) | 34 (0.8) | 42 (1.7) | 26 (0.9) | 13 (2.6)* | 31 (0.9) |
| Central | 48 (2.1) | 25 (1.3) | 11 (1.4) | 28 (2.0) | 44 (6.8) | 23 (1.5) | 12 (1.4) | 25 (2.0) |
| Western | 42 (2.1) | 28 (1.4) | 12 (1.1) | 27 (0.8) | 39 (1.7) | 23 (1.1) | 14 (0.8) | 24 (1.1) |
| **Mother tongue** | | | | | | | | |
| English | 47 (2.3) | 26 (1.1) | 11 (1.5) | 28 (1.0) | 50 (3.7) | 23 (1.9) | 11 (0.7) | 26 (1.2) |
| French | 46 (2.8) | 31 (2.0) | 15 (3.8)* | 32 (1.5) | 44 (3.1) | 29 (2.1) | 20 (3.8)* | 31 (1.5) |
| Other | 45 (3.3) | 17 (1.9) | 12 (3.2)* | 22 (2.5) | 18 (7.6)† | 12 (3.2)* | 15 (4.7)* | 14 (2.5)* |

Note: SE = standard error.
*Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
†Coefficient of variation > 33.3%; results should not be used.
Source: Canadian heart health surveys 1986–92.

**Appendix 2C: Age-standardized percentage of men and women in Canada having high blood pressure* according to education, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) |
| Total | 26 (1.8) | 28 (1.1) | 21 (3.4) | 25 (1.1) | 20 (0.7) | 15 (1.2) | 12 (2.7)† | 17 (0.8) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 12 (3.7)† | 11 (0.9) | 10 (2.9)† | 11 (0.4) | 4 (0.8)† | 2 (0.3) | 2 (0.5)† | 2 (0.2) |
| 35–64 | 34 (2.0) | 34 (2.8) | 23 (4.6)† | 31 (2.1) | 31 (1.8) | 18 (2.2) | 10 (1.5) | 21 (1.3) |
| 65–74 | 60 (3.4) | 52 (3.5) | 45 (10.0)† | 56 (3.4) | 62 (2.7) | 56 (4.8) | 42 (7.7)† | 58 (2.9) |
| **Region** | | | | | | | | |
| Atlantic | 32 (2.2) | 28 (1.5) | 30 (1.7) | 30 (1.2) | 25 (0.8) | 19 (1.4) | 14 (3.5)† | 22 (0.7) |
| Central | 26 (2.9) | 30 (1.4) | 21 (4.9)† | 26 (1.6) | 19 (1.0) | 15 (1.8) | 13 (4.6)‡ | 16 (1.2) |
| Western | 23 (1.2) | 24 (1.6) | 18 (2.1) | 22 (0.8) | 18 (1.1) | 16 (1.0) | 12 (1.9) | 16 (0.4) |
| **Mother tongue** | | | | | | | | |
| English | 30 (3.8) | 29 (3.1) | 21 (5.2)† | 28 (2.0) | 21 (1.2) | 16 (2.1) | 10 (3.4)‡ | 16 (1.3) |
| French | 20 (1.5) | 21 (1.5) | 20 (3.3)† | 20 (1.2) | 18 (1.5) | 13 (1.3) | 15 (4.0)† | 16 (1.0) |
| Other | 20 (1.9) | 34 (4.2) | 21 (3.0) | 25 (2.8) | 20 (2.6) | 17 (3.7)† | 18 (3.3)† | 18 (2.0) |

Note: SE = standard error.
*Mean systolic blood pressure (SBP) ≥ 140 mm Hg or mean diastolic blood pressure (DBP) ≥ 90 mm Hg or treatment (pharmacologic or non-pharmacologic).
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
‡Coefficient of variation > 33.3%; results should not be used.
Source: Canadian heart health surveys 1986–92.

