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How healthy are Canadians?

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.	not available for any reference period
..	not available for specific reference period
...	not applicable
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F	too unreliable to be published

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Health Reports - Special Issue

Canadians are extremely interested in health: our own, the health of our family and friends, and the ability of the health care system to respond to our needs. Compared with most countries, Canadians have much about which they can feel proud. But we have by no means achieved all that is possible in health status or in the quality of health care.

Health encompasses many dimensions. It may be a capacity to function or an absence of disease. It may be a sense of well-being or the result of positive behaviours. Added to this is the growing recognition that the determinants of health—genetics, the physical environment, the socio-economic environment, early childhood experiences, and so on—influence overall population health status and, in some cases, the effectiveness of health care. The health status of a population changes slowly. Improvements in prevention, nutrition and physical activity may be reflected in the population's health only years later.

Health status is not evenly distributed. With each step up the socio-economic ladder, groups are less vulnerable to disease, disability and premature death. We have built an enviable health care system. Medical and technological advances are claiming small and large victories over disease every year. Yet, even in the face of these achievements, inequalities in health status persist.

Statistics Canada and the Canadian Institute for Health Information (CIHI) are reporting jointly on the health status of the Canadian population, the factors that determine or affect our health, and the performance of the health care system. These annual reports are intended to provide information and background so that Canadians, as well as decision-makers, can better judge the complex factors that contribute to improvements in health.

This report, the third in the annual series entitled "How healthy are Canadians?", looks at health from the perspective of "communities". Its companion report, released by CIHI in May 2002, focuses on the health care system. Future reports will build on what we know today, endeavouring to fill gaps in our knowledge as a broader range of information becomes available.

Previous issues in the series

"How healthy are Canadians?", Health Reports, Special Issue, Volume 11, Number 3, Statistics Canada catalogue number 82-003, March, 2000, and "How healthy are Canadians? A summary", Internet publication, http://www.statcan.ca/english/ads/82-003-XPB/summary11-3.pdf.

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Health Care in Canada - A First Annual Report, Canadian Institute for Health Information, April, 2000, full report and brochure, http://www.cihi.ca.

"How healthy are Canadians?", Health Reports, Special Issue, Volume 12, Number 3, Statistics Canada catalogue number 82-003, April, 2001, Internet publication, http://www.statcan.ca/english/freepub/82-003-XIE/free.htm.

Health Care in Canada - 2001, Canadian Institute for Health Information, May, 2001, full report and brochure, http://www.cihi.ca.

Health Care in Canada - 2002, Canadian Institute for Health Information, May, 2002, full report and brochure, http://www.cihi.ca.

About Health Reports

Health Reports is a peer-reviewed quarterly journal produced by the Health Statistics Division at Statistics Canada. It is designed for a broad audience that includes health professionals, researchers, policy makers, educators and students. Its mission is to provide high quality, relevant, and comprehensive information on the health status of the population and the health care system.

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Statistics Canada is authorized under the Statistics Act to collect, analyze and publish statistics relating to the social, economic and general activities and condition of Canadians. The Health Statistics Division's primary objective is to provide statistical information and analyses about the health of the population, determinants of health, and the scope and utilization of Canada's health care sector.

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Since 1994, the Canadian Institute for Health Information (CIHI) has been working to improve the health of Canadians and the health system by providing quality health information. CIHI is a national, not-for-profit organization with a mandate to coordinate the development and maintenance of an integrated approach to Canada's health information. To this end, the Institute provides accurate and timely information that is needed to establish sound health policies, manage the Canadian health system effectively, and create public awareness of factors affecting good health.

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Introduction

In Canada, as in other countries, factors such as income and health behaviours have been shown to account for differences in health outcomes. These however do not account for all variations.

Due to Canada's increasing diversity and the availability of new health information at the regional level, this issue of "How Healthy Are Canadians" explores health factors at the "community" level. Defining community in various ways allows for analyses along many different dimensions: geographic, cultural and socio-economic.

Canadians place great value on their physical and mental health. Indeed, it is one of the prerequisites to enjoying a high quality of life. Issues surrounding the quantity and quality of the services provided by the health care system also rank high in the minds of Canadians.

For the first time, reliable health and health care information is available for all sub-provincial and sub-territorial health regions and for various sub-populations. To capitalize on this new and expansive source of data, the third in a series of annual health reports published by Statistics Canada focuses on “communities” and explores this concept in various ways.

In this report, community has been defined along three dimensions. It has been considered at the geographic level, representing health regions, which were defined by the individual provincial and territorial governments. It has also been defined in terms of socio-economic factors and ethno-cultural identity.

The first section of the report describes the health of Canadians at the geographic level. One hundred and thirty-nine health regions in the country, as identified by the provinces and territories in which they reside, were grouped into “peer groups” on the basis of common socio-demographic characteristics. The first of these articles compares health outcomes (e.g., life expectancy, and self-reported health) and risk factors (e.g., smoking and obesity) within peer groups. The second article asks whether the socio-economic context of a community itself influences health of its individuals. The analysis demonstrates that the differences between communities in terms of health are mostly due to individual factors. The socio-economic context of a community is modestly associated with individual health.

The article in the report which explores Canada’s communities socio-economically, examines trends in key mortality indicators and specific causes of death in association with neighbourhood income. There has been overall significant improvement during the past 30 years, reflected in longer life expectancy and reduced disparities between lower- and higher-income Canadians.

The reports focusing on cultural communities include an article on the health of the off-reserve Aboriginal population. The analysis reveals that this population generally has poorer health than the rest of the Canadian population. This pattern prevailed in the provinces, but not in the north. Many of the health inequalities are attributable not only to socio-economic status, but also to health behaviours, such as smoking and obesity. Contacts with health care professionals, whose services are publicly funded, were similar between the Aboriginal and non-Aboriginal populations, living in the provinces although there was a difference in the use of services that are not funded, notably dentists.

Two other articles in the cultural section deal with the health of immigrants, one focusing on physical and

the other on mental health. The first shows that, by some measures, immigrants and the Canadian-born population have similar health outcomes. By other measures, immigrants tend to be physically healthier than the Canadian-born population, but this is mostly attributable to the superior health of newer arrivals. The second article focuses on the prevalence of depression and on alcohol dependence among immigrants to explore their mental health. All immigrants except those who had arrived at least thirty years ago had lower rates of alcohol dependence and only those having lived in Canada for at least 10 years reported similar rates of depression as those born in Canada. These findings are important given the common misperception that recent immigration levels overburden our health care system.

There have been some interesting findings and some gaps identified by examining Canadians' health along community lines. Data, largely obtained from the Canadian Community Health Survey, indicate that though socio-economic factors such as income do account for disparities in health, there are other factors, which yet need to be explored. For example, when household income was accounted for, immigrants were still healthier than their Canadian born counterparts but Aboriginal respondents living off-reserve in Canada were not. Among peer groups possessing similar socio-economic characteristics, those in some communities fared better than others. Obviously some other factors such as individual health behaviours have an impact on health but others such as access to health services and social support must be further explored.

The paper, which specifically explores the effect of neighbourhood income on health, presents some encouraging yet guarded findings. It reveals that while Canadians at all income levels have made substantial improvements in health in the twenty-five years between 1971 and 1996, those in the lowest income neighbourhoods have made the greatest strides. It also suggests however, that we have work yet to do as the disparity in health outcomes between the richest and poorest persists, such that the latter group continues to account for disproportionate levels of illness and death.

The health of Canada's communities

- *People living in large metropolitan areas and urban centres have the longest life expectancies and disability-free life expectancies in Canada.*
- *People living in Canada's northern remote communities are the least healthy. The smoking rates, obesity rates, and heavy drinking rates in these communities are above the Canadian averages. Conversely, residents of these communities are less likely to report high levels of stress.*
- *Higher daily smoking rates and heavy drinking rates at the health region level are associated with shorter life expectancies.*
- *At the health region level, high obesity rates, high daily smoking rates, and high rates of depression are associated with shorter disability-free life expectancies.*

Abstract

Objectives

This article examines the health of Canadians at the community level. Canada's 139 health regions are grouped into 10 "peer groups" with similar socio-demographic profiles. Health outcomes and risk factors are compared between and within peer groups.

Data source

Life expectancy and disability-free life expectancy estimates are based on data from the 1996 Census of Canada and the Canadian Vital Statistics Database. Risk factor estimates are based on data from the 2000/01 Canadian Community Health Survey (CCHS).

Analytical techniques

Chiang's method for abridged life tables is used to calculate life expectancy. Disability-free life expectancy was calculated according to the Sullivan method. Estimates of self-perceived health and risk factors are derived from the CCHS data. Regression analysis is used to study associations between health outcomes and risk factors.

Main results

Socio-demographic factors and risk factors such as smoking and obesity play a critical role in accounting for differences between communities in health outcomes such as life expectancy and disability-free life expectancy.

Key words

life expectancy, disability-free life expectancy, health status indicators, health behaviour, geographic comparisons, health region, peer group

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Margot Shields and Stéphane Tremblay

Relative to people in most countries, Canadians enjoy a high level of health. Life expectancy in Canada is among the best in the world and has been for several decades.[1] However, health status is by no means evenly distributed across Canada's communities. Life expectancy, an important indicator of population health, varies considerably from region to region, from a low of 65.4 years in the Région du Nunavik, Québec, to a high of 81.2 years in Richmond, British Columbia. To some extent, such disparities can be attributed to socio-demographic differences between communities, since the life expectancy within a community is associated with factors such as the unemployment rate, the proportion of people with a postsecondary education, and the proportion of people who are Aboriginal.[2]

Methods

Data sources

Life expectancy and disability-free life expectancy (DFLE) estimates are based on mortality data for 1995 to 1997 from the Canadian Vital Statistics Database. Population estimates as of July 1, 1996, adjusted for net undercoverage, are from Statistics Canada's Demography Division. The numbers of people living in private households and collective dwellings are from the 1996 Census of Population. Estimated data for major activity limitation are from the 20% sample for the 1996 Census long form.

Estimates of self-perceived health and risk factors are from the Canadian Community Health Survey (CCHS) (see Annex).

Analytical techniques

The program used to calculate life expectancy was based on Chiang's method for abridged life tables.[3] Abridged life tables use 5-year age groupings of both population and mortality rate inputs (as opposed to single-year age breakdown). Because there is more variability in the number of events by age in smaller geographic areas and in areas with small populations, abridged life tables are more suitable to analyses at the sub-provincial (health region) level. Chiang's method was chosen because it was relatively easy to adapt it to the health region level and because it included a standard error calculation (in this case, addressing the variability in the number of deaths in a given health region from one year to the next).

Estimates of DFLE were calculated according to the Sullivan method.[4] This method is based on rates of disability in the population by age and sex group. The standard error of the estimates of DFLE and thus the upper and lower confidence limits around the estimates are based on the method of Mathers.[5] This method takes into account natural fluctuations in rates of death and sampling variability in rates of disability.

All estimates produced with data from the CCHS have been weighted to represent the appropriate target populations at the health region and peer group levels. Confidence intervals for the estimates based on CCHS data were calculated with the formula for simple random sampling, with incorporation of an estimate of a design effect of 2, to account for the complex sampling design of the CCHS. In comparisons of an estimate for a health region with the corresponding estimate for the peer group, the health region was designated as being significantly better (√) or worse (x) than the peer group if the 95% confidence interval for the health region estimate did not overlap with the 95% confidence interval for the peer group estimate. In these comparisons, the peer group estimate was based on all records from the peer group (i.e., including records from the health region for which the comparison was being made).

The age distribution of the population varied among health regions and peer groups. Therefore, all estimates at the health region and peer group levels based on CCHS data were age-standardized, according to the Canadian population.

In this article, the percentages of people in fair or poor health, as well as risk factor prevalence estimates, are based on individual self-reported data from the CCHS. To study and compare health at the community level, these data were aggregated to the health region level. In contrast, life expectancy and DFLE are derived from data on deaths and activity limitations among residents in these health regions. These indicators apply only to health regions, not to individuals within these regions. In the regression analyses focusing on the relationships between risk factor prevalence estimates and health outcomes, the unit of analysis is the health region. As such, associations observed between self-perceived health and risk factors at the health region level do not necessarily represent the associations that exist at the individual level. In the next paper (Regional Socio-economic Context and Health), self-perceived health is examined at the individual level in relation to both health risk factors at the individual level and health region characteristics.

Limitations

Comparison of health measures between health regions represents a much finer scale for examining population health indicators than has traditionally been possible in the Canadian context. However, such comparisons may mask important fluctuations within health regions. For example, even though the health indicators of Vancouver residents compare favourably with Canadian averages, this cannot be interpreted as meaning that the residents of the downtown core in Vancouver have better than average health.

Large sample sizes at the peer group level made it possible to detect significant differences in health indicators between groups, even when the magnitude of the differences was not large. At the health region level, larger differences between estimates were required to attain statistical significance because of smaller sample sizes.

To a great extent, the formulation of peer groups made it possible to compare health indicators for regions with similar socio-demographic profiles. However, even within a single peer group there was considerable variability in socio-demographic factors. This variability may in part explain why some health regions performed better than others within their peer group.

Health regions could be categorized into peer groups according to a variety of methods and variables. The use of other methods and variables could alter the composition of peer groups, as well as the interpretation of the analysis. A variety of approaches were explored,[6] and the one used reflects a consensus of a health expert group.

In this analysis, the obesity rate was based on the population aged 20 or older. Inaccurate self-reporting of height is common among the elderly, many of whom experience a loss of height with aging.[7] Such individuals often cite their height as measured in their younger years. As a result, body mass index for the elderly may be more prone to underestimation.

Because the positive association between socio-economic status and health is one of the most widespread and persistent findings in health research, comparisons between communities are more useful if they are made among those that are socio-economically similar. Therefore, as described in a previously released report,[6] Statistics Canada developed an algorithm to assemble Canada's 139 health regions into "peer groups." A peer group comprises health regions that have a similar socio-demographic profile. In defining the peer groups, data from the 1996 Census of Population were used to examine the socio-demographic profiles of Canada's health regions. Health variables were deliberately not used in the delineation of health regions into peer groups. On the basis of the socio-demographic profiles, cluster and discriminant analyses were used to formulate peer groups and then to determine the variables with the most influence on the grouping of health regions into these peer groups.

The health regions analyzed in this report have been defined by the provincial ministries of health in each province. In total, there are 139 of these regions across Canada (see map, *Health Regions 2000*, at the end of the publication). Comparison of health indicators, such as life expectancy, smoking rates, and obesity rates, among regions provides valuable information to administrators developing and monitoring coordinated programs aimed at improving health in their communities.

The purpose of this article is to compare key health indicators between and within peer groups, including life expectancy, disability-free life expectancy (DFLE), and self-perceived health, all of which are relevant indicators of population health (see *Definitions*). Because of the way in which the peer groups were delineated, it was expected that differences in the indicators would emerge between peer groups. Peer groups with better socio-economic status indicators are likely to have better health status measures. However, of more importance is identifying situations in which specific health regions distinguish themselves from their peers. Therefore, health regions where health status was significantly better or worse than that of the overall peer group are highlighted. A second purpose of this article is to explore reasons why the residents of some peer groups or health regions enjoy better health than others. Therefore, risk factor prevalence estimates, known to be key determinants of health, were compared between and within peer groups. The risk factors considered include lifestyle factors (smoking, exercise, heavy drinking, and obesity), as well as pyscho-social factors (stress levels and depression). Similar to health outcome measures, it was expected that risk factor estimates would be comparable for health regions within a peer group because of the association between risk factors and socio-demographic characteristics. Again, cases where a risk factor estimate for a health region was significantly better or worse than the estimate for the peer group to which it belongs are highlighted.

Links between health outcomes, health behaviours, and pyscho-social factors

A large body of research has established the importance to mortality and morbidity of particular lifestyle and pyscho-social factors. Smoking is the single most important preventable cause of death. In Canada, approximately 45,000 deaths in 1996 were attributed to smoking,[8] and one-fifth of all deaths due to the three leading causes of death—cancer, heart disease, and stroke—were attributed to cigarette smoking. As well, evidence indicating the importance of smoking as a cause of disability is now emerging. For example, in one study, heavy smokers were 30% to 50% more likely than never-smokers to have an activity limitation.[9] Another study, based on seniors, found that smokers had lower odds of recovering from physical dependency (requiring the assistance of another person in daily activities because of a long-term health problem).[10]

Several studies have found a positive association between physical exercise and health. Regular exercise improves strength and aerobic capacity, even in adults who are chronically ill.[11] Even a moderate level of regular exercise is associated with lower odds of later heart disease.[12] However, whether exercise leads to better functional status and prevents disability in older adults is less clear.[10,11,13]

In addition to causing adverse personal and social consequences, alcohol abuse is a major determinant of premature death, contributing to death due to cardiovascular disease, cancer and accidents.[14,15] Even when data are adjusted for the influence of smoking, heavy drinking persists as an independent risk factor for death from heart disease.[14]

Research has identified obesity as a major risk factor for numerous chronic conditions, including diabetes, arthritis, high blood pressure, heart disease, colorectal cancer, and respiratory problems.[16-18] Research also indicates that obesity is a key determinant of disability.[17]

People who experience high levels of personal stress are also at higher risk of certain diseases, perhaps because of an adverse effect on the immune system.[19,20] Longitudinal analysis of Canadian data has indicated that stress is predictive of chronic conditions such as migraine, ulcers, arthritis,

Definitions

In general, *health regions* correspond to the administrative areas established by provincial authorities for local health and social services delivery. At the time the Canadian Community Health Survey (CCHS) was designed, there were 139 health regions in Canada. In this analysis, the Burntwood and Churchill health regions in Manitoba were combined because of Churchill's small population. There are two health regions for which the CCHS does not collect data: the Région du Nunavik and the Région des Terres-Cries-de-la-Baie-James, both in peer group C. Therefore estimates of the percentage of the population in fair or poor health and risk factor estimates are not available for these health regions. Estimates for peer group C are based on the remaining health regions, where CCHS data were collected.

Peer groups are groups of health regions with similar socio-economic characteristics. Each health region in Canada has been assigned to 1 of 10 peer groups.[6]

Life expectancy refers to life expectancy at birth and is the number of years a person is expected to live from the day he or she is born. This value is based on mortality statistics at the time of birth (according to 5-year age groupings). In this article, life expectancy at birth is based on mortality statistics for the years 1995 to 1997 and is referred to as 1996 life expectancy.

Disability-free life expectancy (DFLE) combines information on mortality rates with data on the prevalence of major activity limitation and the percentage of the population living in health care institutions. DFLE estimates the number of years of life that a person can expect to live without activity limitation and outside of a health care institution.[21]

Respondents were classified as having *fair or poor health* based on a question on their self-perceived health: "In general would you say your health is excellent, very good, good, fair, or poor?" Estimates of fair or poor health at the health region level are based on the population aged 12 or older.

Respondents were classified as *daily smokers* if they indicated that they currently smoked cigarettes daily. Daily smoking rates at the health region level are based on the population aged 12 or older.

Body mass index (BMI) is commonly used to determine if an individual is in a healthy weight range. BMI is calculated by dividing weight in kilograms by the square of height in metres. In this analysis, people with a BMI of 30 or more were classified as *obese*, a definition of obesity that is endorsed by the World Health Organization. Obesity rates at the health region level are based on the population aged 20 or older. Pregnant women were excluded in the calculation of obesity rates.

Physical activity is based on the number of times in the previous 3 months that respondents participated in leisure-time physical activity lasting more than 15 minutes. Monthly frequency was the number of times in the past 3 months divided by 3. Respondents were classified as *infrequent exercisers* if the number of times per month was 3 or less. Infrequent exercise rates at the health region level are based on the population aged 12 or older.

Heavy drinking was measured by asking respondents the number of times they had consumed five or more alcoholic drinks on one occasion in the past 12 months. Those who answered once a month or more often were classified as *heavy drinkers*. Heavy drinking rates at the health region level are based on the population aged 18 or older.

To measure levels of stress, respondents were asked the following question: "Thinking about the amount of stress in your life, would you say most days are not at all stressful, not very stressful, a bit stressful, quite a bit stressful, or extremely stressful?" Respondents who answered "quite a bit stressful" or "extremely stressful" were classified as having *high stress*. At the health region level, estimates of the population having high stress are based on the population aged 18 or older.

According to the methodology of Kessler[22] the CCHS defines a major depressive episode by means of a subset of questions from the Composite International Diagnostic Interview. These questions cover a cluster of symptoms for depressive disorder, which are listed in the *Diagnostic and Statistical Manual of Mental Disorders*.[23] Responses to these questions were scored and transformed into a probability estimate of a diagnosis of major depressive episode. If the estimate was 0.9 or more (that is, 90% certainty of a positive diagnosis), then the respondent was classified as *depressed*. Estimates of depression at the health region level are based on the population aged 12 or older.

Definitions for the census variables that were used in the delineation of health regions into peer groups can be found in Appendix Table A.

respiratory disease, and back problems.[24] In the same analysis, stress was also associated with lower ratings of self-perceived level of health.