**Appendix 2D: Age-standardized percentage of men and women in Canada who are overweight* according to education level, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) |
| Total | 39 (1.4) | 33 (1.3) | 26 (2.6) | 34 (1.1) | 32 (1.6) | 27 (2.2) | 19 (3.8) | 27 (2.4) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 26 (4.0) | 23 (0.8) | 23 (1.5) | 23 (0.7) | 24 (1.8) | 19 (1.9) | 8 (1.4)† | 17 (1.6) |
| 35–64 | 51 (2.3) | 42 (2.7) | 29 (3.7) | 43 (2.1) | 43 (4.8) | 32 (3.2) | 21 (5.1)† | 34 (4.4) |
| 65–74 | 46 (4.2) | 29 (4.7) | 33 (8.2)† | 40 (3.7) | 44 (2.6) | 35 (4.2) | 40 (17.0)‡ | 40 (2.4) |
| **Region** | | | | | | | | |
| Atlantic | 46 (2.0) | 37 (2.4) | 38 (3.2) | 41 (1.1) | 39 (1.1) | 30 (1.5) | 24 (2.2) | 33 (0.8) |
| Central | 38 (2.0) | 31 (2.0) | 24 (3.7) | 32 (1.6) | 30 (2.1) | 28 (3.4) | 18 (5.8)† | 27 (3.7) |
| Western | 36 (2.2) | 37 (2.0) | 29 (2.0) | 35 (1.6) | 33 (2.2) | 26 (0.6) | 20 (3.2) | 27 (1.4) |
| **Mother tongue** | | | | | | | | |
| English | 40 (1.9) | 37 (2.2) | 27 (3.1) | 36 (1.6) | 32 (1.5) | 29 (1.6) | 19 (3.7)† | 28 (2.0) |
| French | 36 (3.3) | 29 (3.0) | 24 (4.9)† | 31 (1.9) | 31 (2.3) | 22 (1.5) | 20 (4.5)† | 25 (1.2) |
| Other | 36 (2.9) | 26 (2.8) | 30 (5.7)† | 31 (1.5) | 32 (3.7) | 27 (8.0)† | 15 (4.4)† | 28 (6.5)† |

Note: SE = standard error.
*Body mass index (kg/m$^2$) ≥ 27.
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
‡Coefficient of variation > 33.3%; results should not be used.
Source: Canadian heart health surveys 1986–92.

**Appendix 2E: Age-standardized percentage of men and women in Canada who report lack of leisure-time physical activity* according to education, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) |
| Total | 47 (4.4) | 37 (3.0) | 37 (1.2) | 39 (2.1) | 42 (2.4) | 33 (1.8) | 31 (4.9) | 35 (1.8) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 42 (8.9)† | 31 (2.2) | 32 (1.8) | 34 (3.3) | 37 (3.6) | 31 (3.0) | 28 (1.6) | 31 (2.3) |
| 35–64 | 52 (2.1) | 45 (2.7) | 35 (4.7)† | 44 (1.7) | 47 (1.9) | 35 (1.9) | 32 (8.1)† | 39 (1.3) |
| 65–74 | 42 (3.4) | 29 (6.6) | 39 (10.1)† | 38 (4.1) | 41 (4.1) | 34 (4.1) | 43 (12.6)† | 39 (2.4) |
| **Region** | | | | | | | | |
| Atlantic | 53 (1.5) | 41 (2.0) | 22 (2.0) | 44 (1.3) | 52 (2.3) | 36 (1.2) | 32 (2.2) | 44 (1.3) |
| Central | 49 (7.4) | 38 (4.7) | 41 (2.1) | 40 (3.4) | 40 (4.0) | 34 (2.9) | 32 (7.1)† | 35 (2.8) |
| Western | 41 (1.9) | 33 (1.1) | 30 (2.5) | 35 (0.9) | 40 (2.4) | 32 (0.9) | 26 (1.2) | 33 (0.8) |
| **Mother tongue** | | | | | | | | |
| English | 46 (4.7) | 33 (2.5) | 35 (3.9) | 37 (1.8) | 40 (3.0) | 32 (2.5) | 27 (4.4) | 33 (2.5) |
| French | 49 (3.3) | 35 (2.9) | 33 (4.1) | 39 (1.9) | 39 (3.9) | 31 (2.4) | 32 (5.2) | 34 (1.4) |
| Other | 49 (12.1))† | 50 (5.8) | 49 (7.9) | 47 (6.1) | 49 (2.5) | 39 (2.9) | 39 (5.3) | 42 (2.3) |

Note: SE = standard error.
*Exercised less than once a week during previous month.
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
Source: Canadian heart health surveys 1986–92.

**Appendix 2F: Age-standardized percentage of men and women in Canada with elevated cholesterol* according to education, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Secondary school not complete; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) | Secondary school not completed; % (SE) | Secondary school completed; % (SE) | University degree obtained; % (SE) | Total; % (SE) |
| Total | 46 (1.5) | 45 (2.2) | 38 (1.2) | 44 (1.0) | 43 (1.5) | 42 (1.1) | 35 (2.6) | 41 (0.8) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 29 (4.8)† | 25 (1.6) | 21 (2.1) | 25 (1.4) | 23 (2.6) | 21 (1.3) | 24 (3.8) | 22 (1.3) |
| 35–64 | 61 (2.2) | 60 (3.5) | 52 (2.2) | 58 (2.0) | 61 (2.6) | 49 (2.0) | 37 (3.4) | 51 (2.1) |
| 65–74 | 63 (5.0) | 62 (8.2) | 55 (9.3)† | 62 (4.2) | 79 (2.0) | 80 (5.6) | 69 (7.8) | 78 (1.9) |
| **Region** | | | | | | | | |
| Atlantic | 50 (1.2) | 48 (2.7) | 45 (2.9) | 48 (0.7) | 43 (1.5) | 37 (1.5) | 40 (4.1) | 41 (0.8) |
| Central | 43 (2.4) | 46 (3.1) | 35 (1.6) | 43 (1.5) | 43 (3.0) | 44 (1.4) | 34 (4.7) | 42 (1.2) |
| Western | 47 (1.8) | 44 (0.9) | 42 (1.5) | 44 (0.7) | 41 (1.9) | 38 (1.0) | 36 (1.5) | 38 (0.7) |
| **Mother tongue** | | | | | | | | |
| English | 44 (1.5) | 46 (1.6) | 39 (1.9) | 44 (1.1) | 39 (1.8) | 40 (2.0) | 35 (3.2) | 40 (2.3) |
| French | 48 (1.8) | 51 (2.6) | 41 (3.6) | 47 (1.4) | 47 (2.3) | 48 (1.7) | 36 (4.0) | 46 (1.5) |
| Other | 47 (10.2)† | 35 (6.3)† | 34 (2.9) | 37 (1.9) | 39 (5.1) | 36 (4.3) | 29 (6.9)† | 36 (3.4) |

Note: SE = standard error.
*Total plasma cholesterol ≥ 5.2 mmol/L, among those who fasted 8 h or more.
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
Source: Canadian heart health surveys 1986–92.

**Appendix 3A: Number of men and women according to level of income adequacy, by age group, region and mother tongue**

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| Age/region/language | Low income | Middle income | High income | Low income | Middle income | High income |
| **Age group, yr** | | | | | | |
| 18–34 | 1090 | 2512 | 1646 | 1541 | 2557 | 1361 |
| 35–64 | 615 | 1471 | 1271 | 783 | 1564 | 964 |
| 65–74 | 414 | 1158 | 211 | 535 | 969 | 141 |
| **Region** | | | | | | |
| Atlantic | 1188 | 2018 | 802 | 1514 | 1956 | 617 |
| Central | 231 | 914 | 971 | 366 | 906 | 790 |
| Western | 700 | 2209 | 1355 | 979 | 2228 | 1059 |
| **Mother tongue** | | | | | | |
| English | 1171 | 3255 | 2142 | 1624 | 3204 | 1712 |
| French | 296 | 799 | 508 | 419 | 798 | 404 |
| Other | 275 | 593 | 322 | 347 | 573 | 237 |

Source: Canadian heart health surveys 1986–92.