Depression, estimated to affect about 6% of the Canadian population, is a relatively common mental disorder.[25] In addition to its devastating effects on emotional health, depression is also emerging as an important correlate of physical disability in older adults.[26,27]

Most of the cited studies examined the determinants of health at the individual level. Now, for the first time, it is possible to make Canada-wide comparisons of estimates of health outcomes and risk factors at the community (health region) level, thanks to the large sample size of Statistics Canada's Canadian Community Health Survey (CCHS). The CCHS data reveal that at the health region level, estimates of life expectancy, DFLE, and percentage of residents reporting fair or poor health are associated with estimates of several of the risk factors considered in this analysis (see *Links between health outcomes and risk factors at the health region level*). These associations persist even when the analysis controls for the socio-demographic status of the health region. As such, in comparing health outcomes between and within peer groups, an examination of differences in risk factors is critical to the understanding and interpretation of results.

Links between health outcomes and risk factors at the health region level

To examine the relationship between health outcome measures and risk factors at the health region level, three series of multiple linear regression models were run. In each model, the dependent variable was the estimate of one of the three health outcome variables at the health region level (life expectancy, disability-free life expectancy [DFLE], or the percentage of the population reporting fair or poor health). In the first set of regression models, these outcomes were examined only in relation to socio-demographic factors. The factors used in the regressions were the ones that had the most discriminating power in the designation of the peer groups (proportion of Aboriginal population, proportion of visible minority population, unemployment rate, population size, and percentage of population aged 65 or older), as well as average income and average number of years of schooling.

In subsequent models, each risk factor estimate (i.e., the daily smoking rate, the obesity rate, the infrequent exercise rate, the heavy drinking rate, the high stress rate, and the depression rate) was introduced separately (by itself) into each model to determine if it was significantly associated with each outcome, while controlling for socio-demographic characteristics. In the table at the right, significant risk factors are identified. The ability of each risk factor to explain differences in the three health outcomes considered is quantified by the change in the R^2 statistic. (The R^2 statistic indicates the amount of variance that is explained by all of the independent variables combined.)

Life expectancy at the health region level was negatively associated with both the daily smoking rate and the percentage of the population who drink heavily.

DFLE was negatively associated with a health region's daily smoking rate, obesity rate, heavy drinking rate, and depression rate. The addition of the daily smoking rate, the obesity rate, and the depression rate resulted in the greatest improvement in the R^2 value.

An unexpected finding was that DFLE was positively associated with infrequent exercise.

The percentage of the population reporting fair or poor health was positively associated with the smoking rate, the obesity rate, and the depression rate.

Results of multiple linear regression models relating life expectancy, disability-free life expectancy, and fair or poor health at the health region level to selected risk factors

Control variables	Life expectancy	Disability-free life expectancy	Fair or poor health
	----------R^2----------		
Socio-demographic factors only	0.56	0.32	0.25
Socio-demographic factors and:	----------Increase in R^2----------		
Daily smoking rate	0.08 Neg**	0.06 Neg**	0.04 Pos*
Obesity rate	0.01	0.05 Neg**	0.10 Pos**
Infrequent exercise rate	0	0.03 Pos*	0
Heavy drinking rate	0.01 Neg*	0.03 Neg*	0.01
High stress rate	0	0	0.01
Depression rate	0	0.08 Neg**	0.09 Pos**

Notes: *The original model, controlling only for socio-demographic factors, was based on observations for 136 of the 139 health regions. The Burntwood and Churchill health regions in Manitoba were combined as one health region because of Churchill's small population. The Région du Nunavik and the Région des Terres-Cries-de-la-Baie-James health regions were not included because the CCHS does not collect data in these health regions and therefore risk factor estimates were not available. The subsequent models are all based on these same observations with one exception. The model including the depression rate is based on two fewer observations since questions on depression were not asked in two health regions (Northern Health Services Branch, Saskatchewan, and Brant Public Health Unit, Ontario).*

** $p < 0.05$*

*** $p < 0.01$*

Table 1
Principal characteristics of the 10 peer groups

Peer group	Number of health regions	% of Canadian population	Principal characteristics
A	5	17.4	• Metropolitan areas such as Toronto, Montréal, and Vancouver • Average population size over 1 million • High percentage (32.0%) of visible minority population • Low percentage (0.6%) of Aboriginal population • High average number of years of schooling (13.9 years) • High inequality of income distribution (median share = 18.8%)
B	8	16.5	• Large urban centres with a relatively high population density • Average population size over 500,000 • High percentage (20.2%) of visible minority population • Low percentage (1.5%) of Aboriginal population • High average number of years of schooling (13.9 years)
C	6	0.4	• Mostly northern health regions • High percentage (75.5%) of Aboriginal population • High unemployment rate (17.2%) • Low density of population (3.9 people per square kilometre) • Low percentage (0.9%) of visible minority population • Low average number of years of schooling (10.6 years)
D	9	2.6	• Mostly eastern health regions • High unemployment rate (27.7%) • Low percentage (0.5%) of visible minority population • Low percentage (9.1%) of inter-municipality migrants • Low average personal income (slightly over $18,000)
E	13	2.8	• Mostly rural health regions in the Prairies • High percentage (16.5%) of people aged 65 or older • Low percentage (1.1%) of visible minority population • Low average personal income (slightly over $20,000)
F	13	2.2	• Mostly northern health regions • High percentage (17.2%) of Aboriginal population • Low density of population (0.5 people per square kilometre) • Low inequality of income distribution (median share = 23.6%) • High percentage (22.8%) of inter-municipality migrants
G	21	5.5	• Mostly rural health regions in the Prairies • Low unemployment rate (7.1%) • Low percentage (10.4%) of lone-parent families • Low percentage (13.8%) of people with low income
H	22	23.2	• Health regions mostly in Québec and its neighbouring provinces • Low population growth (0.6%) • High to moderate unemployment rate (11.2%) • Moderate percentage (14.9%) of lone-parent families
I	34	23.5	• Health regions mostly in Ontario • High percentage (85.9%) of residents commuting to the nearby urban centres • Moderate to high percentage (13.5%) of people aged 65 or older
J	8	5.9	• Mostly sub-metropolitan health regions • High population growth (4.3%) • Low unemployment rate (7.5%) • High percentage (24.0%) of inter-municipality migrants • Low percentage (13.9%) of children living in low-income households • Low inequality of income distribution (median share = 24.4%) • High average number of years of schooling (13.5 years)

Data source: *1996 Census of Population*
Note: *In total, 24 socio-demographic variables, in addition to prominent geographic characteristics, were used to delineate the 10 peer groups. In this table, results are presented for 15 of these variables. These specific variables were chosen to highlight the differences between peer groups because their variability between the peer groups was high and the results are easy to interpret. Appendix Table A contains a complete list of all 24 variables used to define the peer groups, definitions for each variable, and estimates for each variable by peer group.*

Canada's peer groups

In total, 10 peer groups were formed across Canada, encompassing from 5 to 34 health regions (see map, *Health Region Peer Groups*, at the end of the publication). The variables that were most critical in the assignment of health regions to peer groups were proportion of Aboriginal and visible minority populations, unemployment rate, population size, percentage of the population aged 65 or older, and income inequality. See Table 1 and Appendix Table A for more detailed descriptions of the composition of each peer group.

Not surprisingly, life expectancy estimates differ considerably between peer groups (Table 2). However, in many cases, the range of estimates for the health regions within a peer group is also substantial (Chart 1). Even relatively small differences in life expectancies may be important. For example, the elimination of lung cancer would increase life expectancy by 0.9 years,[28] an important increase given that lung cancer is the leading cause of cancer death for Canadian men and women.[29]

Peer group A

More than 90% of the population in the health regions of peer group A comes from Canada's largest cities (Toronto, Montréal, and Vancouver). Peer group A is characterized by a high percentage of visible minority population and high levels of education.

People living in the health regions of peer group A are among the healthiest in Canada (Table 3). Life expectancy is a half-year longer than the Canadian average, and DFLE is a full year longer. These people tend to have healthier behaviours than the average Canadian. The percentage of daily smokers is 4 percentage points lower than the overall Canadian rate (18% versus 22%). Peer group A has the lowest obesity rate and the lowest heavy drinking rate of the 10 peer groups. However, peer group A does not fare as well when it comes to exercise: 27% of the residents of the health regions of peer group A are categorized as being infrequent exercisers, whereas this percentage is 22% for all of Canada. Mental health estimates are favourable in peer group A. The depression rate is significantly lower than the rate for Canada as a whole.

Richmond, British Columbia, stands out as an exceptional health region within an exceptional peer group. Life expectancy in Richmond is the highest in the country, at 81.2 years (2.4 years higher than that of peer group A as a whole and 2.9 years higher than that of Canada). DFLE is also the best in the country, at 72.8 years (3.2 years higher than the overall estimate for peer group A and 4.2 years higher than that for Canada). Residents of Richmond have very healthy lifestyle practices. The smoking rate (9%) and the obesity rate (6%) are the lowest in the country.

Table 2
Comparison of Canada and peer groups, selected characteristics

					Health outcomes			Health behaviours				Psycho-social factors	
	CCHS population†		CCHS sample size	Number of health regions	Life expectancy (years)	Disability-free life expectancy (years)	Fair or poor health (age 12+) %	Daily smoking (age 12+) %	Obese (age 20+) %	Infrequent exercise (age 12+) %	Heavy drinking (age 18+) %	High stress (age 18+) %	Depression (age 12+) %
	'000	%											
Canada	25,802	100.0	131,535	139	78.3	68.6	12	22	15	22	16	26	7
PEER GROUP B	4,609	17.9	13,152	8	79.6 √	69.5 √	11 √	18 √	14 √	19 √	15 √	27	8
PEER GROUP A	4,564	17.7	8,229	5	78.8 √	69.6 √	12	18 √	11 √	27 ×	12 √	26	6 √
PEER GROUP J	1,568	6.1	7,866	8	78.8 √	68.8 √	11 √	22	16	17 √	18 ×	24	8
PEER GROUP I	6,001	23.3	34,622	34	78.3	67.6 ×	12	23 ×	17 ×	19 √	18 ×	26	8 ×
PEER GROUP G	1,355	5.3	14,385	21	77.9 ×	67.5 ×	12	23 ×	20 ×	20 √	20 ×	24 √	8
PEER GROUP E	672	2.6	10,535	13	77.8 ×	67.0 ×	14 ×	26 ×	22 ×	22	19 ×	22 √	7
PEER GROUP H	5,843	22.6	26,371	22	77.7 ×	68.8 √	12	25 ×	15	24 ×	17	29 ×	7
PEER GROUP D	624	2.4	6,123	9	77.0 ×	66.5 ×	15 ×	26 ×	21 ×	28 ×	20 ×	19 √	6 √
PEER GROUP F	515	2.0	8,615	13	76.7 ×	66.7 ×	13 ×	25 ×	19 ×	18 √	21 ×	22 √	8 ×
PEER GROUP C	52	0.2	1,637	6	71.8 ×	62.7 ×	15 ×	39 ×	26 ×	27 ×	22 ×	19 √	5 √

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*

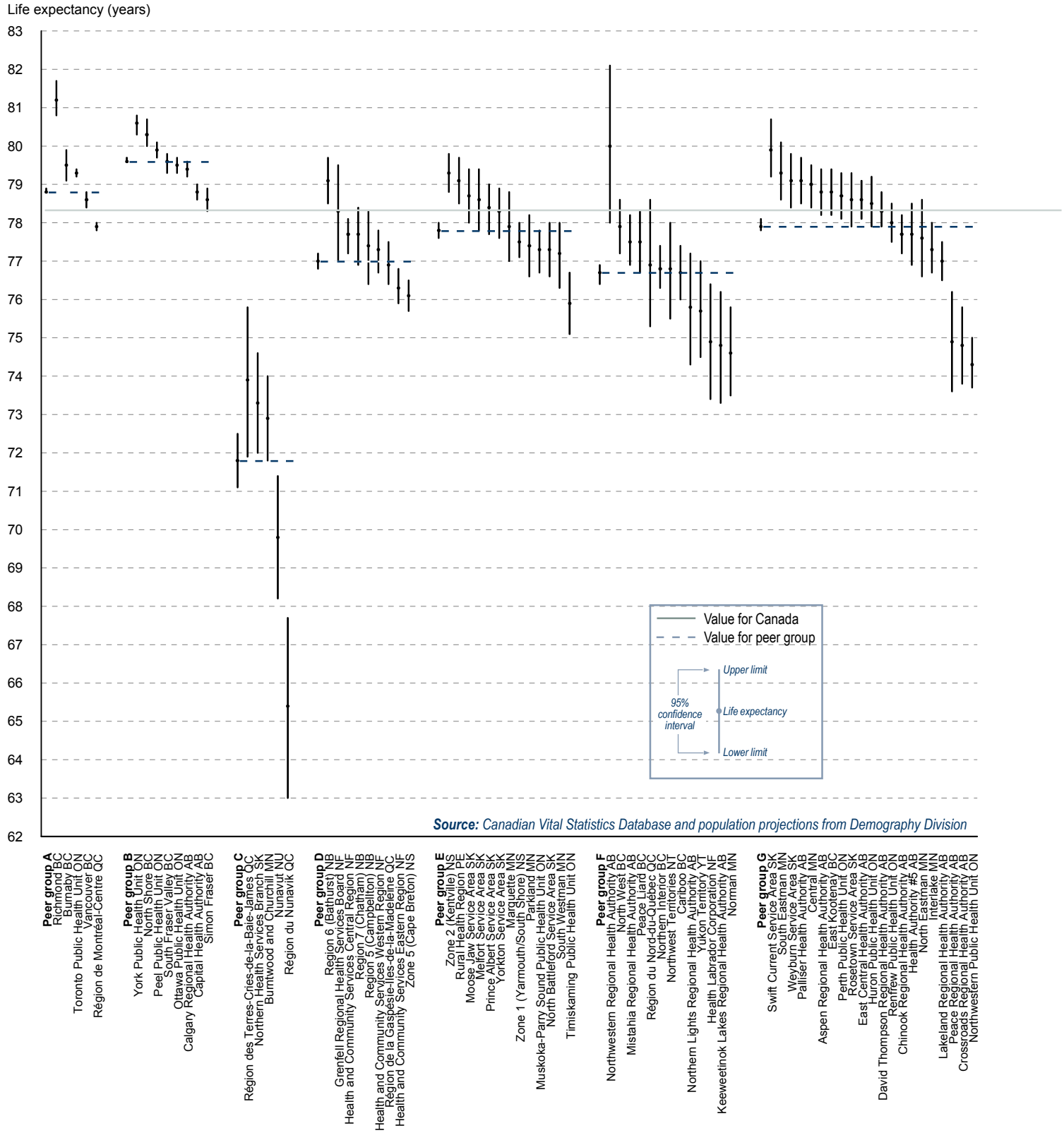
Notes*: The ordering of peer groups is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*

√ Indicates that peer group estimate is significantly better than Canadian estimate.

× Indicates that peer group estimate is significantly worse than Canadian estimate.

† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

Chart 1
Life expectancy at birth, by peer group and health region, 1996



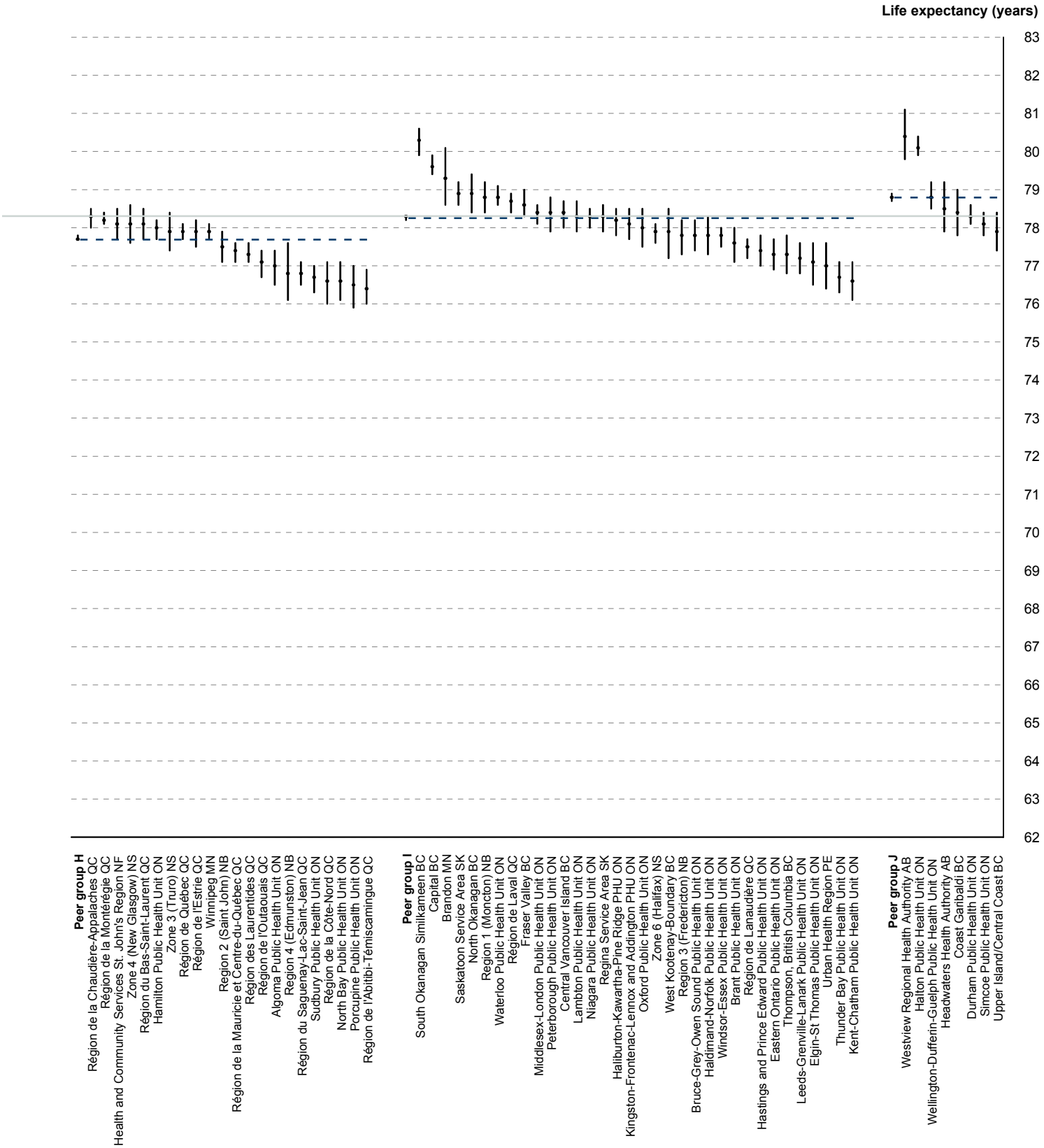

Life expectancy (years)
83
82
81
80
79
78
77
76
75
74
73
72
71
70
69
68
67
66
65
64
63
62
Peer group H
Région de la Chaudière-Appalaches QC
Région de la Montérégie QC
Health and Community Services St. John's Region NF
Zone 4 (New Glasgow) NS
Région du Bas-Saint-Laurent QC
Hamilton Public Health Unit ON
Zone 3 (Truro) NS
Région de Québec QC
Région de l'Estrie QC
Winnipeg MN
Region 2 (Saint John) NB
Région de la Mauricie et Centre-du-Québec QC
Région des Laurentides QC
Région de l'Outaouais QC
Algoma Public Health Unit ON
Region 4 (Edmunston) NB
Région du Saguenay-Lac-Saint-Jean QC
Sudbury Public Health Unit ON
Région de la Côte-Nord QC
North Bay Public Health Unit ON
Porcupine Public Health Unit ON
Région de l'Abitibi-Témiscamingue QC
Peer group I
South Okanagan Similkameen BC
Capital BC
Brandon MN
Saskatoon Service Area SK
North Okanagan BC
Region 1 (Moncton) NB
Waterloo Public Health Unit ON
Région de Laval QC
Fraser Valley BC
Middlesex-London Public Health Unit ON
Peterborough Public Health Unit ON
Central Vancouver Island BC
Lambton Public Health Unit ON
Niagara Public Health Unit ON
Regina Service Area SK
Haliburton-Kawartha-Pine Ridge PHU ON
Kingston-Frontenac-Lennox and Addington PHU ON
Oxford Public Health Unit ON
Zone 6 (Halifax) NS
West Kootenay-Boundary BC
Region 3 (Fredericton) NB
Bruce-Grey-Owen Sound Public Health Unit ON
Haldimand-Norfolk Public Health Unit ON
Windsor-Essex Public Health Unit ON
Brant Public Health Unit ON
Région de Lanaudière QC
Hastings and Prince Edward Public Health Unit ON
Eastern Ontario Public Health Unit ON
Thompson, British Columbia BC
Leeds-Grenville-Lanark Public Health Unit ON
Elgin-St Thomas Public Health Unit ON
Urban Health Region PE
Thunder Bay Public Health Unit ON
Kent-Chatham Public Health Unit ON
Peer group J
Westview Regional Health Authority AB
Halton Public Health Unit ON
Wellington-Dufferin-Guelph Public Health Unit ON
Headwaters Health Authority AB
Coast Garibaldi BC
Durham Public Health Unit ON
Simcoe Public Health Unit ON
Upper Island/Central Coast BC

Table 3
Comparison of peer group A health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Health outcomes: Disability-free life expectancy (years)		Health outcomes: Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Health behaviours: Obese (age 20+) %		Health behaviours: Infrequent exercise (age 12+) %		Health behaviours: Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Psycho-social factors: Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP A	4,564	100.0	8,229	78.8	√	69.6	√	12		18	√	11	√	27	×	12	√	26		6	√
BC	Richmond	144	3.2	828	81.2	√ √	72.8	√ √	13		9	√ √	6	√ √	18	√	10	√	24		5	√
BC	Burnaby	172	3.8	871	79.5	√ √	69.6	√	13		13	√ √	8	√	16	√ √	8	√ √	25		7	
ON	Toronto Public Health Unit	2,177	47.7	2,524	79.3	√ √	69.0	× √	12		17	√	11	√	29	×	10	√	24		6	
BC	Vancouver	501	11.0	1,285	78.6		68.9	× √	13		14	√ √	9	√	18	√ √	14		21	√ √	8	
QC	Région de Montréal-Centre	1,569	34.4	2,721	77.9	× ×	70.3	√ √	11		21	×	12	√	29	×	15		31	× ×	6	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

Richmond residents are also less likely to be classified as infrequent exercisers: the infrequent exercise rate for Richmond is 18% compared with 27% for peer group A.

The Région de Montréal-Centre has the lowest life expectancy in peer group A, at 77.9 years (0.9 years lower then the overall rate for peer group A). Furthermore, it is the only health region within peer group A with a life expectancy lower than the Canadian average. Montréal also has the distinction of having the highest daily smoking rate, the highest obesity rate, the highest heavy drinking rate, and the highest stress rate within peer group A. Nonetheless, the DFLE for Montréal compares favourably with the DFLE for peer group A as a whole (70.3 versus 69.6).

Although the overall exercise rate for peer group A does not compare favourably with the Canadian rate, this finding is not consistent for all health regions within the peer group. In fact, two health regions (Burnaby and Vancouver), both in British Columbia, have better exercise rates than Canada as a whole. However, Toronto and the Région de Montréal-Centre have much poorer exercise rates, at 29%, 7 percentage points worse than the Canadian average.

Peer group B

Peer group B consists of Canada's large urban centres. The average population of the health regions within peer group B is in excess of 500,000. Similar to the health regions in peer group A, those in peer group B have a high visible minority population, and residents tend to have high levels of education.

Life expectancy in peer group B is the highest in Canada, at 79.6 years (Table 4). Seven of the 8 health regions in peer group B have life expectancies significantly higher than the Canadian average. Residents of the health regions in peer group B can expect to live 1.3 years longer than the average Canadian. DFLE is also higher than the Canadian average, and the percentage of people reporting fair or poor health is lower. Peer group B compares favourably with Canada as a whole in terms of lifestyle behaviours. It is tied with peer group A for the lowest daily smoking rate. The obesity rate, the infrequent exercise rate, and the heavy drinking rate are all lower than the Canadian figures.

Two health regions within peer group B have notably better health outcome measures than the others: York in Ontario and North Shore in British Columbia. The

Table 4
Comparison of peer group B health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Health outcomes: Disability-free life expectancy (years)		Health outcomes: Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Health behaviours: Obese (age 20+) %		Health behaviours: Infrequent exercise (age 12+) %		Health behaviours: Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Psycho-social factors: Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP B	4,609	100.0	13,152	79.6	√	69.5	√	11	√	18	√	14	√	19	√	15	√	27		8	
ON	York Public Health Unit	635	13.8	1,732	80.6	√ √	71.1	√ √	11		18	√	12	√	20		13	√	29		7	
BC	North Shore	161	3.5	842	80.3	√ √	72.5	√ √	7	√ √	10	√ √	7	√ √	10	√ √	18		30		6	
ON	Peel Public Health Unit	858	18.6	1,837	79.9	√	70.1	√ √	11		16	√	14		26	× ×	13	√	28		7	
BC	South Fraser Valley	503	10.9	1,437	79.6	√	69.7	√	13		13	√ √	15		15	√ √	14		21	√ √	9	
ON	Ottawa Public Health Unit	664	14.4	1,936	79.5	√	69.2	× √	11		17	√	14		17	√	16		25		8	
AB	Calgary Regional Health Authority	810	17.6	2,092	79.4	√	69.1	× √	10	√	20		14		19		16		26		9	
AB	Capital Health Authority	700	15.2	2,111	78.8	× √	68.0	× ×	12		23	×	15		17	√	18		28		10	×
BC	Simon Fraser	279	6.1	1,165	78.6	×	68.6	×	12		16	√	13		18	√	11	√ √	27		6	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

life expectancies and DFLEs for both of these health regions are better than those of peer group B as a whole. In addition, North Shore has the lowest percentage of residents reporting fair or poor health in the country (7%). In the case of North Shore, these superior health outcome measures are accompanied by favourable health behaviours. North Shore enjoys a lower daily smoking rate, a lower obesity rate, and a lower infrequent exercise rate than peer group B as a whole. However, the same cannot be said for York. Although the health behaviour rates for York are better than those for Canada, they are not any better than those for peer group B as a whole.

Peer group C

Canada's northernmost remote health regions constitute peer group C. This peer group is characterized by a high percentage of Aboriginal population, a high unemployment rate, and low levels of education.

Peer group C has the lowest life expectancy and the lowest DFLE in the country (Table 5). These two measures are below the Canadian average for all of the health regions within peer group C. In the Région du Nunavik, Québec, life expectancy falls short of the overall life expectancy for peer group C and is the lowest in the country, at 65.4 years, close to 13 years less than the Canadian average. The DFLE in the Région du Nunavik is also the lowest in the country, at 61 years.

The daily smoking rate for peer group C (39%) is the highest in the country, 17 percentage points higher than the Canadian rate. The obesity rate and the heavy drinking rate are also the highest in the country. One of every four residents of the peer group C health regions is obese, whereas for Canada this ratio is one of every seven. In peer group C, 22% of residents have at least one day of heavy drinking each month, a substantially greater proportion than for Canada as a whole (16%). The infrequent exercise rate for peer group C (27%) is also higher than the Canadian average (22%).

Interestingly, peer group C compares favourably for pyscho-social factors. The percentage of the population in this peer group who report a high stress level is lower than the Canadian rate by seven percentage points (19% versus 26%). Generally, individuals living in rural communities report lower stress levels (data not shown). The depression rate for peer group C is the lowest among the 10 peer groups, at 5%.

Table 5
Comparison of peer group C health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Health outcomes: Disability-free life expectancy (years)		Health outcomes: Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Health behaviours: Obese (age 20+) %		Health behaviours: Infrequent exercise (age 12+) %		Health behaviours: Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Psycho-social factors: Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP C	52	100.0	1,637	71.8	×	62.7	×	15	×	39	×	26	×	27	×	22	×	19	√	5	√
QC	Région des Terres-Cries-de-la-Baie-James	...		...	73.9	×	65.9	√ ×	...		...		...		...		...		...		...	
SK	Northern Health Services Branch	16	30.7	424	73.3	×	62.5	×	15		33	×	22	×	22		24	×	22		...	
MN	Burntwood and Churchill	16	31.5	506	72.9	×	62.4	×	15		35	×	26	×	27		24	×	19	√	6	
NU	Nunavut	19	37.8	707	69.8	×	62.9	×	16		48	× ×	28	×	30	×	18		16	√	4	√
QC	Région du Nunavik	...		...	65.4	× ×	61.0	×	...		...		...		...		...		...		...	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
Estimates for peer group C based on CCHS data exclude Région des Terres-Cries-de-la-Baie-James and Région du Nunavik since CCHS data were not collected in these health regions.
The questions on depression were not asked in the Northern Health Services Branch in Saskatchewan.
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.
··· Not applicable

Peer group D

The health regions in peer group D are mostly from Canada's eastern provinces. The unemployment rate in these regions is high, and average personal income is low. Most residents tend to live in these communities for long periods of time, as indicated by the low inter-municipality migration rate.

Peer group D falls behind Canada in terms of most of the health indicators considered (Table 6). Life expectancy is lower than the Canadian average, the DFLE ranks as the second lowest among the 10 peer groups, and a higher percentage of residents in this peer group rate their health as fair or poor, than Canadians as a whole. Residents of the health regions of peer group D tend to have poor health behaviours. The daily smoking rate, the obesity rate, the infrequent exercise rate, and the heavy drinking rate are all significantly higher than the Canadian rates. At 28%, the rate of infrequent exercise is the highest of the 10 peer groups. Similar to peer group C, peer group D does better when it comes to pyscho-social factors. Peer group D has the second lowest depression rate among the 10 peer groups and is tied with peer group C for the lowest stress rate.

The Bathurst region in New Brunswick (Region 6) has the highest life expectancy in peer group D, more than 2 years greater than the overall average for the peer group. It is the only health region within peer group D with a life expectancy higher than the Canadian average. However, the health behaviour rates for Bathurst are not significantly different than the overall rates for peer group D.

The health region within peer group D that distinguishes itself with regard to health behaviours is Région de la Gaspésie-Îles-de-la-Madeleine, Québec. In this health region, residents are less likely to be obese, less likely to be infrequent exercisers, and less likely to drink heavily than residents of peer group D as a whole. The DFLE for Gaspésie is greater than the DFLE for peer group D, but life expectancy is approximately the same.

The health region in peer group D with the lowest life expectancy is the Cape Breton region in Nova Scotia (Zone 5). Life expectancy in Cape Breton is 0.9 years less than that for peer group D and 2.2 years less than the Canadian average. DFLE in Cape Breton is very low, at 61.8 years, lagging 4.7 years behind peer group D and 6.8 years behind the Canadian

Table 6
Comparison of peer group D health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Disability-free life expectancy (years)		Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Obese (age 20+) %		Infrequent exercise (age 12+) %		Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP D	624	100.0	6,123	77.0	×	66.5	×	15	×	26	×	21	×	28	×	20	×	19	√	6	√
NB	Region 6 (Bathurst)	75	12.1	681	79.1	√	√	67.1	×	17	×	20		17		31	×	18		23		6	
NF	Grenfell Regional Health Services Board	14	2.2	335	78.3			70.8	√	√	14		25		27	×	33	×	21		15	√	5	
NF	Health and Community Services Central Region	90	14.5	711	77.7	×		69.2	√	√	13		25		27	×	29	×	21		11	√	√	5	√
NB	Region 7 (Chatham)	41	6.6	481	77.7			65.9		×	18	×	27		25	×	35	×	16		19	√	5	
NB	Region 5 (Campbellton)	27	4.3	478	77.4			63.4	×	×	20	×	29	×	22	×	24		20		25		6	
NF	Health and Community Services Western Region	75	12.0	623	77.3	×		67.8	√	×	13		28	×	18		31	×	20		17	√	5	
QC	Région de la Gaspésie-Îles-de-la-Madeleine	85	13.7	1,184	76.9	×		68.8	√		13		31	×	15	√	23	√	15	√	21	√	6	
NF	Health and Community Services Eastern Region	104	16.6	810	76.3	×		67.0		×	13		25		23	×	28	×	23	×	14	√	4	√
NS	Zone 5 (Cape Breton)	112	18.0	820	76.1	×	×	61.8	×	×	15		26	×	23	×	27	×	25	×	25	×		10	×

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

average. When DFLE is compared with life expectancy, it becomes apparent that Cape Breton residents can expect to spend 14.3 years living with disability, the longest period for any health region across the country. However, health behaviours in Cape Breton do not stand out as being particularly poor. There are no significant differences in health behaviour rates between Cape Breton and peer group D as a whole. On the other hand, Cape Breton does not fare well when it comes to pyscho-social factors. The stress and depression rates for Cape Breton are the highest of the 9 health regions in peer group D.

Peer group E

For the most part, peer group E consists of rural health regions predominantly from the Prairie provinces. This is the peer group with the highest percentage of people aged 65 or older. Average income is low.

Life expectancy in peer group E is half a year less than the Canadian average (Table 7). DFLE also falls behind the Canadian average, and a higher percentage of residents report fair or poor health. These inferior health outcome measures are coupled with unhealthy lifestyles. The obesity rate in peer group E is the second worst of the 10 peer groups, at 22%; 9 of the 13 health regions in peer group E have obesity rates significantly higher than the Canadian average. The smoking rate and the heavy drinking rate are also higher than the Canadian rates. Conversely, the percentage of the population reporting high levels of stress is lower than the Canadian rate.

The Kentville region in Nova Scotia (Zone 2), has the highest life expectancy (79.3 years) of all health regions in peer group E. At the same time the DFLE for Kentville (66.0 years) is lower than the average for peer group E. Taken together, these measures mean that Kentville residents can expect to live for 13.3 years with a disability, which ranks this health region third highest in the country in terms of number of expected years of disability.

Table 7
Comparison of peer group E health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Disability-free life expectancy (years)		Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Obese (age 20+) %		Infrequent exercise (age 12+) %		Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP E	672	100.0	10,535	77.8	×	67.0	×	14	×	26	×	22	×	22		19	×	22	√	7	
NS	Zone 2 (Kentville)	70	10.5	711	79.3	√	66.0	×	14		24		20	×	19		17		25		9	
PEI	Rural Health Region	62	9.2	2,262	79.1	√	68.8	√	12		24	×	21	×	24		16		18	√	5	√
SK	Moose Jaw Service Area	47	6.9	758	78.7		68.2	√	11		23		19		27		20		23		4	√
SK	Melfort Service Area	35	5.2	758	78.6		69.3	√	12		22		21	×	24		17		19	√	5	
SK	Prince Albert Service Area	56	8.4	658	78.4		67.2	×	13		29	×	26	×	19		20		22		6	
SK	Yorkton Service Area	49	7.3	633	78.3		68.5	√	16	×	26		24	×	29	×	16		28		6	
MN	Marquette	30	4.4	637	77.9		69.3	√	10		18	√	22	×	26		19		25		6	
NS	Zone 1 (Yarmouth/South Shore)	108	16.1	956	77.5	×	65.4	×	16	×	29	×	27	×	24		21	×	21	√	9	
MN	Parkland	34	5.0	614	77.4	×	67.7	×	18	×	21		25	×	18		24	×	18	√	4	√
ON	Muskoka-Parry Sound Public Health Unit	72	10.7	763	77.3	×	66.0	×	12		27	×	16	√	15	√	19		27		6	
SK	North Battleford Service Area	49	7.2	730	77.3	×	66.9	×	13		31	×	21	×	21		21		22		7	
MN	South Westman	29	4.3	550	77.2	×	69.3	√	10		17	√	17		25		17		19	√	6	
ON	Timiskaming Public Health Unit	32	4.7	505	75.9	×	63.3	×	15		33	×	18		14	√	18		23		9	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

PEI's Rural Health Region has the second highest life expectancy among the health regions in peer group E. It also has a higher DFLE than peer group E as a whole. Health behaviours for rural PEI are approximately equal to the overall rates for peer group E. However the stress rate is quite low, at 18%, significantly lower than the stress rate for peer group E (22%).

Timiskaming, Ontario, has both the lowest life expectancy and the lowest DFLE in peer group E. Life expectancy in Timiskaming is 1.9 years short of the life expectancy for peer group E as a whole, and DFLE is 3.7 years shorter than the DFLE for the peer group. The daily smoking rate in Timiskaming, 33%, is the highest smoking rate for all health regions in peer group E and the fifth highest smoking rate in the country. Timiskaming residents compare favourably when it comes to exercise: the infrequent exercise rate for Timiskaming is the lowest among all health regions in peer group E.

Peer group F

Peer group F encompasses many of Canada's northern communities, primarily from the west. Approximately one-sixth of the population of the health regions in peer group F is Aboriginal.

Life expectancy in peer group F is the second lowest among the 10 peer groups (Table 8). Nine of the 13 health regions in peer group F have life expectancies significantly lower than the Canadian average. DFLE also lags behind, 11 of the regions having DFLEs significantly less than the Canadian average. Peer group F does not fare well when it comes to health behaviours. The daily smoking rate, the obesity rate, and the heavy drinking rate are all higher than the Canadian average. However, this is not the case for exercise. The infrequent exercise rate for peer group F is significantly lower than the Canadian rate and is the second lowest among the 10 peer groups.

In terms of life expectancy, the Northwestern Regional Health Authority in Alberta and Norman, Manitoba, are the best and the worst health regions,

respectively, in peer group F. Northwestern residents can expect to live 3.3 years longer than the average for peer group F and 5.4 years longer than the residents of Norman. Heavy drinking is inversely related to these life expectancies: the Northwestern Regional Health Authority has the lowest heavy drinking rate in peer group F (14%), whereas Norman has the highest (30%) (this is also the highest heavy drinking rate in the country). The obesity rates for both of these health regions are higher than the rate for peer group F. This finding might be expected for Norman, given its low life expectancy. However, the very high rate for the Northwestern Regional Health Authority (the highest obesity rate in the country) is surprising, given the high life expectancy for this health region.

The Région du Nord-du-Québec has the highest DFLE in peer group F, 2 years longer than the average for the peer group as a whole. The other notable measure for the Région du Nord-du-Québec is the depression rate (4%), which is significantly lower than the depression rate for peer group F and the second lowest depression rate in the country.

The Northwest Territories has the worst health behaviour rates in peer group F. It has the highest daily smoking rate and the highest infrequent exercise rate in the peer group, and the obesity and heavy drinking rates are both above the overall peer group rates. However, the same is not true for the three health outcome measures. The Northwest Territories is in line with peer group F in terms of life expectancy, DFLE, and the percentage of the population reporting fair or poor health. This may be partially attributable to the economic situation in the Northwest Territories relative to peer F. The average income for residents of the Northwest Territories is higher than the overall average for peer group F (data not shown). It should be noted however, that the Northwest Territories lags behind Canada for all three health outcome measures.

Table 8
Comparison of peer group F health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes						Health behaviours								Psycho-social factors			
					Life expectancy (years)		Disability-free life expectancy (years)		Fair or poor health (age 12+) %		Daily smoking (age 12+) %		Obese (age 20+) %		Infrequent exercise (age 12+) %		Heavy drinking (age 18+) %		High stress (age 18+) %		Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP F	515	100.0	8,615	76.7	×	66.7	×	13	×	25	×	19	×	18	√	21	×	22	√	8	×
AB	Northwestern Regional Health Authority	10	2.0	341	80.0	√	67.7		18		21		34	× ×	25		14	√	23		7	
BC	North West	62	12.1	650	77.9	√	67.1	×	11		22		20		13	√ √	19		16	√	7	
AB	Mistahia Regional Health Authority	73	14.2	799	77.5	×	66.6	×	12		26	×	18		20		18		29	×	10	
BC	Peace Liard	51	9.9	611	77.5		67.4	×	12		22		18		17		23	×	22		7	
QC	Région du Nord-du-Québec	14	2.8	655	76.9		68.7	√	11		28	×	17		19		18		21	√	4	√ √
BC	Northern Interior	104	20.3	859	76.8	×	66.8	×	14		25		15		16	√	20		22		10	
NT	Northwest Territories	32	6.3	1,001	76.8	×	67.0	×	17	×	35	× ×	27	× ×	32	× ×	29	× ×	24		9	
BC	Cariboo	60	11.6	673	76.7	×	66.5	×	15		21		16		13	√	21		24		11	×
AB	Northern Lights Regional Health Authority	33	6.4	605	75.8	×	66.3	×	13		28	×	19		23		23	×	23		6	
YT	Yukon Territory	25	4.8	809	75.7	×	66.9	×	11		26	×	17		16	√	23	×	19	√	9	
NF	Health Labrador Corporation	20	3.9	499	74.9	×	66.3	×	13		32	×	24	×	23		26	×	13	√ √	5	
AB	Keeweetinok Lakes Regional Health Authority	16	3.0	556	74.8	× ×	64.4	× ×	19	×	32	× ×	22	×	24		18		24		8	
MN	Norman	15	2.9	557	74.6	× ×	65.1	× ×	16		21		27	× ×	12	√ √	30	× ×	15	√ √	8	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

Peer group G

Like peer group E, peer group G is made up mostly of rural health regions from the Prairie provinces. It has a low level of unemployment and a low percentage of people with incomes below the low-income cut-off (see Appendix Table A definitions).

Life expectancy and DFLE for peer group G are both slightly lower than the national average, but within the peer group, the data are highly variable (Table 9). Of the total of 21 health regions, 3 have life expectancies significantly greater than the Canadian average, whereas 6 have life expectancies that are significantly lower than the national average. For 3 of the 21 health regions, DFLE is significantly greater than for Canada as a whole, and for 9, DFLE is significantly lower. The percentage of residents who smoke daily is slightly above the Canadian rate. The obesity and heavy drinking rates are moderately high. Nine health regions in peer group G have obesity rates significantly higher than that of Canada as a whole, and 7 regions have heavy drinking rates higher than Canada's. The infrequent exercise rate for peer group G is slightly better than the Canadian rate.

Swift Current Service Area, in Saskatchewan, has the highest life expectancy in peer group G, 2 years greater than the overall estimate for the peer group. Swift Current also has the greatest DFLE in peer group G and is the only health region in peer group G for which the percentage of people reporting fair or poor health is significantly lower than the Canadian rate.