**Appendix 3B: Age-standardized percentage of men and women in Canada smoking more than one cigarette per day according to income adequacy, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) |
| Total | 40 (2.3) | 28 (1.7) | 22 (2.1) | 28 (1.3) | 34 (2.2) | 27 (0.9) | 19 (1.7) | 26 (1.3) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 46 (2.4) | 34 (1.3) | 24 (2.1) | 33 (1.5) | 40 (2.0) | 31 (1.3) | 23 (1.6) | 30 (1.2) |
| 35–64 | 38 (4.5) | 26 (2.2) | 23 (2.5) | 27 (1.7) | 33 (5.0) | 27 (2.7) | 18 (3.5)* | 24 (1.7) |
| 65–74 | 19 (5.8)* | 17 (3.7)* | 12 (5.9)† | 17 (1.4) | 14 (3.1)* | 12 (3.3)* | 16 (5.2)* | 15 (1.7) |
| **Region** | | | | | | | | |
| Atlantic | 48 (1.3) | 29 (1.3) | 24 (1.5) | 34 (0.8) | 40 (1.5) | 28 (1.1) | 20 (1.6) | 31 (0.9) |
| Central | 39 (3.8) | 29 (2.9) | 22 (2.9) | 28 (2.0) | 33 (3.1) | 28 (1.3) | 18 (2.3) | 25 (2.0) |
| Western | 34 (5.0) | 28 (1.5) | 21 (1.6) | 27 (0.8) | 32 (2.9) | 24 (1.3) | 19 (1.1) | 24 (1.1) |
| **Mother tongue** | | | | | | | | |
| English | 38 (3.6) | 28 (2.9) | 21 (2.7) | 28 (1.0) | 35 (1.6) | 27 (2.0) | 18 (2.3) | 26 (1.2) |
| French | 50 (3.8) | 33 (2.5) | 27 (2.5) | 32 (1.5) | 44 (3.2) | 31 (1.9) | 23 (2.5) | 31 (1.5) |
| Other | 28 (4.8)* | 22 (2.7) | 15 (1.9) | 22 (2.5) | 13 (4.9)† | 19 (2.3) | 9 (2.5)* | 14 (2.5)* |

Note: SE = standard error.
*Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
†Coefficient of variation > 33.3%; results should not be used.
Source: Canadian heart health surveys 1986–92.

**Appendix 3C: Age-standardized percentage of men and women in Canada having high blood pressure* according to income adequacy, by age group, region and mother tongue**

| Age/region/ language | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) |
| Total | 27 (2.8) | 26 (1.3) | 25 (3.6) | 25 (1.1) | 17 (0.9) | 17 (0.8) | 14 (1.4) | 17 (0.8) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 9 (1.8)† | 11 (2.3)† | 13 (3.6)† | 11 (0.4) | 3 (0.6)† | 3 (0.4) | 2 (0.3)† | 2 (0.2) |
| 35–64 | 41 (6.0) | 35 (2.1) | 27 (3.3) | 31 (2.1) | 22 (2.3) | 23 (1.5) | 15 (2.3) | 21 (1.3) |
| 65–74 | 56 (8.8) | 56 (2.5) | 54 (7.8) | 56 (3.4) | 64 (2.9) | 57 (2.7) | 52 (5.7) | 58 (2.9) |
| **Region** | | | | | | | | |
| Atlantic | 30 (2.5) | 29 (1.2) | 29 (1.8) | 30 (1.2) | 26 (0.7) | 20 (1.2) | 18 (3.1)† | 22 (0.7) |
| Central | 27 (4.7)† | 28 (2.2) | 25 (5.3)† | 26 (1.6) | 14 (1.5) | 18 (1.4) | 14 (1.9) | 16 (1.2) |
| Western | 24 (3.1) | 22 (0.9) | 22 (1.0) | 22 (0.8) | 19 (1.6) | 16 (0.8) | 14 (1.7) | 16 (0.4) |
| **Mother tongue** | | | | | | | | |
| English | 28 (2.8) | 29 (1.9) | 29 (4.4) | 28 (2.0) | 16 (1.1) | 17 (1.3) | 12 (1.7) | 16 (1.3) |
| French | 22 (3.1) | 23 (1.8) | 16 (2.9)† | 20 (1.2) | 15 (2.3) | 17 (1.9) | 18 (2.7) | 16 (1.0) |
| Other | 28 (5.3)† | 24 (3.4) | 22 (4.6)† | 25 (2.8) | 17 (2.4) | 18 (3.2)† | 17 (2.8)† | 18 (2.0) |