Table 9
Comparison of peer group G health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Health outcomes: Disability-free life expectancy (years)		Health outcomes: Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Health behaviours: Obese (age 20+) %		Health behaviours: Infrequent exercise (age 12+) %		Health behaviours: Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Psycho-social factors: Depression (age 12+) %	
		'000	%			P C		P C		P C		P C		P C		P C		P C		P C		P C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP G	1,355	100.0	14,385	77.9	×	67.5	×	12		23	×	20	×	20	√	20	×	24	√	8	
SK	Swift Current Service Area	38	2.8	492	79.9	√ √	70.8	√ √	8	√	22		20		19		22		24		6	
MN	South Eastman	43	3.2	749	79.3	√ √	69.3	√	12		18	√	19		29	× ×	11	√ √	20	√	4	√ √
SK	Weyburn Service Area	46	3.4	605	79.1	√	69.4	√ √	12		23		20		25		20		23		3	√ √
AB	Palliser Health Authority	78	5.7	726	79.1	√ √	68.7	√	10		24		17		19		18		23		7	
MN	Central	76	5.6	827	79.0	√	68.9	√	10		17	√ √	19		28	× ×	12	√ √	25		5	√ √
AB	Aspen Regional Health Authority	74	5.5	761	78.8	√	67.7	×	14		26		20	×	22		24	×	22		7	
BC	East Kootenay	69	5.1	645	78.8	√	68.3		12		23		19		13	√ √	23	×	23		9	
ON	Perth Public Health Unit	63	4.6	722	78.7		68.6	√	11		20		14	√	23		19		18	√ √	6	
SK	Rosetown Service Area	39	2.9	506	78.6		70.4	√ √	11		23		21		25		22		26		9	
AB	East Central Health Authority	86	6.3	802	78.6		68.2		11		29	× ×	22	×	24		23	×	26		10	
ON	Huron Public Health Unit	51	3.8	520	78.5		68.2		12		17	√	18		13	√ √	21		26		6	
AB	David Thompson Regional Health Authority	163	12.0	973	78.3		67.2	×	12		24		20	×	18	√	22	×	25		11	×
ON	Renfrew Public Health Unit	83	6.1	722	78.0		65.5	× ×	17	× ×	25		21	×	14	√ √	15		26		6	
AB	Chinook Regional Health Authority	121	8.9	890	77.7	×	67.4	×	13		22		20	×	21		16		27		10	
AB	Health Authority #5	43	3.2	623	77.7		68.1		10		24		17		22		17		22		5	
MN	North Eastman	30	2.2	522	77.6		68.3		12		19		22	×	20		20		24		6	
MN	Interlake	61	4.5	762	77.3	×	67.4	×	12		24		26	× ×	20		26	× ×	29		6	
AB	Lakeland Regional Health Authority	85	6.2	814	77.0	× ×	66.0	× ×	12		26	×	20	×	18		18		23		9	
AB	Peace Regional Health Authority	18	1.3	433	74.9	× ×	63.8	× ×	15		26		18		19		23	×	24		8	
AB	Crossroads Regional Health Authority	34	2.5	581	74.8	× ×	64.3	× ×	14		25		20		18		21		25		8	
ON	Northwestern Public Health Unit	56	4.1	710	74.3	× ×	63.9	× ×	13		23		21	×	17	√	22	×	23		8	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*

Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*

In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.

In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.

† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

Three health regions in peer group G have particularly low depression rates: 4% for South Eastman, Manitoba, 3% for Weyburn Service Area, Saskatchewan, and 5% for Central, Manitoba. These rates are all significantly lower than the 8% rate for peer group G. These three health regions compare favourably to peer group G on a number of other measures. All three have life expectancies and DFLEs greater than the peer group average. South Eastman and Central have the lowest heavy drinking rates in peer group G (11% and 12%, respectively). They are the only two health regions in peer group G with lower heavy drinking rates than the Canadian average (16%) and considerably lower than the overall rate for peer group G (20%). The daily smoking rates for these two health regions (18% and 17%, respectively) are also much lower than the 23% for peer group G.

Peer group H

Half of the 22 health regions in peer group H are in Québec, and most of the others are in provinces bordering Québec. Peer group H is characterized by low population growth and high to moderate unemployment.

Table 10
Comparison of peer group H health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Health outcomes: Disability-free life expectancy (years)		Health outcomes: Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Health behaviours: Obese (age 20+) %		Health behaviours: Infrequent exercise (age 12+) %		Health behaviours: Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Psycho-social factors: Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP H	5,843	100.0	26,371	77.7	×	68.8	√	12		25	×	15		24	×	17		29	×	7	
QC	Région de la Chaudière-Appalaches	331	5.7	1,427	78.3	√	70.2	√ √	10		21		13		31	× ×	15		32	×	5	√
QC	Région de la Montérégie	1114	19.1	2,461	78.2	√	71.1	√ √	11		25	×	13		24		16		31	×	6	
NF	Health and Community Services St. John's Region	158	2.7	892	78.1		68.2	×	12		24		17		27	×	24	× ×	18	√ √	5	√
NS	Zone 4 (New Glasgow)	83	1.4	691	78.1		66.1	× ×	15		20		22	× ×	21		24	× ×	22	√	6	
QC	Région du Bas-Saint-Laurent	175	3.0	1,127	78.1		69.4	√ √	12		25		12	√	30	× ×	11	√ √	30		5	√
ON	Hamilton Public Health Unit	424	7.2	1,326	78.0	×	66.6	× ×	15		23		19	× ×	18	√ √	16		30	×	9	
NS	Zone 3 (Truro)	89	1.5	801	77.9		65.6	× ×	16		25		21	× ×	19		18		23	√	12	× ×
QC	Région de Québec	556	9.5	1,653	77.9	×	70.8	√ √	9	√ √	23		10	√ √	23		17		36	× ×	6	
QC	Région de l'Estrie	244	4.2	1,180	77.9	×	68.9		11		26	×	12	√	27	×	16		28		6	
MN	Winnipeg	536	9.2	2,070	77.9	×	68.0	× ×	12		21	√	16		25		18		27		8	
NB	Region 2 (Saint John)	149	2.6	915	77.5	×	66.3	× ×	13		20	√	19		22		17		26		9	
QC	Région de la Mauricie et Centre-du-Québec	408	7.0	1,622	77.4	× ×	69.4	√ √	11		28	×	14		24		17		25	√	7	
QC	Région des Laurentides	395	6.8	1,440	77.3	× ×	70.0	√ √	9	√ √	27	×	12		22		15		32	×	7	
QC	Région de l'Outaouais	268	4.6	1,185	77.1	× ×	68.3	×	16	× ×	34	× ×	15		24		15		26		7	
ON	Algoma Public Health Unit	105	1.8	812	77.0	× ×	64.9	× ×	17	× ×	27	×	21	× ×	20		22	×	26		9	
NB	Region 4 (Edmunston)	46	0.8	583	76.8	× ×	64.7	× ×	20	× ×	24		19		28	×	16		31		8	
QC	Région du Saguenay-Lac-Saint-Jean	242	4.1	1,122	76.8	× ×	69.3	√ √	9		28	×	12		28	×	20		25		6	
ON	Sudbury Public Health Unit	166	2.8	979	76.7	× ×	64.2	× ×	17	× ×	28	×	18		21		23	× ×	23	√	8	
QC	Région de la Côte-Nord	78	1.3	1,098	76.6	× ×	69.7	√ √	13		31	× ×	19	× ×	23		21	×	19	√ √	6	
ON	North Bay Public Health Unit	78	1.3	979	76.6	× ×	63.6	× ×	15		24		19		19	√	20		24	√	9	
ON	Porcupine Public Health Unit	75	1.3	755	76.5	× ×	64.1	× ×	18	× ×	25		24	× ×	20		22	× ×	25		6	
QC	Région de l'Abitibi-Témiscamingue	124	2.1	1,253	76.4	× ×	67.7	× ×	13		28	×	13		19	√	21	×	28		5	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

Life expectancy in peer group H lags behind the Canadian average by 0.6 years, and 16 of the 22 health regions have life expectancies significantly lower than the Canadian level (Table 10). However, the DFLE is slightly greater than the Canadian average. This may be due in part to the large number of health regions in peer group H that are in Québec. Eight of the health regions in peer group H, all located in Québec, have DFLEs significantly greater than the Canadian average. In general, DFLEs in the province of Québec are the highest in the country and the DFLEs of 11 of the 18 health regions in Québec are in the top quartile of health regions in Canada.[21] This may in part be attributable to Québec's relatively low rates of arthritis, a major cause of activity limitation and disability. On the basis of CCHS data, of the 10 provinces, Québec has the lowest prevalence rate for arthritis (11%), 4 percentage points lower than the Canadian rate (15%).

The smoking rate in peer group H is higher than the Canadian rate (25% versus 22%), and 10 of the 22 regions have a rate significantly higher than that of Canada. There are no health regions in peer group H where the smoking rate is significantly lower than the rate for all of Canada. The percentage of residents in the health regions of peer group H reporting high stress levels is the highest among the 10 peer groups.

In terms of life expectancy, the two extremes within peer group H are both found in the province of Québec. The Région de la Chaudière-Appalaches has the highest life expectancy, at 78.3 years, identical with the Canadian average. The Région de l'Abitibi-Témiscamingue has the lowest life expectancy, lagging 1.9 years behind Chaudière-Appalaches. Surprisingly, Chaudière-Appalaches has the worst infrequent exercise rates in peer group H (31%), whereas Abitibi-Témiscamingue has one of the best rates (19%). Although the smoking and heavy drinking rates for Abitibi-Témiscamingue are not significantly different from the rates for peer group H, they are both significantly higher than the Canadian rates.

The Truro health region in Nova Scotia (Zone 3) is the only health region in peer group H with a depression rate higher than the Canadian average, and it has the second highest depression rate in the country (12%). The obesity rate for Truro is 6 percentage points higher that the overall rate for peer group H (21% versus 15%), and the DFLE is 3.2 fewer years than the DFLE for the overall peer group. However, Truro residents compare favourably when it comes to stress. Truro's stress rate is 6 percentage points lower than the rate for peer group H (23% versus 29%).

Peer group I

For the most part, peer group I consists of smaller urban centres and surrounding areas. Just over half of the health regions in peer group I are located in Ontario. A high percentage of residents commute to nearby urban centres for work. Among the 10 peer groups, peer group I ranks third in terms of the proportion of the population who are 65 or older.

Life expectancy in peer group I is 78.3 years, exactly the same as the Canadian average (Table 11). The DFLE lags behind the Canadian average by 1 year, and 26 of the 34 health regions have a DFLE significantly below the Canadian average. The smoking rate, the obesity rate, and the heavy drinking rate are all slightly higher than the corresponding Canadian rates. Peer group I compares well with all of Canada when it comes to exercise. The infrequent exercise rate is better than the Canadian average for 15 of the health regions in this peer group.

The two health regions in peer group I with the highest life expectancies are both in British Columbia: South Okanagan Similkameen and Capital. South Okanagan Similkameen ranks in the top 5 health regions in Canada with respect to life expectancy (80.3 years). In both of these health regions, DFLE is significantly greater than the average for peer group I. Furthermore, DFLE for both health regions is higher than the Canadian average. This finding is contrary to the general trend for peer group I, for which the overall DFLE is lower than the Canadian average. The favourable life expectancy and DFLE figures in these two health regions are associated with better than average health behaviours, particularly in the case of Capital. The infrequent exercise rates for both of these regions are lower than the overall rates for peer group I. Moreover, Capital has the lowest obesity rate and its tied with North Okanagan, British Columbia for the lowest daily smoking rate for peer group I.

The Région de Laval, Québec, has the best DFLE in peer group I and ranks third in Canada. The obesity rate, the heavy drinking rate, and the depression rate for Laval all compare favourably with the averages for peer group I.

Kent-Chatham Public Health Unit, Ontario, has both the lowest life expectancy and the lowest DFLE in peer group I. The heavy drinking rate for Kent-Chatham is high, at 23%, 5 percentage points higher that the rate for peer group I and 7 percentage points higher than the Canadian rate.

Table 11
Comparison of peer group I health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Disability-free life expectancy (years)		Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Obese (age 20+) %		Infrequent exercise (age 12+) %		Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP I	6,001	100.0	34,622	78.3		67.6	×	12		23	×	17	×	19	√	18	×	26		8	×
BC	South Okanagan Similkameen	196	3.3	1,063	80.3	√ √	69.1	√ √	13		22		13		13	√ √	20		23		10	×
BC	Capital	283	4.7	1,225	79.6	√ √	69.5	√ √	12		16	√ √	10	√ √	9	√ √	18		24		10	×
MN	Brandon	39	0.7	676	79.3	√ √	67.8		13		21		18		18		25	× ×	22		6	
SK	Saskatoon Service Area	232	3.9	1,274	78.9	√ √	68.3	√	12		22		19	×	22		19		27		10	
BC	North Okanagan	99	1.7	890	78.9	√	67.4	×	11		16	√ √	14		17	√	14		23		7	
NB	Region 1 (Moncton)	158	2.6	985	78.8	√	68.1	×	16	×	25		22	× ×	21		21	×	23		11	×
ON	Waterloo Public Health Unit	378	6.3	1,304	78.8	√ √	68.6	√	12		22		17		24	×	18		26		7	
QC	Région de Laval	297	5.0	1,045	78.7	√	72.0	√ √	10		22		13	√	28	× ×	9	√ √	32	× ×	5	√ √
BC	Fraser Valley	196	3.3	1,125	78.6		67.4	×	14		21		16		15	√ √	18		30		12	× ×
ON	Middlesex-London Public Health Unit	349	5.8	1,282	78.4		67.0	× ×	10		18	√	16		19		18		30		6	
ON	Peterborough Public Health Unit	109	1.8	842	78.4		66.9	× ×	12		19		15		11	√ √	21	×	24		5	√
BC	Central Vancouver Island	203	3.4	1,077	78.4		67.5	×	11		24		15		14	√ √	22	×	26		9	
ON	Lambton Public Health Unit	109	1.8	866	78.3		67.7	×	14		24		20	×	20		24	× ×	23		6	
ON	Niagara Public Health Unit	362	6.0	1,275	78.3		67.3	× ×	12		22		17		19		18		27		8	
SK	Regina Service Area	199	3.3	1,171	78.3		68.4	√	13		24		18		21		21	×	28		7	
ON	Haliburton-Kawartha-Pine Ridge Public Health Unit	145	2.4	967	78.2		67.2	×	12		24		17		14	√ √	19		24		9	
ON	Kingston-Frontenac-Lennox and Addington Public Health Unit	149	2.5	938	78.1		66.8	× ×	11		21		16		16	√	17		28		9	
ON	Oxford Public Health Unit	86	1.4	713	78.0		67.0	× ×	9	√	23		22	× ×	15	√ √	17		25		7	
NS	Zone 6 (Halifax)	325	5.4	1,340	77.9	× ×	66.8	× ×	12		22		19		20		21	×	22	√ √	8	
BC	West Kootenay-Boundary	71	1.2	705	77.9		66.8	× ×	17	× ×	22		15		14	√ √	20		26		13	× ×
NB	Region 3 (Fredericton)	137	2.3	873	77.8	×	66.8	× ×	15		25		21	×	26	×	14	√	19	√ √	6	
ON	Bruce-Grey-Owen Sound Public Health Unit	134	2.2	860	77.8	×	67.2	×	13		22		17		29	× ×	21	×	22		6	
ON	Haldimand-Norfolk Public Health Unit	93	1.6	723	77.8		66.8	× ×	16	×	26		19		19		19		21	√	8	
ON	Windsor-Essex Public Health Unit	325	5.4	1,250	77.8	× ×	66.6	× ×	15	×	22		19	×	23		17		26		8	
ON	Brant Public Health Unit	106	1.8	756	77.6	× ×	65.9	× ×	13		26		18		16	√	16		29		...	
QC	Région de Lanaudière	331	5.5	1,494	77.5	× ×	69.8	√ √	11		29	× ×	14		21		12	√ √	28		7	
ON	Hastings and Prince Edward Public Health Unit	133	2.2	889	77.4	× ×	65.5	× ×	12		25		17		23		20		28		6	
ON	Eastern Ontario Public Health Unit	163	2.7	982	77.3	× ×	65.6	× ×	12		29	× ×	21	×	16	√	18		26		6	
BC	Thompson, British Columbia	110	1.8	982	77.3	× ×	66.2	× ×	14		21		15		17	√	21	×	26		7	
ON	Leeds-Grenville-Lanark Public Health Unit	138	2.3	901	77.2	× ×	66.5	× ×	12		26	×	20	×	17	√	21	×	26		9	
ON	Elgin-St Thomas Public Health Unit	70	1.2	742	77.1	× ×	65.7	× ×	11		25		16		24	×	15		23		7	
PE	Urban Health Region	54	0.9	1,389	77.0	× ×	66.3	× ×	13		26	×	15		24	×	19		19	√ √	7	
ON	Thunder Bay Public Health Unit	130	2.2	959	76.7	× ×	65.5	× ×	15		24		19	×	16	√	22	×	26		7	
ON	Kent-Chatham Public Health Unit	93	1.6	1,059	76.6	× ×	64.9	× ×	11		25		20	×	23		23	× ×	23		6	

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*

Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
The questions on depression were not asked in the Brant Public Health Unit, Ontario.
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.
-- Not applicable

Table 12
Comparison of peer group J health regions, selected characteristics

		CCHS population†		CCHS sample size	Health outcomes: Life expectancy (years)		Health outcomes: Disability-free life expectancy (years)		Health outcomes: Fair or poor health (age 12+) %		Health behaviours: Daily smoking (age 12+) %		Health behaviours: Obese (age 20+) %		Health behaviours: Infrequent exercise (age 12+) %		Health behaviours: Heavy drinking (age 18+) %		Psycho-social factors: High stress (age 18+) %		Psycho-social factors: Depression (age 12+) %	
		'000	%		P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
	Canada	25,802		131,535	78.3		68.6		12		22		15		22		16		26		7	
	PEER GROUP J	1,568	100.0	7,866	78.8	√	68.8	√	11	√	22		16		17	√	18	×	24		8	
AB	Westview Regional Health Authority	77	4.9	648	80.4	√ √	68.1		12		24		20	×	14	√	13		22		9	
ON	Halton Public Health Unit	321	20.5	1,257	80.1	√ √	71.1	√ √	9	√	19		15		18	√	20	×	26		8	
ON	Wellington-Dufferin-Guelph Public Health Unit	204	13.0	1,170	78.8	√	69.4	√ √	9	√	21		18		17	√	16		28		7	
AB	Headwaters Health Authority	63	4.0	701	78.5		69.5	√	7	√	22		16		15	√	21	×	23		8	
BC	Coast Garibaldi	63	4.0	623	78.4		68.2		10		16	√	13		10	√ √	22	×	24		8	
ON	Durham Public Health Unit	428	27.3	1,383	78.3	×	68.1	× ×	12		23		16		19		15		24		7	
ON	Simcoe Public Health Unit	317	20.2	1,338	78.1	×	67.2	× ×	13		25		18		17	√	20	×	23		9	
BC	Upper Island/Central Coast	95	6.1	746	77.9	×	67.9	× ×	11		18		14		10	√ √	20		22		12	×

Data source: *Estimates of life expectancy and disability-free life expectancy are based on 1996 Census of Population, Canadian Vital Statistics Database, and population projections from Demography Division. Other estimates, as well as population counts and sample sizes, are based on 2000/01 Canadian Community Health Survey (CCHS) (see Annex).*
Notes*: The ordering of health regions is based on life expectancy, from highest to lowest. All estimates based on CCHS data have been age-standardized.*
In column P, √ indicates that health region estimate is significantly better than peer group estimate; in column C, √ indicates that health region or peer group estimate is significantly better than Canadian estimate.
In column P, × indicates that health region estimate is significantly worse than peer group estimate; in column C, × indicates that health region or peer group estimate is significantly worse than Canadian estimate.
† Because of rounding, detail may not add to total population. Percentages were calculated using unrounded data.

Peer group J

Peer group J consists mostly of sub-metropolitan health regions. Population growth in these health regions is high. Correspondingly, a relatively high proportion of residents in these health regions lived in a different municipality 5 years previously. The unemployment rate in peer group J is low, and the average level of education is high.

Peer group J is tied with peer group A for the second highest life expectancy of the 10 peer groups, half a year longer than the Canadian average (Table 12). The estimates for DFLE and the percentage of the population in fair or poor health are both slightly better than the Canadian averages. Estimates for health behaviours are similar to Canadian rates, with the exception of exercise, for which peer group J fares better. Peer group J has the lowest infrequent exercise rate among the 10 peer groups. Seven of the 8 health regions within peer group J have significantly better exercise rates than the Canadian average.

Upper Island/Central Coast in British Columbia is the health region in peer group J with the lowest life expectancy. Its DFLE also lags behind the DFLE for peer group J. The depression rate for this health region is high, at 12%, which is 5 percentage points higher than the Canadian rate; this is one of the highest depression rates in Canada.

Concluding remarks

In Canada, most public health programs are administered at the municipal or community level. Throughout the 1990s, there was a growing trend in most provinces toward the devolution of health care responsibilities to sub-provincial regions. The goal was to make health care services and programs more responsive to local needs.[30] Whether or not this regionalization of responsibilities has resulted in improvements to community-based services has not yet been adequately assessed. More information and analysis are required at the community level to make such an assessment.

Comparisons of health outcome measures at the peer group level show clearly that socio-demographic factors are associated with health status. People living in large metropolitan areas and urban centres, where education levels are high (e.g., peer groups A and B), have the highest life expectancies and DFLEs in all of Canada. At the other end of the continuum, people

living in remote northern communities, where education levels are low and a large percentage of the population is Aboriginal (e.g., peer groups C and F), have the lowest life expectancies and DFLEs.

The links between health outcomes and risk factors are evident. Particularly high or particularly low life expectancies or DFLEs within a peer group often go hand in hand with estimates of various risk factors. For example, communities such as Richmond, British Columbia (peer group A), and North Shore, British Columbia (peer group B), that distinguish themselves within their respective peer groups by having long life expectancies and DFLEs also have low risk factor estimates. In contrast, Norman, Manitoba (peer group F), and Montréal (peer group A) have lower life expectancies than the other health regions in their peer groups and higher estimates for key risk factors.

In general, high life expectancies are associated with low rates of daily smoking and heavy drinking (see *Links between health outcomes and risk factors at the health region level*). Among the risk factors examined, a high obesity rate, a high smoking rate, and a high depression rate were the strongest predictors of a low DFLE. These relationships persisted even with adjustment for socio-demographic factors. At the same time, a number of health regions stand out as paradoxical, for example with both relatively good health outcomes and high prevalences of risk factors.

Many factors influence health at the community level. The present analysis is a first step in exploring some of these factors. Further analysis is needed to understand the patterns presented, including the more paradoxical health regions. The CCHS collects information on a range of health issues, many more than have been used in this overview. This information should be valuable to health region administrators, provincial health ministries, and researchers as they design and monitor programs to promote and improve health in their communities.

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Appendix

Table A
Estimates of socio-demographic characteristics and relative rankings of these characteristics at the peer group level

	Aboriginal		Visible minority		Unemployment		1996 Population		Population ≥ 65		Income inequality	
Rank	Peer	%	Peer	%	Peer	%	Peer	'000	Peer	%	Peer	%
1	C	75.5	A	32.0	D	27.7	I	6,973	E	16.5	J	24.4
2	F	17.2	B	20.2	C	17.2	H	6,883	A	13.6	F	23.6
3	E	7.5	J	5.7	F	11.4	A	5,159	I	13.5	G	23.5
4	G	6.8	I	4.5	A	11.3	B	4,887	G	12.9	B	23.2
5	I	2.5	F	3.5	H	11.2	J	1,739	D	12.1	I	22.9
6	H	2.1	H	3.1	E	10.5	G	1,642	H	11.8	E	22.8
7	D	2.1	G	1.8	I	9.4	E	830	J	10.6	D	22.4
8	J	1.8	E	1.1	B	7.8	D	770	B	9.3	C	22.2
9	B	1.5	C	0.9	J	7.5	F	663	F	5.8	H	22.1
10	A	0.6	D	0.5	G	7.1	C	125	C	3.1	A	18.8
Canada		***2.9***		***11.2***		***10.2***		***29,670***		***12.1***		***22.2***

	Migration mobility		Population < 15		Average dwelling		Population density		House affordability		Own dwelling	
Rank	Peer	%	Peer	%	Peer	$ '000	Peer	No./km²	Peer	%	Peer	%
1	J	24.0	C	35.8	A	236	A	2,936.6	A	35.7	D	79.3
2	F	22.8	F	25.7	B	206	B	331.4	B	27.3	E	76.8
3	G	20.5	G	23.1	J	179	I	93.8	I	25.1	G	76.0
4	I	18.4	J	22.3	I	136	H	84.5	J	25.0	J	74.3
5	B	18.0	B	21.4	F	111	J	83.7	H	24.4	I	69.3
6	C	16.1	E	21.0	G	99	D	7.3	D	19.7	F	69.0
7	E	15.9	I	20.4	H	97	G	5.0	E	18.4	B	67.4
8	H	15.8	H	19.8	C	89	E	5.0	F	18.0	H	64.9
9	A	11.9	D	19.2	E	76	C	3.9	G	17.7	A	43.2
10	D	9.1	A	16.7	D	60	F	0.5	C	13.5	C	38.2
Canada		***16.8***		***20.2***		***152***		***167.7***		***26.2***		***64.4***

	Average school		Employment		LT unemployment		Government transfer		Male–Female ratio		Average income	
Rank	Peer	No. years	Peer	%	Peer	%	Peer	%	Peer		Peer	$ '000
1	A	13.9	G	82.3	D	6.9	D	29.8	C	1.08	B	29.1
2	B	13.9	J	82.0	C	5.7	E	21.6	F	1.08	J	29.0
3	J	13.5	B	81.0	A	5.1	C	18.6	G	1.02	F	27.2
4	I	13.1	I	78.2	H	3.8	H	16.3	J	1.00	A	25.8
5	H	12.8	E	76.8	I	2.9	I	15.1	E	1.00	I	24.7
6	G	12.6	F	76.7	B	2.5	G	14.9	D	0.99	H	23.3
7	F	12.5	H	74.5	J	2.4	A	13.7	B	0.99	G	23.1
8	E	12.3	A	72.9	F	2.3	J	10.8	H	0.98	C	20.1
9	D	11.5	C	65.1	E	2.2	F	10.4	I	0.98	E	20.1
10	C	10.6	D	55.4	G	1.6	B	9.5	A	0.94	D	18.2
Canada		***13.2***		***76.6***		***3.4***		***14.4***		***0.98***		***25.2***

	Low kids		Growth		Low income		Lone parent		MIZ		Recent immigration	
Rank	Peer	%	Peer	%	Peer	%	Peer	%	Peer	%	Peer	%
1	A	37.7	B	4.4	A	30.4	C	20.4	A	100.0	A	52.6
2	D	28.4	J	4.3	D	22.4	A	18.8	B	100.0	B	45.9
3	E	22.0	F	4.1	H	20.0	H	14.9	J	89.4	H	38.4
4	C	22.0	C	4.1	B	18.0	D	14.9	I	85.9	C	37.8
5	H	21.9	A	2.0	E	17.5	I	13.8	H	80.8	D	31.1
6	B	21.2	I	1.9	C	17.2	F	13.7	F	59.6	F	28.5
7	I	19.7	G	1.7	I	16.2	B	13.4	G	38.9	I	27.7
8	G	16.8	H	0.6	G	13.8	J	12.0	D	32.9	J	25.1
9	F	15.2	E	0.3	F	12.7	E	11.8	E	25.8	G	24.4
10	J	13.9	D	-2.1	J	11.6	G	10.4	C	10.8	E	20.5
Canada		***23.3***		***2.1***		***19.6***		***14.6***		***83.1***		***37.1***

Data source: *1996 Census of Population*
Notes: *All estimates at the peer group level are based on the weighted average of the health regions within the peer group. The weight assigned to each health region was the 1996 population for the health region divided by the total population for the peer group. Likewise the estimate for Canada is based on the weighted average of all health regions in the country, based on the 1996 population. The one exception is that estimates for population density were based on unweighted averages.*

Definitions:

Aboriginal: Aboriginal people living in a geographic area as a percentage of the total population.

Visible minority: Population belonging to a visible minority group as a percentage of the total population.

Unemployment: Number of unemployed persons aged 15 or older divided by the total number of persons aged 15 or older participating in the labour force.

1996 population: Estimate of the total number of people living in the health region in 1996.

Population ≥ 65: Proportion of the population aged 65 or older.

I**ncome inequality:** Proportion of total household income in the less well-off 50% of households within a geographic area (that is, the "median share" of income). In a situation of complete inequality, the bottom half receives 0, and the top half 100%, of all income. With total equality, the bottom half of the income distribution receives 50% of the total income and the geographic area then has a median share value of 50%. In this range from 0 to 50%, higher median values indicate more equal income distributions.

Migration mobility: Proportion of the population that lived in a different census subdivision (municipality) at the time of the previous census (1991). Canadians living in households outside Canada, such as military and government personnel, are excluded.

Population < 15: Proportion of the population younger than 15.

Average dwelling: Average expected value of an owner-occupied, non-farm, non-reserve dwelling, including land, at the time of the 1996 Census.

Population density: Number of persons per square kilometre.

House affordability: Proportion of households spending more than 30% of their income on shelter.

Own dwelling: Proportion of dwellings in which the owner lives. Band housing and collective dwellings are excluded from both numerator and denominator.

Average school: Average number of years of schooling (elementary, secondary, university, and non-university) for the population aged 25 to 54.

Employment: Number of employed persons aged 25 to 54 divided by the total number of individuals aged 25 to 54.

LT unemployment (long-term unemployment): Proportion of the labour force aged 15 or older who did not have a job any time during the current or previous year.

Government transfer: Proportion of total income coming from federal programs such as Guaranteed Income Supplement/Old Age Security, Pension Plan, and Employment Insurance.

Male–female ratio: Total number of males in a given health region in 1996 divided by total number of females.

Average income: Average post-transfer, pre-tax personal income from all sources, for people aged 15 or older.

Low kids: Proportion of children under age 18 living in economic families with 1995 incomes below Statistics Canada's low-income cut-offs. Data were not derived for economic families or unattached individuals in the Territories or on Indian Reserves.

Growth: Change in the population size between 1995 and 1997.

Low income: Proportion of persons in economic families and unattached individuals with 1995 incomes below the Statistics Canada low-income cut-off (LICO). The cut-offs represent levels of income where people spend disproportionate amounts of money for food, shelter, and clothing. LICOs are based on family size and degree of urbanization; they are updated to account for changes in the consumer price index. Data were not derived for economic families or unattached individuals in the Territories or on Indian Reserves.

Lone parents: Proportion of lone-parent families, among all census families living in private households.

MIZ (metropolitan influenced zone): Population living in census metropolitan areas (CMAs), census agglomerations (CAs), and communities that fall outside CMAs/CAs in which at least 30% of the employed labour force commutes to the CMAs/CAs. The measure is used to describe the degree of urban influence in the health region. CMAs and CAs are large urban areas, together with adjacent urban and rural areas that have a high degree of economic and social integration with that urban area. CMAs and CAs are defined as urban areas that have attained certain population thresholds: 100,000 for CMAs and 10,000 for CAs.

Recent immigration: Proportion of individuals who came to Canada between 1981 and 1996 among total of immigrants.

Regional socio-economic context and health

- *It's who you are and what you do, not where you live, that has a greater influence on the state of your health.*
- *Self-reporting of fair or poor health was strongly associated with individuals' age, sex, socio-economic position (as measured by education and household income), smoking, obesity, and infrequent exercise.*
- *Regional socio-economic context was modestly associated with self-reported fair or poor health.*

Abstract

Objectives

To determine the influence of health region socio-economic context on the self-rated health of Canadians.

Data sources

Individual data are from the first cycle of the 2000/01 Canadian Community Health Survey. Health region-level social, demographic, and economic characteristics were derived from the 1996 Census (short and long forms), the Canadian Vital Statistics Database, and the Demography and Geography Divisions of Statistics Canada.

Analytical techniques

Multilevel logistic regression was used to model fair or poor health.

Main results

At the individual level, the perception of fair or poor health was strongly associated with age, sex, socio-economic position (as measured by education and household income), smoking, obesity, and infrequent exercise. Overall, a handful of individual factors accounted for much of the variation between health regions in reporting of fair or poor health. There was an additional influence of socio-economic context on individual reporting of fair or poor health at the health region scale, but it was modest.

Conclusion

This Canadian study has not demonstrated as strong an influence of the social environment on individual health status as have studies in the United States and the United Kingdom. Federal and provincial government programs such as universal health care, unemployment insurance and old age security is one possible hypothesis that may explain the main results of the study.

Key words

Health status; self-perceived health; socio-economic context; multilevel studies; health risk factors.

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This analysis considers the influence of the regional social environment on the self-rated health of Canadians. Social environment can be defined in many ways: physical surroundings, cultural milieu, social groups, institutions, and public policy.[1,2] *(Note: Social environment, or social context, is defined here by the socio-economic and demographic profile of a health region using Census data)*. Individual risk factors such as age, family income, and smoking are known to influence individual health, but the social environment may also have an effect, over and above individual factors. If so, public policy could address the social conditions of places as a way of improving overall population health.[3]

Methods

Data sources

Data for the present analysis came from the first cycle (cycle 1.1) of the 2000/01 Canadian Community Health Survey (CCHS). Social, demographic, and economic determinants of health for each health region (see Appendix Table B) were derived from four Statistics Canada data sources: the 1996 Census (short and long forms), the Canadian Vital Statistics Database, and the Demography and Geography Divisions of Statistics Canada. Of the 118,336 CCHS respondents aged 18 or older from 136 health regions, 53 were excluded from the analytical sample because they did not report their perceived health. Dummy variables were created for each explanatory variable that had missing information, to keep as many respondents in the analysis as possible and to control for potential bias introduced by non-response.

Appendix Table A lists the resulting 136 health regions, and the number of respondents from each (296 to 2,495), the 1996 population (18,000 to 2.5 million).

Analytical techniques

Multilevel model software (MlwiN)[4] was used to fit logistic models of fair or poor health, a binary health outcome. The logit function was used to model the relationship between health outcome and various explanatory variables. MlwiN does not calculate the deviance of the models (representing the lack of fit between the model and the data) for binary outcomes. Therefore, inferences on model specifications could not be generated. Standardized weights were used at the individual level, and equal weights were used at the health region level, since the CCHS does not sample at the latter level.

Three models were developed incrementally. This process allowed simultaneous consideration of i individuals nested within j health regions. The first model, usually called the "empty" or "null" model, was fitted with no explanatory variables. The empty model was used to determine whether overall differences between health regions in terms of the percentage of people reporting fair or poor health were significant.

The second model, called the "individual" model, included various individual characteristics, to allow assessment of the association between fair or poor health and these characteristics. This model was also used to determine if there were still significant differences between health regions after individual-level characteristics were taken into account. In addition to the age and sex of each individual, this second model fitted socio-demographic characteristics, such as income and education, and common health risk factors, such as smoking, obesity, and physical activity (see *Definitions* in Appendix Table B). For each individual-level characteristic, binary variables (0,1) were derived for the non-reference group categories.

Since the differences between health regions were still significant after controlling for individual characteristics, a third model, called the "final" model, was generated, which included all explanatory variables at the individual plus four health region variables. With this model, it was possible to begin exploring the extent to which the social environment of the health region plays a significant role in the reporting of fair or poor health for different health risk factors.

Four synthetic independent and standardized, i.e. average 0 and standard deviation 1, factors were derived at the health region level from the total of 21 variables, which were primarily demographic and socio-economic census variables potentially related to the variations in reporting of fair or poor health. These factors were constructed through principal component analysis, a standard statistical method used to reduce the number of variables to analyse. These four synthetic factors-"Remote," "Prosperous," "Cosmopolitan," and "Disadvantaged"- each represented a separate subset of the original variables; this methodology was also employed by Mayer et al.[5] (see *Definitions* in Appendix Table B).

All estimates resulting from the multilevel modeling are tested with a Chi-square test with a significance level of $p < 5\%$.

Limitations

Most of the research in this area involves a theoretical understanding of health as a function of individual and social environmental characteristics. When individuals interact with their environment, at some point the social environment must "get under the skin" and affect their health[6]; however, the subtleties of this interaction are beyond the scope of this analysis. Until the theoretical understanding of exactly how environments influence health along some causal pathway is more fully developed, it will be difficult to build models to examine these mechanisms.

Even with the availability of multilevel statistical models to address the relationships between social environment and health, the complexity of these relationships is not well understood. For instance, individual smoking behaviour can be influenced by the degree to which social contexts are more or less supportive of smoking, perhaps through the existence of restrictive bylaws. The degree to which cultures and norms shape individual behaviours should be the focus of future work related to the CCHS.

Because this work is cross-sectional, causal claims cannot be made about the relationship between the explanatory variables and individual health outcomes. In addition, other features of the social environment that might be related to health within health regions, for example, social connectedness or public health policies, were not measured.

The scale used for social context in this analysis, the health region, has both advantages and disadvantages. Although public health and health care policy are, to some degree, determined at this scale in some provinces, the towns and neighbourhoods within some health regions do not share all socio-spatial characteristics of the health region. Therefore, it is quite possible that the heterogeneity of the social environment within any given health region is greater than that between health regions. A study of the influences on health of differences in social environment between declining inner-city neighbourhoods in Canada's largest cities and the more affluent suburbs of the same cities might yield different results than those reported here. Determining the ideal geographic scale for conducting multilevel studies of health outcomes is the subject of current research.

A variety of evidence supports a connection between conditions in the social environment and health. For example, in the 19th century, Durkheim reported that suicide rates differed between places and that these differences remained remarkably constant through time, even though the make-up of the populations within the places changed.[2,7] In modern times, community disadvantage has consistently been associated with low school readiness and achievement and with behavioral and emotional problems in children.[8,9]

Evidence from studies in the United States and the United Kingdom suggests that both the characteristics of individuals and the characteristics of the social environments in which they live and work, can both affect health. A recent review reported that 23 of 25 studies (with a wide variety of study designs and geographic units of analysis) had shown at least a moderate relationship between the social environment and individual health status, over and above individual characteristics.[10] Although this evidence strongly suggests a connection between social environment and health outcomes, such a relationship has never been clearly demonstrated for Canada.

Three recent Canadian studies of the effects of social environment on health outcomes (in Ontario, Québec, and Nova Scotia) differed in both their approaches and their results. One study yielded modest evidence for an association of place with health outcomes; the effects varied by the type of outcome measured and the spatial definition of regions.[11] The second found significant variations in health status at the local level but not the regional level, after accounting for individual characteristics.[12] The third study found no association between social context and risk of death at the neighbourhood level.[13] In Canada, health outcome indicators including mortality, life expectancy, disability-free life expectancy, and self-perceived health status differ substantially at the regional level[5,14] (see also the previous study in this series, "The Health of Canada's Communities" by Shields and Tremblay). However, the extent to which this regional variation is attributable to the composition of the population within each health region, rather than to the social context, remains an open question.

A more complex analysis of the relationships between health region social environments and the health of Canadians—after taking explicit account of individual characteristics—is required. A multilevel logistic regression analysis provides estimates of the probabilities of Canadians reporting fair or poor health as a function both of the socio-demographic characteristics of their health region, and their own socio-economic and health-related risk profiles. In other words, this type of analysis describes simultaneously the associations of health regions' social environment and individuals' own circumstances with individual's health status. It examines the effects of geographic region above and beyond the characteristics of individuals living in these regions (see *Methods and Limitations*).

General health of individuals

In Table 1, according to the 2000/01 Canadian Community Health Survey (CCHS) data, 22.8% of the Canadian population aged 18 or older smoke daily, 14.3% are obese, 21.3% engage in physical activity less than four times a month, and 12.8% report being in fair or poor health (see *Definitions* in Appendix Table B). The proportion of people reporting fair or

Table 1
Characteristics reported as percentage of total Canadians aged 18 or older

	Percentage
Self-reported health	
Fair/poor health	12.8
Excellent/very good/good	87.2
Characteristics	
Age	
18 to 29	21.2
30 to 44†	32.0
45 to 64	31.2
65 or older	15.6
Sex	
Female†	51.0
Male	49.0
Education	
Less than secondary	22.4
Secondary	20.2
Some post-secondary†	8.7
Post-secondary	47.7
Income group‡	
Lowest	3.5
Lower-middle	6.8
Middle	19.8
Upper-middle†	32.0
Highest	27.7
Smoking status	
Don't smoke†	72.7
Smoke daily	22.8
Smoke occasionaly	4.4
Obesity‡	
Obese	14.3
Non-obese†	83.0
Physical activity	
Infrequent exerciser	21.3
Frequent exerciser†	71.0

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Notes*: In this table, variables with missing information for some records are included in order to retain these individuals for analyses and to control for potential bias due to missing information.*
† Category used to illustrate the reference group in the models.
‡ See Definitions in Appendix.

poor health by health region ranged from a low of 6.8% in Headwaters Regional Health Authority in Alberta to a high of 22.3% in Region 5 (Campbellton) in New Brunswick and in Parkland in Manitoba (see Appendix Table A).

Who is in fair or poor health?

In general, individuals' reports of fair or poor health status were patterned by age, sex, education, and household income. Table 2 shows the proportions reporting fair or poor health according to a series of individual-level factors one at a time. Table 3 shows the relative odds of reporting fair or poor health for each individual-level factor adjusted for all of the other ones.

Table 2
Proportion of fair or poor health among Canadians aged 18 or older

Characteristics	Proportion
	%
Age	
18 to 29	5.1
30 to 44†	7.3
45 to 64	15.1
65 or older	29.7
Sex	
Female†	13.5
Male	12.0
Education	
Less than secondary	25.8
Secondary	10.9
Some post-secondary†	9.3
Post-secondary	7.9
Missing	18.6
Income group‡	
Lowest	27.6
Lower-middle	26.6
Middle	18.3
Upper-middle†	10.2
Highest	5.7
Missing	15.2
Smoking status	
Don't smoke†	12.0
Smoke daily	15.8
Smoke occasionaly	8.8
Obesity‡	
Obese	20.7
Non-obese†	11.4
Missing	13.0
Physical activity	
Infrequent exerciser	22.8
Frequent exerciser†	9.3
Missing	16.9

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Notes*: In this table, variables with missing information for some records are included in order to retain these individuals for analyses and to control for potential bias due to missing information.*
† Category used to illustrate the reference group in the models.
‡ See Definitions in Appendix.

Older Canadians reported fair or poor health more often than younger Canadians, and there were notable increases in the reporting of fair or poor health in those over age 45. The odds of reporting fair or poor health for Canadians aged 45 to 64 were twice as likely, and those aged 65 or older nearly four times as likely, to report fair or poor health as the reference age group (aged 30 to 44).