Note: SE = standard error.
*Mean systolic blood pressure ≥ 140 mm Hg, or mean diastolic blood pressure ≥ 90 mm Hg or treatment (pharmacologic or non-pharmacologic).
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.

**Appendix 3D: Age-standardized percentage of men and women in Canada who are overweight* according to income adequacy, by age group, region and mother tongue**

| Age/region/ language | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) |
| Total | 36 (2.4) | 33 (1.0) | 33 (1.7) | 34 (1.1) | 30 (2.1) | 29 (2.2) | 23 (2.6) | 27 (2.4) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 19 (2.6) | 25 (1.8) | 24 (1.7) | 23 (0.7) | 23 (4.8)† | 17 (1.1) | 13 (2.9)† | 17 (1.6) |
| 35–64 | 53 (3.9) | 40 (2.3) | 41 (2.3) | 43 (2.1) | 36 (10.1)† | 37 (4.3) | 29 (2.7) | 34 (4.4) |
| 65–74 | 44 (11.8)† | 40 (4.6) | 30 (5.4)† | 40 (3.7) | 38 (3.1) | 46 (3.5) | 30 (8.5)† | 40 (2.4) |
| **Region** | | | | | | | | |
| Atlantic | 43 (2.8) | 42 (1.6) | 39 (2.4) | 41 (1.1) | 37 (1.5) | 32 (1.4) | 27 (1.9) | 33 (0.8) |
| Central | 31 (4.5) | 32 (1.5) | 31 (2.5) | 32 (1.6) | 26 (2.5) | 30 (3.7) | 22 (3.4) | 27 (3.7) |
| Western | 36 (3.6) | 33 (1.3) | 35 (2.4) | 35 (1.6) | 34 (2.6) | 27 (2.0) | 25 (2.0) | 27 (1.4) |
| **Mother tongue** | | | | | | | | |
| English | 37 (3.0) | 34 (1.1) | 36 (1.9) | 36 (1.6) | 33 (1.4) | 28 (2.6) | 26 (2.8) | 28 (2.0) |
| French | 25 (5.0)† | 33 (2.5) | 28 (3.3) | 31 (1.9) | 23 (2.0) | 29 (2.4) | 23 (2.6) | 25 (1.2) |
| Other | 38 (4.5) | 28 (2.4) | 33 (3.9) | 31 (1.5) | 26 (5.0)† | 30 (2.5) | 19 (4.1)† | 28 (6.5)† |

Note: SE = standard error.
*Body mass index (kg/m$^2$) ≥ 27.
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
‡Coefficient of variation > 33.3%; results should not be used.
Source: Canadian heart health surveys 1986–92.