While women reported fair or poor health more often than men, once the other factors (e.g. age) are taken into account, they are slightly less likely than men to report fair or poor health (Table 3). Lower education level and lower household income were associated

Table 3
Adjusted odds ratios for fair or poor health by individual and health region characteristics compared to the reference category

	Individual model		Final model	
Characteristics	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Age				
18 to 29	0.67	0.63, 0.72	0.67	0.63, 0.72
30 to 44†	1.00	...	1.00	...
45 to 64	2.16	2.05, 2.27	2.16	2.05, 2.27
65 or older	3.85	3.63, 4.07	3.84	3.63, 4.06
Sex				
Female†	1.00	...	1.00	...
Male	1.06	1.02, 1.10	1.06	1.02, 1.10
Education				
Less than secondary	1.44	1.34, 1.56	1.45	1.34, 1.57
Secondary	0.90	0.83, 0.98	0.90	0.83, 0.98
Some post-secondary†	1.00	...	1.00	...
Post-secondary	0.80	0.74, 0.87	0.80	0.74, 0.87
Income group‡				
Lowest	3.07	2.82, 3.34	3.07	2.83, 3.34
Lower-middle	2.38	2.23, 2.54	2.38	2.23, 2.54
Middle	1.53	1.45, 1.60	1.53	1.45, 1.61
Upper-middle†	1.00	...	1.00	...
Highest	0.65	0.61, 0.70	0.65	0.61, 0.69
Smoking status				
Don't smoke†	1.00	...	1.00	...
Smoke daily	1.53	1.46, 1.60	1.53	1.46, 1.60
Smoke occasionaly	1.10*	0.99, 1.22	1.10*	0.99, 1.22
Obesity				
Obese	1.74	1.66, 1.82	1.74	1.67, 1.82
Non-obese†	1.00	...	1.00	...
Physical activity				
Infrequent exerciser	2.10	2.01, 2.19	2.10	2.02, 2.19
Frequent exerciser†	1.00	...	1.00	...
Synthetic factor§				
Remote			0.96*	0.92, 1.01
Prosperous			1.06	1.01, 1.10
Cosmopolitan			1.00*	0.96, 1.04
Disadvantaged			1.04*	1.00, 1.08

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
† Category used to illustrate the reference group in the models.
‡ See Definitions in Appendix.
§ Change in odds when the factor is increased by one standard deviation
** Not significantly different from the reference category.*
··· Not applicable

with greater odds of reporting fair or poor health. For both education and income, each step down the socio-economic ladder was associated with greater odds of reporting fair or poor health (except for those with secondary graduation in Table 3), and those in the lowest income category had an overwhelming five-fold greater risk of reporting fair or poor health than those in the top income category. As might be expected, reporting fair or poor health was greater among daily smokers, obese individuals, and infrequent exercisers than among others. Daily smokers were 1.5 times as likely as non-smokers to report fair or poor health. Individuals classified as obese also had significantly greater odds of reporting fair or poor health than non-obese individuals. Similarly, infrequent exercisers were twice as likely to report fair or poor health as more frequent exercisers. These results are consistent with previous Canadian studies.[15,16]

Multilevel studies of health

Multilevel or contextual studies of health seek to account for individual health outcomes simultaneously affected by characteristics of individuals and the environment in which they live. Multilevel models were first employed in the field of education in an effort to determine the value that schools or classrooms were adding to student achievement, above and beyond the students' own characteristics. These models, also known as hierarchical or random effects models, have become increasingly popular in health research, coinciding with epidemiologists' renewed interest in social contexts.[18]

The statistical advantages of multilevel models over traditional statistical models are discussed in detail elsewhere.[19,20] Briefly, individuals living in the same health region share similar experiences such as culture, environment, health behaviours, health care services, and experiences. Therefore, people living within a particular health region tend to be more alike than those living in different health regions. The main objective of multilevel studies is to "partial out" observable similarities to better understand the effect of these common exposures. These similarities within regions cause analytical problems for traditional statistical analyses. Multilevel models are specifically designed to deal with "like" people in "like" places and to parse out effects at various levels of analysis.

What is the influence of socio-economic context on health?

In order to explore further the role of the socio-economic context, a series of 21 demographic and socio-economic variables were derived for 136 health regions in Canada from the 1996 census and Statistics Canada's Geography Division (see *Definitions* in Appendix Table B). Since many of these variables are highly correlated, an analysis was undertaken to reduce these to a manageable number of synthetic social environment factors. This analysis resulted in four factors that could be summarized by the words: "Remote" - the degree of remoteness from large urban centers, "Prosperous" - the degree of economic prosperity, "Cosmopolitan" - the degree of urbanization and ethnic diversity, and "Disadvantaged" - the degree of social and economic disadvantage.

The odds, reported in the right hand part of Table 3, include both the individual-level variables and the four synthetic factors at the health region level. After the effects of population composition and individual health risk factors were accounted for, these four synthetic factors were generally not significant. There was a relatively small association for one of the social environment factors, "Prosperous". In this case, the odds ratio was 1.06 for each increase of one standard deviation from the mean. This small but significant finding runs counter to most epidemiological evidence linking greater economic prosperity and better health[17], and deserves further investigation.

This modest association is best explained by the smaller differences among health regions remaining in the proportions reporting fair or poor health compared with the national average, after adjustment for individual characteristics (see *Methods*).

To put these results in context, recall that overall, the unadjusted range of health region proportions of individuals reporting fair or poor health is 15.5%. This is shown graphically in the map, *Self-perceived Health by Health Region* (Map 1), at the end of the publication, and in the "Unadjusted" column in Appendix Table A.

On the map, red indicates health regions with a higher proportion of people reporting fair or poor health, and blue indicates health regions with a lower proportion. In addition, the darker the shade, the greater the deviation of the region's proportion reporting fair or poor health from the national average.

These "unadjusted" figures, however, are potentially misleading because elderly individuals, to take one individual-level characteristic, are more likely to describe themselves as being in fair or poor health, and some regions have older or younger populations than the national average. Adjusting for these differences in the age composition of the regions results in the range narrowing slightly to 14.4%, as

shown in the map, *Self-perceived Health by Health Region* (Map 2), at the end of the publication, and the "Age standardized" column of Appendix Table A.

As a third step, the effects of other individual-level socio-demographic characteristics (beyond age) and health-related risk factors have been taken into account (left side of Table 3). This results in the range across Canada's health regions decreasing by over one-third to 9.2%. Further adjustment by including the four synthetic social environment variables (i.e. moving from the "individual" to the "final" model in Table 3) did not noticeably affect this latter range.

The transition from Map 1 to Map 2 does not show much change, except in Nunavut and in Swift Current (Saskatchewan). This is in line with the observation above that age standardization reduced the range of proportions reporting fair or poor health only somewhat from 15.5% to 14.4%. However, comparing maps 2 and 3 shows a more substantial decrease in the variations among health regions. For example, the health regions with the largest declines in the proportion with fair or poor health are from the territories, the northern parts of the Prairies and to some extent the Atlantic provinces. The only region with a substantial increase was North Shore, B.C. It had the lowest age-adjusted rate of fair or poor health, but would have been close to the national average if its residents had the same income, education, and health risk factors as the rest of the country (Appendix Table A)

Essentially, these comparisons among the maps, which are spelled out in greater detail in Appendix Table A, suggest that a large portion of the observed inter-regional variations in self-reported health status can be attributed to variation in the mix of individuals living within each region in terms of their socio-economic characteristics (income and education) and health-related risk factors (smoking, obesity, and physical activity). Nevertheless, the map, *Self-perceived Health by Health Region* (Map 3), at the end of the publication, and the last column of Appendix Table A still show variations.

Overall, these findings suggest that individual factors accounted for much of the variation among health regions in reporting fair or poor health. The influence of specific social environment factors, those listed in Appendix Table B, on individual reporting fair or poor health at the health region scale was small by comparison.

Concluding remarks

These results suggest that self-reported fair or poor health is strongly associated with individual-level characteristics and is modestly associated with regional social context.

There are many possible hypotheses for this relatively small contribution of health regions' social context on individual health status differences. There are number of federal and provincial government programs such as universal health care, unemployment insurance and old age security, designed to address social disparities, and they may well attenuate the effects of the regional social context. In addition, the particular geographic unit used in the analysis, the health region, may not be the most appropriate for representing individuals' experiences of social context. For example, metropolitan health regions such as Toronto and Montréal have diverse social structures, so that for most people a smaller geographic unit like a "neighbourhood" would be more appropriate. Health region differences may also be due to regional variables other than social context as it was measured here. Social capital is a concept that refers to the overall quality of social relationship within a community. This concept is thought to play an important role in the explanation of variation in health status across geographic localities[16,21].

Interestingly, further analysis (data not shown) has examined several health system characteristics, specifically the number of hospital beds, general practitioners, specialists and physicians per capita. None of these variables was statistically significant in a multilevel regression analysis. In other words, the variations between regions in the availability of these health care services do not appear to play a role in accounting for individual health status differences.

From an international perspective, Canadian studies have not demonstrated as strong an influence of the social environment on individual health status as have studies in the United States and the United Kingdom. This difference may indicate that Canada already has a range of social and health policies that have been relatively effective in preventing health inequalities, at least on a regional scale. Nevertheless, in line with many other studies, this analysis supports the fundamental importance of individual socio-economic circumstances and key health-related risk factors in accounting for variations in individuals' health status. And even though health region effects were modest, many strategies that address these broader determinants of health may be most effectively developed at the health region level.[22,23]

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Appendix

Table A
Proportion of fair or poor health among Canadians aged 18 or older

Health region		Size		Proportion reporting fair or or poor health		
Code	Name	Sample	1996 population ('000)	Unadjusted (%)	Age standardized (%)	Adjusted for individual characteristics (%)
1001	NF-Health and Community Services St John's Region	804	187	12.6	13.0	12.0
1002	NF-Health and Community Services Eastern Region	707	125	14.3	14.5	9.9
1003	NF-Health and Community Services Central Region	604	113	14.3	13.7	10.5
1004	NF-Health and Community Services Western Region	549	93	13.5	13.4	10.1
1005	NF-Grenfell Regional Health Services Board	296	18	13.5	13.9	10.6
1006	NF-Health Labrador Corporation	437	26	12.1	14.5	11.3
1101	PEI-Urban	1,294	63	13.6	13.5	13.1
1102	PEI-Rural	2,081	72	12.8	12.4	11.3
1201	NS-Zone 1 (Yarmouth/South Shore)	865	128	19.3	17.7	14.6
1202	NS-Zone 2 (Kentville)	657	83	15.6	14.7	14.1
1203	NS-Zone 3 (Truro)	701	106	17.4	16.6	14.3
1204	NS-Zone 4 (New Glasgow)	604	100	16.6	15.6	13.4
1205	NS-Zone 5 (Cape Breton)	728	143	17.8	16.2	13.1
1206	NS-Zone 6 (Halifax)	1,182	371	12.8	13.4	14.0
1301	NB-Region 1 (Moncton)	893	183	17.0	16.7	14.8
1302	NB-Region 2 (Saint John)	801	178	14.5	14.1	13.1
1303	NB-Region 3 (Fredericton)	798	165	16.2	16.2	13.4
1304	NB-Region 4 (Edmunston)	507	55	21.9	21.5	17.7
1305	NB-Region 5 (Campbellton)	436	33	22.3	21.6	16.1
1306	NB-Region 6 (Bathhurst)	606	89	18.0	18.0	13.2
1307	NB-Region 7 (Miramichi)	438	50	20.1	19.5	15.1
2401	QC-Région du Bas-Saint-Laurent	1,025	209	13.8	13.1	10.1
2402	QC-Région du Saguenay - Lac-Saint-Jean	1,005	291	9.7	9.9	9.9
2403	QC-Région de Québec	1,552	645	9.5	9.2	8.9
2404	QC-Région de la Mauricie-Centre-du-Québec	1,488	484	12.2	11.6	10.5
2405	QC-Région de l'Estrie	1,054	283	12.1	11.7	10.1
2406	QC-Région de Montréal-Centre	2,495	1808	12.3	11.9	10.8
2407	QC-Région de l'Outaouais	1,061	313	15.8	16.3	14.1
2408	QC-Région de l'Abitibi-Témiscaminque	1,107	157	13.8	14.3	11.9
2409	QC-Région de la Côte-Nord	977	105	13.4	13.6	12.4
2410	QC-Région du Nord-du-Québec	611	19	8.4	11.1	11.3
2411	QC-Région de la Gaspésie-Îles-de-la-Madeleine	1081	107	15.3	14.4	11.0
2412	QC-Région de la Chaudière-Appalaches	1,289	387	11.0	10.9	9.7
2413	QC-Région de Laval	965	336	10.5	10.3	11.4
2414	QC-Région de Lanaudière	1,341	382	11.7	11.8	11.2
2415	QC-Région des Laurentides	1,282	441	9.5	9.5	10.0
2416	QC-Région de la Montérégie	2,216	1287	11.8	11.9	10.4
3526	ON-Algoma	731	130	19.3	18.2	15.5
3527	ON-Brant	689	123	12.5	12.4	13.2
3530	ON-Durham	1,236	473	11.9	12.6	15.5
3531	ON-Elgin-St Thomas	671	81	12.2	12.0	12.5
3533	ON-Bruce-Grey-Owen Sound	782	158	15.3	13.8	13.4
3534	ON-Haldimand-Norfolk	642	106	17.1	16.7	14.7
3535	ON-Haliburton	883	162	14.4	13.1	12.9
3536	ON-Halton	1,148	350	8.9	9.0	12.0
3537	ON-Hamilton-Wentworth	1,176	482	16.0	15.7	15.8
3538	ON-Hastings and Prince Edward	831	157	13.5	12.8	12.3
3539	ON-Huron	480	62	13.5	12.3	13.2
3540	ON-Kent-Chatham	951	113	12.4	12.0	11.7
3541	ON-Kingston	852	181	12.2	11.6	13.0
3542	ON-Lambton	773	133	15.7	15.3	14.5
3543	ON-Leeds	821	160	13.7	12.9	13.5

Health region		Size		Proportion reporting fair or or poor health		
Code	Name	Sample	1996 population ('000)	Unadjusted (%)	Age standardized (%)	Adjusted for individual characteristics (%)
3544	ON-Middlesex-London	1,149	404	10.9	11.1	12.2
3545	ON-Muskoka-Parry Sound	710	81	14.7	12.6	12.4
3546	ON-Niagara	1,149	415	13.4	12.4	13.4
3547	ON-North Bay	903	96	17.2	16.6	15.4
3549	ON-Northwestern	650	84	14.4	13.9	14.6
3551	ON-Ottawa Carleton	1,728	743	11.6	12.0	14.4
3552	ON-Oxford	638	100	10.1	9.8	11.9
3553	ON-Peel	1,655	882	10.3	11.5	13.8
3554	ON-Perth	654	74	12.0	11.6	12.3
3555	ON-Peterborough	801	127	14.1	12.6	14.2
3556	ON-Porcupine	696	100	19.5	19.7	16.7
3557	ON-Renfrew	650	101	18.0	17.1	15.2
3558	ON-Eastern Ontario	881	192	13.2	13.0	12.8
3560	ON-Simcoe	1183	340	13.8	13.4	14.3
3561	ON-Sudbury	889	208	17.8	17.4	16.0
3562	ON-Thunder Bay	859	167	16.0	15.8	15.9
3563	ON-Timiskaming	460	40	18.1	16.9	15.1
3565	ON-Waterloo	1,177	418	12.5	13.2	13.4
3566	ON-Wellington-Dufferin-Guelph	1,041	224	9.9	10.2	11.5
3568	ON-Windsor-Essex	1,128	361	16.2	16.5	16.4
3570	ON-York	1,509	612	10.5	11.2	13.4
3595	ON-City of Toronto	2,295	2463	13.4	13.4	14.9
4610	MB-Winnipeg	1,878	640	12.9	12.7	12.0
4615	MB-Brandon	612	47	14.0	13.6	13.0
4620	MB-North Eastman	458	38	14.3	13.0	14.4
4625	MB-South Eastman	669	52	12.1	12.8	12.0
4630	MB-Interlake	667	75	14.5	13.3	13.0
4640	MB-Central	743	95	11.8	11.2	11.2
4650	MB-Marquette	571	38	12.7	10.0	10.1
4655	MB-South Westman	487	35	12.0	10.7	9.7
4660	MB-Parkland	556	44	22.3	19.1	14.2
4670	MB-Norman	491	24	15.2	16.2	13.7
4680	MB-Burntwood+Churchill	434	46	9.8	16.3	12.1
4701	SK-Weyburn (A) Service Area	537	59	14.4	12.6	11.9
4702	SK-Moose Jaw (B) Service Area	678	59	12.5	11.2	11.6
4703	SK-Swift Current (C) Service Area	432	47	10.1	8.7	9.7
4704	SK-Regina (D) Service Area	1,039	246	13.4	13.1	12.7
4705	SK-Yorkton (E) Service Area	559	62	21.1	17.0	14.2
4706	SK-Saskatoon (F) Service Area	1,140	279	12.6	12.7	13.1
4707	SK-Rosetown (G) Service Area	445	48	12.4	11.7	10.6
4708	SK-Melfort (H) Service Area	691	44	15.6	13.5	10.8
4709	SK-Prince Albert (I) Service Area	585	76	15.4	14.1	11.6
4710	SK-North Battleford (J) Service Area	660	68	13.6	13.1	12.5
4711	SK-Northern Health Services Branch (K) Svc Area	379	32	13.1	16.3	13.2
4801	AB-Chinook Regional Health Authority	808	145	13.2	13.6	12.9
4802	AB-Palliser Regional Health Authority	652	87	10.5	10.3	10.8
4803	AB-Headwaters Regional Health Authority	618	71	6.8	7.5	9.5
4804	AB-Calgary Regional Health Authority	1,856	845	9.3	10.0	11.3
4805	AB-Regional Health Authority #5	558	53	10.3	10.2	12.0
4806	AB-David Thompson Regional Health Authority	856	181	12.5	13.2	13.9
4807	AB-East Central Regional Health Authority	701	104	12.7	12.0	11.2
4808	AB-Westview Regional Health Authority	562	89	11.7	12.7	13.2
4809	AB-Crossroads Regional Health Authority	537	39	13.9	14.4	12.2
4810	AB-Capital Health Authority	1,891	783	12.0	12.7	13.8
4811	AB-Aspen Regional Health Authority	692	88	14.6	14.8	12.8
4812	AB-Lakeland Regional Health Authority	708	108	12.0	12.4	11.9
4813	AB-Mistahia Regional Health Authority	711	86	11.8	13.0	12.3
4814	AB-Peace Regional Health Authority	383	21	13.5	15.3	12.7
4815	AB-Keeweetinok Regional Health Authority	496	24	16.4	19.3	16.5

Health region		Size		Proportion reporting fair or or poor health		
Code	Name	Sample	1996 population ('000)	Unadjusted (%)	Age standardized (%)	Adjusted for individual characteristics (%)
4816	AB-Northern Lights Regional Health Authority	530	37	8.4	13.7	13.4
4817	AB-Northwestern Regional Health Authority	308	18	16.8	18.3	13.5
5901	BC-East Kootenay	583	79	13.3	12.9	13.2
5902	BC-West Kootenay-Boundary	642	82	18.5	17.3	16.3
5903	BC-North Okanagan	822	114	12.3	11.4	11.5
5904	BC-South Okanagan Similkameen	955	221	15.4	13.8	14.7
5905	BC-Thompson	873	130	14.8	14.7	15.0
5906	BC-Fraser Valley	995	231	15.1	14.9	15.3
5907	BC-South Fraser Valley	1,272	543	12.9	13.2	15.6
5908	BC-Simon Fraser	1,057	303	12.0	12.2	14.6
5909	BC-Coast Garibaldi	593	73	11.0	10.7	12.6
5910	BC-Central Vancouver Island	960	233	13.4	12.0	13.0
5911	BC-Upper Island / Central Coast	669	119	12.2	11.8	14.5
5912	BC-Cariboo	611	73	15.8	16.2	15.1
5913	BC-North West	567	90	11.2	12.0	13.4
5914	BC-Peace Liard	533	65	10.9	12.6	13.2
5915	BC-Northern Interior	798	129	12.3	14.5	14.6
5916	BC-Vancouver	1,200	546	13.9	14.3	15.9
5917	BC-Burnaby	791	187	13.3	13.7	15.4
5918	BC-North Shore	767	177	6.9	7.2	11.1
5919	BC-Richmond	731	155	14.2	14.4	15.4
5920	BC-Capital	1,113	332	13.3	12.2	14.2
6001	Yukon	722	32	10.7	11.5	13.8
6101	Northwest Territories	865	42	14.2	18.1	13.7
6201	Nunavut	578	26	11.8	17.0	8.5
	Canada					
	Total	**118,283**	**29,653**	**12.8**	**12.8**	**12.8**
	Minimum	**296**	**18**	**6.8**	**7.2**	**8.5**
	Maximum	**2,495**	**2,463**	**22.3**	**21.6**	**17.7**
	Range	**2,199**	**2,445**	**15.5**	**14.4**	**9.2**

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*

Definitions:

Individual level

Fair or poor health: The health outcome variable is derived from a question on the Canadian Community Health Survey that measures self-reported health status "In general, would you say your health is excellent, very good, good, fair, or poor?" Responses were categorized into two groups: fair or poor and excellent, very good, or good. Self-assessment of health is recognized as a straightforward concept to administer; it is also a reliable and valid measure of health and has good predictive power.[24-26]

Reference Group: In multilevel studies, effects are usually presented as odds or deviations from a reference group. Here, the reference group is defined as the median category of each variable studied. A person belonging to the reference group was a middle-aged (age 30 to 44), upper-middle income woman with some post-secondary education, did not smoke, who was not obese, and who exercised at least four times per month.