**Appendix 3E: Age-standardized percentage of men and women in Canada who report lack of leisure-time physical activity* according to income adequacy, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) |
| Total | 43 (5.1) | 41 (1.7) | 36 (0.9) | 39 (2.1) | 37 (5.0) | 33 (0.9) | 34 (2.2) | 35 (1.8) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 30 (5.7)† | 36 (2.2) | 31 (1.4) | 34 (3.3) | 31 (8.3)† | 30 (1.2) | 30 (1.5) | 31 (2.3) |
| 35–64 | 52 (6.5) | 46 (1.9) | 41 (2.0) | 44 (1.7) | 41 (2.5) | 36 (1.4) | 39 (3.3) | 39 (1.3) |
| 65–74 | 45 (5.3) | 39 (4.4) | 37 (5.0) | 38 (4.1) | 40 (3.8) | 33 (3.2) | 38 (5.6) | 39 (2.4) |
| **Region** | | | | | | | | |
| Atlantic | 49 (1.6) | 45 (1.8) | 33 (2.0) | 44 (1.3) | 50 (1.5) | 42 (2.1) | 37 (1.8) | 44 (1.3) |
| Central | 43 (9.7)† | 42 (2.9) | 39 (1.6) | 40 (3.4) | 32 (8.3)† | 31 (1.5) | 36 (2.7) | 35 (2.8) |
| Western | 37 (4.1) | 38 (2.0) | 30 (0.8) | 35 (0.9) | 40 (2.6) | 33 (1.5) | 27 (1.5) | 33 (0.8) |
| **Mother tongue** | | | | | | | | |
| English | 37 (6.7)† | 39 (1.9) | 34 (3.2) | 37 (1.8) | 32 (7.7)† | 31 (1.4) | 34 (2.3) | 33 (2.5) |
| French | 50 (5.4) | 41 (2.1) | 35 (3.0) | 39 (1.9) | 34 (3.3) | 32 (2.0) | 36 (3.5) | 34 (1.4) |
| Other | 46 (5.7) | 48 (2.7) | 48 (8.1)† | 47 (6.1) | 52 (3.6) | 41 (2.7) | 33 (6.2)† | 42 (2.3) |

Note: SE = standard error.
*Exercise less than once a week during previous month.
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
Source: Canadian heart health surveys 1986–92.

**Appendix 3F: Age-standardized percentage of men and women in Canada with elevated cholesterol* according to income adequacy, by age group, region and mother tongue**

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| Age/region/ language | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) | Low income; % (SE) | Middle income; % (SE) | High income; % (SE) | Total; % (SE) |
| Total | 43 (2.2) | 43 (1.1) | 46 (1.3) | 44 (1.0) | 42 (3.2) | 40 (0.9) | 43 (2.7) | 41 (0.8) |
| **Age group, yr** | | | | | | | | |
| 18–34 | 22 (4.5)† | 27 (2.0) | 26 (1.8) | 25 (1.4) | 23 (1.5) | 24 (2.7) | 22 (1.9) | 22 (1.3) |
| 35–64 | 60 (4.4) | 56 (2.2) | 60 (3.0) | 58 (2.0) | 55 (4.0) | 45 (1.9) | 51 (6.1) | 51 (2.1) |
| 65–74 | 53 (5.7) | 62 (4.6) | 75 (3.8) | 62 (4.2) | 73 (2.2) | 76 (2.7) | 89 (5.1) | 78 (1.9) |
| **Region** | | | | | | | | |
| Atlantic | 49 (1.8) | 47 (1.1) | 51 (2.1) | 48 (0.7) | 42 (1.5) | 40 (1.6) | 39 (2.1) | 41 (0.8) |
| Central | 44 (3.9) | 42 (1.7) | 47 (1.7) | 43 (1.5) | 44 (5.0) | 41 (1.3) | 45 (3.6) | 42 (1.2) |
| Western | 39 (3.7) | 44 (1.2) | 44 (1.5) | 44 (0.7) | 39 (1.7) | 37 (1.5) | 39 (1.8) | 38 (0.7) |
| **Mother tongue** | | | | | | | | |
| English | 43 (2.6) | 43 (1.3) | 46 (1.9) | 44 (1.1) | 42 (3.1) | 39 (2.1) | 40 (4.2) | 40 (2.3) |
| French | 48 (5.1) | 48 (2.1) | 48 (2.4) | 47 (1.4) | 43 (4.0) | 44 (1.9) | 51 (2.4) | 46 (1.5) |
| Other | 35 (5.4) | 38 (3.0) | 45 (2.1) | 37 (1.9) | 43 (13.0)† | 33 (3.9) | 40 (4.9) | 36 (3.4) |

Note: SE = standard error.
*Total plasma cholesterol ≥ 5.2 mmol/L, among those who fasted 8 h or more.
†Coefficient of variation ≥ 16.5% but ≤ 33.3%; results should be interpreted with care.
Source: Canadian heart health surveys 1986–92.