Age: Respondents were grouped into four age groups: 18-29, 30-44, 45-64, and 65 or older.

Education: Respondents were grouped into four categories based on the highest level attained as of the completion of the first cycle of the CCHS: less than secondary graduation, secondary graduation, some post-secondary education, or post-secondary diploma or degree.

Household income: Household income was grouped into five categories defined by the number of people in the household and the total household income from all sources in the 12 months before the interview.

Household income group	People in household	Total household income
Lowest	1 to 4	Less than $10,000
	5 or more	Less than $15,000
Lower-middle	1 or 2	$10,000 to $14,999
	3 or 4	$10,000 to $19,999
	5 or more	$15,000 to $29,999
Middle	1 or 2	$15,000 to $29,999
	3 or 4	$20,000 to $39,999
	5 or more	$30,000 to $59,999
Upper-middle	1 or 2	$30,000 to $59,999
	3 or 4	$40,000 to $79,999
	5 or more	$60,000 to $79,999
Highest	1 to 2	$60,000 or more
	3 or more	$80,000 or more

Daily smoker: Respondents were classified as daily smokers if they reported smoking cigarettes daily.

Occasional smoker: Respondents were classified as occasional smokers if they reported smoking cigarettes occasionally.

Obese: Body mass index (BMI) is commonly used to determine if an individual is in a healthy weight range. BMI is calculated by dividing weight in kilograms by the square of height in metres. In this analysis, people with a BMI of 30 or more were classified as obese, a definition of obesity that is endorsed by the World Health Organization. The obesity measure is calculated for the population aged 20 or older. Pregnant women were excluded in the calculation of obesity rates.

Infrequent Exerciser: Physical activity is based on the number of times in the previous 3 months that respondents participated in leisure-time physical activity lasting more than 15 minutes. Monthly frequency was the number of times in the past 3 months divided by 3. Respondents were classified as infrequent exerciser if the number of times per month was three or less.

Health region level

Health region: In general, health regions correspond to the administrative areas established by provincial authorities for local delivery of health and social services. At the time the CCHS was designed, there were 139 health regions in Canada. However, the CCHS does not collect data for two of these: the Région des Terres-Cries-de-la-Baie-James and the Région du Nunavik, both in the province of Québec. Furthermore, two health regions (Burntwood and Churchill, both in Manitoba) were combined because of Churchill's small population. The analytical file contains 136 health regions.

Synthetic factors: The synthetic factors "Remote," "Prosperous," "Cosmopolitan," and "Disadvantaged" are linear combinations of the 21 original variables, each representing a separate subset of these variables. Signs between parentheses indicate the direction of the association between synthetic variable and the main demographic and socio-economic variables of which it is composed.

Remote: Synthetic factor encompassing 8 variables, which represent the degree of remoteness of the health regions from large urban centers:

Male-female ratio (+): Total number of males in a given health region in 1996 divided by total number of females.

Population < 15 (+): Proportion of the population younger than 15.

House inaffordability (-): Proportion of households spending more than 30% of total household income on shelter.

Education 25-54 (-): Proportion of the population aged 25 to 54 with a post-secondary degree, certificate, or diploma.

Population ≥ 65 (-): Proportion of the population aged 65 or older.

MIZ (metropolitan influenced zone) (-): Proportion of population living in census metropolitan areas (CMAs), census agglomerations (CAs), and communities that fall outside CMAs/CAs in which at least 30% of the employed labour force commutes to the CMAs/CAs. The measure is used to describe the degree of urban influence in the health region. CMAs and CAs are large urban areas, together with adjacent urban and rural areas that have a high degree of economic and social integration with that urban area. CMAs and CAs are defined as urban areas that have attained certain population thresholds: 100,000 for CMAs and 10,000 for CAs.

Aboriginal (+): Aboriginal people living in a geographic area as a percentage of the total population.

Frost-free days (-): Average annual number of days with a temperature above 5°C.

Prosperous: Synthetic factor encompassing five variables, which represent the degree of economic prosperity of health regions:

Government transfers (-): Payments from federal programs such as Guaranteed Income Supplement/Old Age Security, the Canada Pension Plan, and Employment Insurance.

Internal migration (+): Proportion of the population that lived in a different census subdivision (municipality) at the time of the previous census (1991). Canadians living in households outside Canada, such as military and government personnel, are excluded.

Population change (+): Change in the population size between 1995 and 1997 (as a percentage).

Unemployment (-): Number of unemployed persons aged 15 or older divided by the total number of persons aged 15 or older participating in the labour force.

Average income (+): Average post-transfer, pre-tax personal income from all sources, for people aged 15 or older.

Cosmopolitan: Synthetic factor encompassing five variables, which represent the degree of urbanization and ethnicity of health regions:

Recent immigration (+): Proportion of individuals who came to Canada between 1981 and 1996 among total of immigrants.

Population density (+): Number of people per square kilometre.

Population size (+): Proportion of the Canadian population within a health region.

Dwelling values (+): Average expected value of an owner-occupied, non-farm, non-reserve dwelling, including land, at the time of the 1996 Census.

Visible minority (+): Proportion of population belonging to a visible minority group as a percentage of the total population.

Disadvantaged: Synthetic factor encompassing three variables, which represent the degree of social and economic disadvantage of health regions:

Income equality (-): Proportion of total household income in the less well-off 50% of households within a geographic area (that is, the "median share" of income). In a situation of complete inequality, the bottom half receives 0, and the top half 100%, of all income. With total equality, the bottom half of the income distribution receives 50% of the total income, and the geographic area then has a median share value of 50%. In this range from 0 to 50%, lower median values indicate less equal income distributions.

Lone-parent families (+): Proportion of lone-parent families, among all census families living in private households.

Owner-occupied household (-): Proportion of dwellings in which the owner lives. Band housing and collective dwellings are excluded from both numerator and denominator.

Trends in mortality by neighbourhood income in urban Canada from 1971 to 1996

- *From 1971 to 1996, differences in life expectancy between the richest and poorest income quintiles diminished by well over 1 year for each sex.*
- *Differences in infant mortality declined by 7 per thousand (76%).*
- *The rate of income-related excess potential years of life lost before age 75 diminished by 35%.*
- *For most causes of death, socio-economic disparities in mortality diminished markedly over time. However, some causes of death showed little change, and a few showed clearly widening disparities.*

Abstract

Objectives

This article describes changes in income-related differences in mortality in Canada from 1971 to 1996, including trends by specific causes of death.

Data source

Death registration and population data for residents of census metropolitan areas (CMAs) were obtained from the Canadian Mortality Data Base and population censuses for 1971, 1986, 1991, and 1996. The death data were then coded to census tract (CT), and institutional residents were identified (for exclusion).

Analytical techniques

Within each CMA, the non-institutional population and deaths were grouped into neighbourhood income quintiles on the basis of the CT percentage of population below Canada's low-income cut-offs. Life expectancy at birth, probability of survival to age 75, potential years of life lost (PYLL), and income-related excess PYLL before age 75 were calculated, as were age-specific mortality rates and age-standardized mortality rates (ASMRs) for major causes of death.

Main results

From 1971 to 1996, differences in life expectancy between the richest and poorest income quintiles of urban Canada diminished by well over 1 year for each sex (from 6.3 to 5.0 years for males, and from 2.8 to 1.6 years for females). Inter-quintile differences in infant mortality declined by 7 per thousand (76%). The rate of income-related excess potential years of life lost (PYLL) before age 75 diminished by 35%. By 1996 the major causes of death contributing to excess PYLL were circulatory diseases, injuries, neoplasms, and infectious diseases. For most causes of death (notably ischemic heart disease, most injuries, cirrhosis of the liver, and perinatal conditions), socio-economic disparities in mortality diminished markedly over time. However, some causes of death (such as lung cancer, prostate cancer and suicide for males, and breast cancer for females) showed little change, while a few (lung cancer for females, and infectious diseases, mental disorders and diabetes for both sexes) showed clearly widening disparities.

Conclusions

Because of the multiple pathways through which such differences are believed to arise, continued progress in reducing socio-economic disparities in mortality in Canada may require both broad-based intersectoral policies and highly targeted interventions, as well as better data on the nature of the existing disparities with respect to socio-economic characteristics other than neighbourhood income.

Key words

infant mortality, life expectancy, survival probability, premature mortality, excess deaths, age-standardized mortality rate, population-attributable risk

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The reduction of socio-economic inequities in health—"Health for All"—is an explicit objective of health policy in Canada.[1-3] Many studies in various countries have shown that all-cause mortality, as well as mortality for specific causes of death, is considerably higher among people of lower socio-economic status.[4-7] In Canada an increasing number of studies have confirmed such patterns using individual-level socio-economic data[8-24] as well as small area-based socio-economic data.[25-35]

Internationally, the findings for trends over time are inconsistent. Some studies have reported a widening of socio-economic disparities in mortality,[36-41] while others have reported a narrowing of such differences,[28, 42-43] and a few have reported changes in both directions, depending on the time period.[39, 44] Only two Canadian studies, neither of them recent, have provided information on how income-related disparities in mortality rates have changed over

Methods

Data sources

Death registration and population data for residents of Canadian census metropolitan areas (CMAs) were obtained from the Canadian Mortality Data Base and population censuses for 1971, 1986, 1991, and 1996. CMAs, which account for about 60% of Canada's total population, were used because neighbourhoods are more clearly defined and residential segregation by income is more pronounced in big cities than in small towns and rural areas.

Variables extracted from the Canadian Mortality Data Base included age, sex, marital status, place of birth, census subdivision (municipality) of usual place of residence, and cause of death. From microfilm records, optical images, and supplementary electronic files, the street address, city, and postal code (if available) were also obtained for each death to establish the census tract (CT) of usual place of residence and to determine if the decedent resided in a long-term care facility (for further information, see *Restrictions and coding to CT and quintile*[48-52] and Appendix Table A). For 1971, data already coded to CT and with institutional residents identified were obtained from a tape created by Statistics Canada for a previous study.[25]

Deaths of residents of long-term care facilities were excluded because the income level of the CT in which an institution was located might be unrelated to the income of its residents. A smaller number of deaths were excluded because the CT of residence could not be coded, because CT income data were not available, or because age or sex was unknown (Table 1). After these exclusions, approximately 357,000 deaths (74,000 in 1971, 88,000 in 1986, 93,000 in 1991, and 102,000 in 1996) were available for analysis by quintile. These represented approximately 98% of non-institutional deaths in 1971 and at least 99% of non-institutional deaths in subsequent years.

Causes of death had been coded according to the International Classification of Diseases (ICDA-8[53] in 1971 and ICD-9[54] in subsequent years) and were analyzed by ICD chapter and by common specific causes within chapters (see Appendix Table B). For 1986 only, deaths due to acquired immune deficiency syndrome were reallocated from metabolic disorders (ICD-9 279.1) to infectious diseases (ICD-9 042.9) for comparability with coding for subsequent years.

For 1986, 1991, and 1996, the total population less residents of long-term care facilities (14.9 million in 1986, 16.5 million in 1991, and 17.7 million in 1996) was used as the denominator for calculating mortality rates. For 1971, the total population (11.6 million) was used instead, since the 1971 census coding of type of collective dwelling was considered unreliable. The study base thus consisted of 60.7 million person-years at risk.

Analytical techniques

Abridged life tables for 1971, 1986, 1991, and 1996 and corresponding standard errors for life expectancy and the probability of survival to each age were calculated for each income quintile and sex according to the method of Chiang,[55] except that life expectancy for the last age interval (95+) was taken as the inverse of the age-specific mortality rate. Life tables for both sexes together were constructed by combining the columns for survivors and life years lived from the life tables for each sex, rather than using mortality rates based on pooled death and population data. This ensured that the actual distribution of the population by age and sex would have no effect on the life table results.

Potential years of life lost (PYLL) before age 75 was calculated as described by Romeder and McWhinnie,[56] except that infant deaths and deaths from ages 70 to 74 were included. Excess PYLL was defined as the difference between observed and expected PYLL, where expected PYLL was that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population.

Confidence intervals for the age-specific mortality rates were calculated by the method of Fleiss.[57] The inter-quintile mortality rate ratio was calculated as the rate for the poorest quintile divided by the rate for the richest quintile. Mortality rate differences were calculated as the rate for the poorest quintile (or total) less that for the richest quintile. Confidence intervals for the rate ratios and rate differences were calculated as described by Rothman[58] and Kelsey et al.[59] Survivorship differences were expressed as the percentage of the population in the richest quintile that was expected to survive to a given age, less the percentage of the population in the poorest quintile that was expected to survive to that age.

Age-standardized mortality rates (ASMRs) for each sex were calculated by the direct method, with the 1986 CMA population (excluding residents of long-term care facilities) as the reference population. ASMRs for both sexes together were standardized by sex as well as by age. Standard errors for the ASMRs were calculated as described by Spiegelman[60] and Brillinger;[61] this method assumes a binomial distribution of the rates in each stratum. Asymmetric confidence intervals for the ASMRs were calculated by the method of Carrière and Roos,[62] which assumes a Poisson distribution of the deaths in each stratum. Inter-quintile mortality rate ratios for the ASMRs were calculated as the ratio of the ASMR in the poorest quintile divided by the ASMR in the richest quintile. Inter-quintile mortality rate differences compared the ASMR of the poorest quintile with that of the richest quintile. Excess mortality was defined as the ASMR for the total population less the ASMR of the richest quintile. Confidence intervals for the population-attributable risk percentages were calculated according to the method of Fleiss.[57]

time.[27,28] Furthermore, trends for certain specific causes of death differed from those for all-cause mortality.[28, 45,46] In some cases, the direction of trends also differed according to whether rate ratio or rate difference measures were used.[47]

This study fills an important gap since it examines changes in mortality rates by income in urban Canada over a recent 25-year period. The objective was to determine if income-related differences in mortality rates have changed since the early 1970s, and if so, by how much, in which period, and for what ages and which causes of death.

Demographic and socio-economic characteristics

We divided the population into fifths (quintiles) based on the percentage of population in their neighbourhood (CT) below the low-income cut-offs (see *Restrictions and coding to CT and quintile*). Because the population increased, the number of people of each sex in each neighbourhood income quintile grew from about 1.1 million in 1971 to 1.7 million in 1996 (Table 2). The number of deaths per quintile and sex varied from a low of just over 4,000 for females of the richest quintile in 1971 to a high of over 14,000 for males of the poorest quintile in 1986.

The percentage of residents classified as low income in each quintile was generally similar in 1971, 1986, and 1991, but the gradient between the poorest and richest quintiles was noticeably steeper in 1996 (Chart 1).

Table 1
Total deaths, deaths excluded from analysis (by reason for exclusion), and non-institutional population, urban Canada, 1971 to 1996

	1971	1986	1991	1996
Total deaths in study area	81,465	104,104	109,960	122,104
Death registrations not retrieved	18	0	0	0
Residents of health care facilities	5,912	14,835	16,510	19,185
Census tract not coded	1,375	923	17	1,010
Census tract excluded	109	213	97	122
Age or sex unknown	61	4	8	1
Deaths remaining for analysis by quintile	73,990	88,129	93,328	101,786
Non-institutional population for analysis	11,605,660	14,946,360	16,503,465	17,690,820

Data source: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
Notes: *The 1971 and 1986 analysis files were restricted to deaths for which income quintile was known. The 1991 and 1996 analysis files included 79 and 1023 deaths, respectively, that were not classified by income quintile. Census tracts were excluded either because of missing income data or high rate of non-response to census.*

From 1971 to 1996, the percentage of the population born outside of Canada diminished for quintile 1 (the richest), stayed roughly the same for quintile 2, and grew substantially for quintiles 3, 4, and 5 (Chart 2).

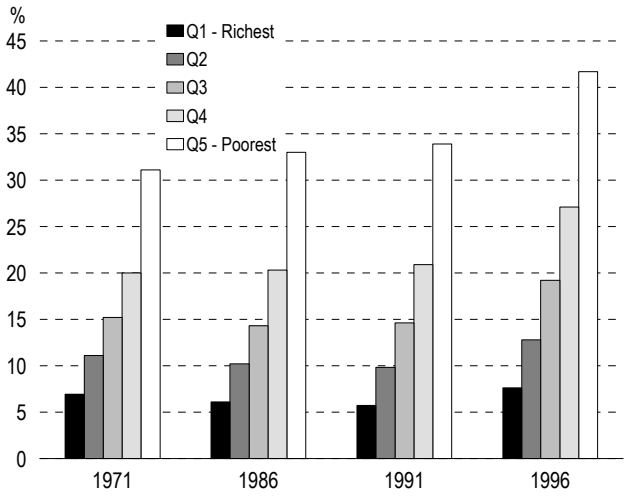
Other socio-economic characteristics also varied systematically by quintile[63] (see values for 1996 in Table 3). Thus, the poorer quintiles had not only a lower average household income, but also a higher percentage of renters, lower levels of education, higher unemployment, and a lower percentage of people with professional and managerial occupations.

Table 2
Non-institutional deaths and population by neighbourhood income quintile and sex, urban Canada, 1971 to 1996

	1971			1986			1991			1996		
	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females
Deaths												
Total	73,990	42,974	31,016	88,129	49,462	38,667	93,407	52,175	41,232	102,809	55,929	46,880
Quintile 1 (richest)	9,488	5,359	4,129	11,794	6,607	5,187	12,330	6,932	5,398	15,268	8,359	6,909
Quintile 2	11,815	6,755	5,060	14,308	8,030	6,278	15,176	8,440	6,736	17,076	9,327	7,749
Quintile 3	14,200	8,062	6,138	17,105	9,509	7,596	18,784	10,427	8,357	19,974	10,811	9,163
Quintile 4	16,054	9,090	6,964	19,609	10,887	8,722	21,881	12,068	9,813	23,347	12,495	10,852
Quintile 5 (poorest)	22,433	13,708	8,725	25,313	14,429	10,884	25,157	14,267	10,890	26,121	14,384	11,737
Population ('000)												
Total	11,606	5,728	5,878	14,946	7,313	7,633	16,503	8,090	8,414	17,691	8,647	9,044
Quintile 1 (richest)	2,231	1,111	1,120	2,908	1,449	1,459	3,312	1,656	1,654	3,634	1,808	1,827
Quintile 2	2,307	1,139	1,168	2,980	1,476	1,503	3,275	1,616	1,659	3,509	1,725	1,784
Quintile 3	2,323	1,143	1,180	2,995	1,458	1,538	3,334	1,619	1,714	3,524	1,708	1,815
Quintile 4	2,324	1,137	1,186	2,984	1,434	1,551	3,332	1,607	1,725	3,517	1,694	1,823
Quintile 5 (poorest)	2,421	1,199	1,222	3,079	1,496	1,582	3,248	1,589	1,660	3,500	1,708	1,791

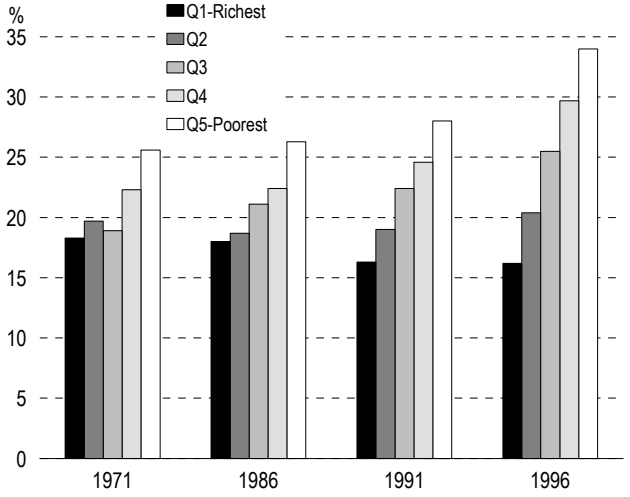
Data source: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
Note: *For 1991 and 1996, total deaths include those for which income quintile was unknown (not shown separately).*

Chart 1
Low income: percentage of population below the low-income cut-offs, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Chart 2
Foreign-born: percentage of population born outside Canada, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Census tract profile data for non-institutional population[63]; special tabulations.*

Table 3
Socio-economic characteristics of each neighbourhood income quintile, urban Canada, 1996

Income quintile	Low income	Average household income	IPPE†	Income from gov't transfers	Housing owned	Foreign born	Recent immi-grants‡	Unem-ployed§	Managerial professional occupations††	Low education‡‡ (<9 years)	Lone parent families§§
	%	$	$	%	%	%	%	%	%	%	%
Total	21.5	51,718	34,901	12.1	58.6	25.1	5.6	9.3	9.8	10.4	23.3
Quintile 1 (richest)	7.6	72,944	45,592	7.3	84.7	16.2	2.7	6.1	13.2	5.7	13.4
Quintile 2	12.8	61,780	39,636	9.6	75.7	20.4	4.1	7.3	11.0	8.1	17.4
Quintile 3	19.2	52,880	35,393	12.0	62.2	25.5	5.6	8.7	9.5	9.8	22.8
Quintile 4	27.1	43,921	30,616	15.3	49.4	29.7	6.9	10.6	8.1	13.0	28.5
Quintile 5 (poorest)	41.7	33,421	24,531	20.3	30.2	34.0	8.6	14.5	6.7	15.2	37.8

***Data source:** 1996 census tract profile data for non-institutional population[63]*
Notes: † Income per person-equivalent (average household income adjusted for household size).
‡ Immigrants who arrived from 1981 to 1991, as a percentage of all persons aged 5 or older.
§ As percentage of labour force aged 15 and over.
†† Includes occupations in managerial, administrative, teaching, and related occupations, as well as occupations in medicine and health.
‡‡ As percentage of population aged 15 and over.
§§ As percentage of all families with children at home.

General mortality trends

The results that follow show that from 1971 through 1996 there was a general pattern of decline in mortality rates for all income quintiles, for both sexes, and for most causes of death. Throughout this 25-year period, the most common pattern was of an income gradient in mortality whereby the richest quintile had the lowest mortality rates and the poorest quintile the highest. These income gradients generally persisted over time, although they tended to be less steep in the more recent years, particularly for females.

Restrictions and coding to CT and quintile

Study areas. In 1986, 1991, and 1996, 25 urban agglomerations were defined by Statistics Canada as census metropolitan areas (CMAs) on the basis of population size and commuting flows, and all of these were included in the study. The 25 CMAs represented roughly 60% of the total Canadian population in those years. In 1971, 22 urban agglomerations in Canada met the CMA definition, but one (Chicoutimi-Jonquière) was excluded because census tract (CT) reference information was not available when the coding was done for the earlier study.[25] The analysis for 1971 was therefore based on 21 CMAs representing 54% of the total Canadian population.

Geographic coding. Street address data from death registrations were used to code the CT of usual place of residence of each deceased person (CTs are socially-homogeneous small areas (neighbourhoods) with a typical population of 4,000). For 1971, the coding was done manually on the basis of street indexes and maps. For 1986, 1991, and 1996, postal codes were generated from addresses, validated, and then converted to CT by means of an enhanced version of the Statistics Canada Postal Code Conversion File (for the most recent version, see reference 48). For 1986, addresses for which no postal code could be found or for which the postal code was linked only to post office location (such as for rural route delivery and post office boxes) were manually assigned to CT by means of street indexes, maps, and other reference documents. For 1991 and 1996, most such codes were probabilistically assigned in proportion to the distribution of census population by postal code and CT.

Identification of institutional residents in the death data. For 1971, addresses of long-term care facilities were compiled from various sources and compared with those of decedents. For 1986, 1991, and 1996, Statistics Canada lists of health care facilities were used to identify institutions, and deaths of residents of facilities with 10 or more beds were excluded. If a facility's postal code was unique to the institution, residents of the facility were excluded automatically on the basis of their postal code. If the postal code was not unique to the institution, street addresses and facility names (if given) were used to determine if the decedent was a usual resident of a long-term care facility.

Exclusion of CTs. In each of the study years, any CT with a non-reserve private household population (the denominator used to calculate percentage of low-income residents) of less than 250 was excluded because for these CTs census data on income were suppressed. Institutional CTs with few or no private households, industrial CTs with little or no population of any kind, and most Indian reserves were thus excluded. However, a few smaller reserves were included as part of larger CTs. In 1986, 1991, and 1996, three other CTs containing larger but incompletely enumerated Indian reserves were also excluded.

Construction of quintiles. The population of each CMA was divided into five quintiles as follows. Persons, excluding institutional residents and status Indians on reserves, were classified as having low income if their total economic family (or unattached individual) income in the year preceding the census was below that year's Statistics Canada low-income cut-off, which varied according to family size and CMA size (see Appendix Table A).[49-52] Each CT within the CMA was then ranked according to percentage of population below the low-income cut-off, and the CTs were assigned to five groups from lowest to highest percentage of low-income residents, such that each of the five groups of CTs contained approximately one-fifth of the total non-institutional population of the CMA. The quintile data were then pooled across CMAs.

Note concerning the quintiles. Relative rather than absolute income was used to define the quintiles, such that each quintile represented a fifth of the population ranked by income, regardless of how income distribution changed over time. In comparisons of quintiles, quintile 5 is referred to as the poorest (with the highest percentage of population below the low-income cut-off) and quintile 1 as the richest (with the lowest percentage of population below the low-income cut-off).

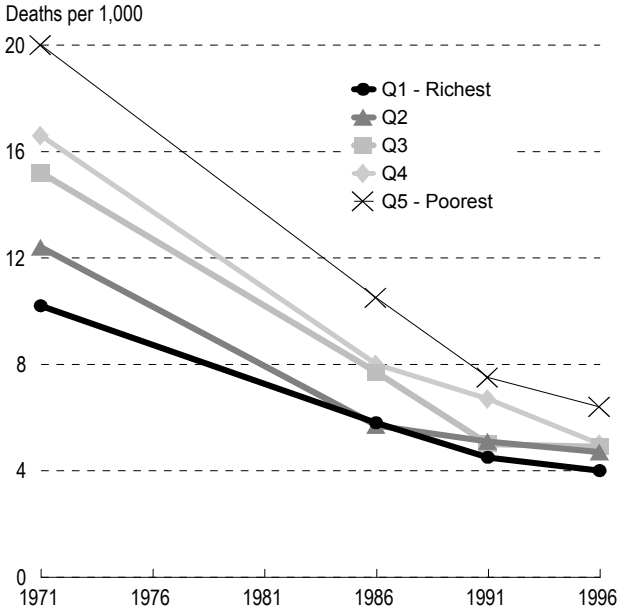
Infant mortality rates

The infant mortality rates (deaths before age 1) in each of the income quintiles declined over the 25-year study period (Chart 3, Table 4). The inter-quintile rate difference (quintile 5 minus quintile 1) fell from 9.8 per thousand in 1971 to 2.4 per thousand in 1996. Thus, the disparity between the poorest and the richest quintiles diminished markedly in terms of rate differences, although the decline was much less impressive in terms of rate ratios (from 1.97 in 1971 to 1.61 in 1996).

Nevertheless, the rate differences are more relevant to the public health impact of the changes observed. If the rate in the richest quintile had applied to all urban Canada, and the same relative rates had also been experienced by non-metropolitan areas, then there would have been approximately 2000 fewer infant deaths in 1971, compared to only about 500 fewer in 1996.[35]

In 1996, infant mortality in Canada's poorest neighbourhoods, 6.4 deaths for every 1,000 live births, was considerably lower than the national rate for the United States (7.8). However, the rate in Canada's richest neighbourhoods was no better than Sweden's national rate (4.0).

Chart 3
Infant mortality rates, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Mortality rate ratios at various ages

With few exceptions, the higher the percentage of low-income population in a quintile, the higher the age-specific mortality rate (data not shown). In many respects, trends in mortality rates by income at most other ages were similar to those for infant mortality: in most income quintiles the mortality rate declined over time, but the inter-quintile rate ratios tended to diminish to a much lesser extent. However, the absolute improvements for the poorer quintiles were generally greater than those for the other quintiles, so the rate differences usually diminished over time.

In general, the pattern of inter-quintile mortality rate ratios—expressed as the mortality rate in the poorest quintile divided by the rate in the richest quintile—was similar over time (Table 5). Disparities were largest in infancy (age less than 1) and during the prime working years (ages 25 to 64). Disparities were smallest for ages 15 to 24 and 75 or older. There were exceptions for children ages 1 to 14, for whom rates were extremely low and unstable, and for men ages 35 to 44, for whom rate ratios increased markedly from 1986

Table 4
Infant mortality rate per 1000 by neighbourhood income quintile, urban Canada, 1971 to 1996 (95% confidence intervals in parentheses)

	1971		1986		1991		1996	
Total	15.0	(14.5, 15.6)	7.5	(7.2, 7.9)	5.8	(5.5, 6.1)	5.1	(4.8, 5.4)
Quintile 1 (richest)	10.2	(9.1, 11.3)	5.8	(5.1, 6.6)	4.5	(4.0, 5.2)	4.0	(3.4, 4.6)
Quintile 2	12.4	(11.3, 13.1)	5.7	(5.0, 6.5)	5.1	(4.5, 5.8)	4.7	(4.1, 5.4)
Quintile 3	15.2	(14.0, 16.5)	7.7	(6.9, 8.6)	5.0	(4.4, 5.7)	4.9	(4.2, 5.5)
Quintile 4	16.6	(15.3, 17.9)	8.0	(7.2, 8.9)	6.7	(6.0, 7.5)	5.0	(4.4, 5.7)
Quintile 5 (poorest)	20.0	(18.6, 20.5)	10.5	(9.6, 11.6)	7.5	(6.7, 8.3)	6.4	(5.7, 7.1)
Rate difference (Q5 - Q1)	9.8	(8.1, 11.6)	4.8	(3.5, 6.0)	2.9	(1.9, 3.9)	2.4	(1.5, 3.3)
Rate ratio (Q5/Q1)	1.97	(1.73, 2.23)	1.82	(1.56, 2.13)	1.64	(1.39, 1.94)	1.61	(1.34, 1.93)
Excess (Total - Q1)	4.9		1.8		1.2		1.1	
Excess % (Total - Q1)/Total	32		23		21		22	

***Data source:** Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
***Note:** Census population aged less than 1 used as denominator. Rate differences and rate ratios calculated with unrounded data.*

Table 5
Inter-quintile mortality rate ratios (Q5/Q1) by age group and sex, urban Canada, 1971 to 1996 (95% confidence intervals in parentheses)

Age group (years)	Males								Females							
	1971		1986		1991		1996		1971		1986		1991		1996	
< 1	1.99	(1.68, 2.35)	2.02	(1.64, 2.49)	1.65	(1.31, 2.08)	1.75	(1.37, 2.24)	1.94	(1.59, 2.35)	1.59	(1.27, 2.00)	1.59	(1.24, 2.03)	1.44	(1.10, 1.89)
1-14	1.62	(1.27, 2.05)	1.82	(1.32, 2.50)	1.78	(1.30, 2.45)	1.65	(1.18, 2.32)	1.70	(1.30, 2.50)	1.17	(0.84, 1.64)	1.49	(0.98, 2.24)	1.84	(1.26, 2.69)
15-24	1.24	(1.03, 1.49)	1.10	(0.91, 1.33)	1.27	(1.04, 1.56)	1.06	(0.86, 1.31)	1.26	(0.93, 1.72)	1.20	(0.89, 1.63)	1.18	(0.84, 1.64)	1.21	(0.88, 1.66)
25-34	1.68	(1.38, 2.05)	1.95	(1.66, 2.30)	1.83	(1.58, 2.12)	1.82	(1.55, 2.14)	1.74	(1.32, 2.28)	1.84	(1.42, 2.39)	1.52	(1.20, 1.92)	2.15	(1.63, 2.82)
35-44	2.29	(2.00, 2.62)	2.40	(2.09, 2.74)	3.34	(2.94, 3.81)	3.24	(2.87, 3.66)	1.87	(1.57, 2.23)	1.70	(1.42, 2.03)	2.06	(1.74, 2.42)	2.00	(1.71, 2.35)
45-54	2.11	(1.92, 2.31)	2.34	(2.12, 2.58)	2.37	(2.15, 2.62)	2.61	(2.37, 2.88)	1.59	(1.41, 1.80)	1.62	(1.42, 1.85)	1.63	(1.43, 1.85)	1.65	(1.46, 1.85)
55-64	1.63	(1.52, 1.76)	1.98	(1.85, 2.11)	1.89	(1.76, 2.03)	1.88	(1.75, 2.02)	1.43	(1.29, 1.58)	1.44	(1.31, 1.58)	1.57	(1.43, 1.73)	1.51	(1.37, 1.65)
65-74	1.48	(1.39, 1.59)	1.55	(1.46, 1.64)	1.67	(1.58, 1.77)	1.49	(1.42, 1.57)	1.15	(1.06, 1.25)	1.31	(1.22, 1.40)	1.32	(1.23, 1.41)	1.29	(1.21, 1.38)
75-84	1.21	(1.13, 1.30)	1.18	(1.12, 1.26)	1.14	(1.07, 1.21)	1.18	(1.12, 1.24)	1.06	(0.99, 1.14)	0.99	(0.93, 1.06)	0.96	(0.90, 1.02)	0.99	(0.94, 1.05)
85+	1.24	(1.11, 1.37)	0.95	(0.87, 1.04)	1.04	(0.95, 1.13)	0.96	(0.89, 1.03)	0.96	(0.88, 1.04)	0.81	(0.75, 0.87)	0.75	(0.73, 0.80)	0.77	(0.73, 0.82)

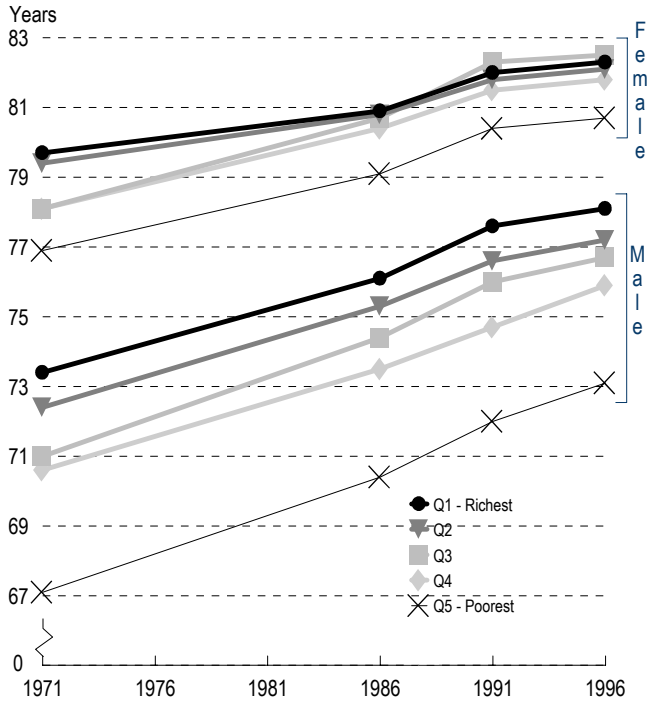
Data source: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

to 1991 (primarily because of acquired immune deficiency syndrome [AIDS]). From 1986 onward, the mortality rate ratios for non-institutionalized women age 85 or older were considerably less than 1.00, that is, rates were higher in the richest quintile compared to the poorest quintile.

Life expectancy at birth

For both sexes together (not shown) and for males in all years, as well as for females in 1971, the poorer the neighbourhood, the shorter the life expectancy of its residents (Chart 4, Table 6). For females from 1986 onward, the three richest quintiles (1, 2, and 3) were not significantly different from each other in terms of life expectancy. But for both males and females in all years, the poorest quintile was particularly disadvantaged, in that the difference in life expectancy between the poorest and next-poorest quintiles (quintiles 5 and 4 respectively) was always greater than the difference between any other adjoining quintiles. Nevertheless, there were substantial gains in life expectancy for all quintiles from 1971 to 1996, and the gains in life expectancy were greater for quintile 5 than for quintile 1.

Chart 4
Life expectancy at birth, by neighbourhood income quintile, by sex, urban Canada, 1971 to 1996



Data sources*: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Table 6
Life expectancy at birth (in years), by neighbourhood income quintile and sex, urban Canada, 1971 to 1996 (95% confidence intervals in parentheses)

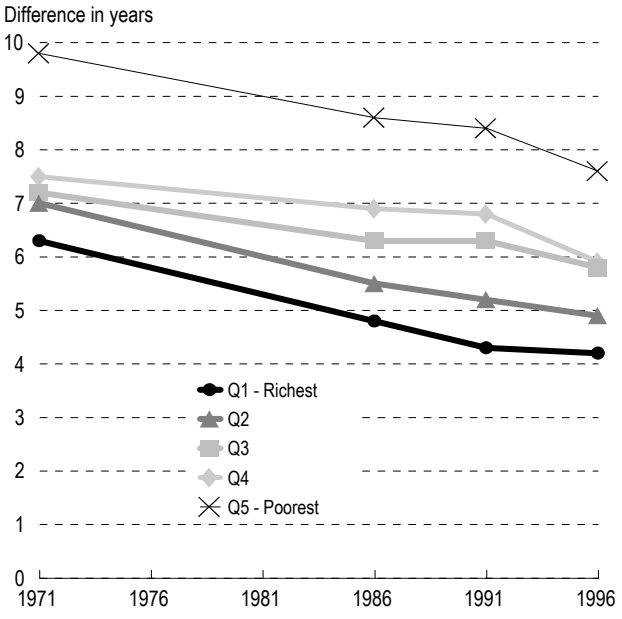
Income quintile	Males								Females							
	1971		1986		1991		1996		1971		1986		1991		1996	
Total	70.6	(70.4,70.7)	73.8	(73.7,73.9)	75.3	(75.2, 75.4)	76.0	(75.9, 76.1)	78.4	(78.2, 78.5)	80.4	(80.3, 80.5)	81.6	(81.5, 81.6)	81.8	(81.7, 81.9)
Quintile 1 (richest)	73.4	(73.0,73.7)	76.1	(75.8,76.3)	77.6	(77.4, 77.9)	78.1	(77.9, 78.3)	79.7	(79.4, 80.1)	80.9	(80.6, 81.2)	82.0	(81.7, 82.2)	82.3	(82.1, 82.6)
Quintile 2	72.4	(72.1,72.7)	75.3	(75.1,75.6)	76.6	(76.3, 76.8)	77.2	(76.9, 77.4)	79.4	(79.1, 79.8)	80.8	(80.6, 81.1)	81.8	(81.6, 82.1)	82.1	(81.8, 82.3)
Quintile 3	71.0	(70.7,71.3)	74.4	(74.1,74.6)	76.0	(75.7, 76.2)	76.7	(76.5, 76.9)	78.1	(77.8, 78.5)	80.7	(80.5, 80.9)	82.3	(82.1, 82.5)	82.5	(82.2, 82.7)
Quintile 4	70.6	(70.3,70.9)	73.5	(73.2,73.7)	74.7	(74.4, 74.9)	75.9	(75.7, 76.1)	78.1	(77.8, 78.5)	80.4	(80.1, 80.6)	81.5	(81.3, 81.7)	81.8	(81.6, 82.0)
Quintile 5 (poorest)	67.1	(66.8,67.4)	70.4	(70.2,70.7)	72.0	(71.7, 72.2)	73.1	(72.8, 73.3)	76.9	(76.6, 77.2)	79.1	(78.8, 79.3)	80.4	(80.2, 80.7)	80.7	(80.5, 80.9)
Q1 - Q5	6.3		5.6		5.7		5.0		2.8		1.8		1.6		1.6	
Q1 - Total	2.8		2.3		2.4		2.0		1.4		0.5		0.3		0.5	

Data source: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
Notes: *Rate differences calculated with unrounded data.*

In 1971, the disparity in life expectancy between the richest and poorest quintiles was over 6 years for men and nearly 3 years for women. By 1996, the inter-quintile disparity had diminished to 5 years for men and to considerably less than 2 years for women. The inter-quintile disparity reveals how much life expectancy people in the poorest income quintile would gain if their mortality rates were as low as those of the richest quintile. Also of interest is the difference in life expectancy between the richest quintile and the entire population, which reveals how much the population as a whole would gain if everyone were subject to the mortality rates of the richest quintile. In 1971, this value was nearly 3 years for males and almost 17 months for females, whereas in 1996, the difference was 2 years for males and just 6 months for females.

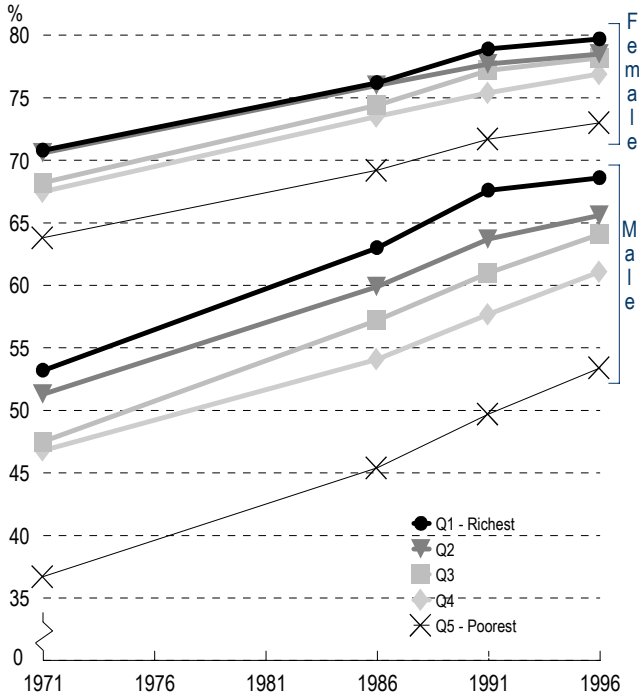
In all four study years, the gap in life expectancy at birth between males and females was greater in each successively poorer income quintile (Chart 5). However, in all quintiles, that gap diminished between 1971 and 1996.

Chart 5
Female-male difference in life expectancy at birth, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Chart 6
Probability of survival to age 75, by neighbourhood income quintile, by sex, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Probability of survival to age 75

In all four study years, the difference between the richest and poorest quintiles in the percentage of the population expected to survive from birth to a given age increased for both sexes up to age 75 and then decreased for older ages (data not shown).

For the probability of survival to age 75, the gradients by income were similar in 1971 and 1996 (Chart 6, Table 7). In 1996, 53% of males in the poorest quintile and 69% of those in the richest quintile were expected to survive to age 75 (Chart 7). For women, the corresponding figures were 73% and 80% (Chart 8).

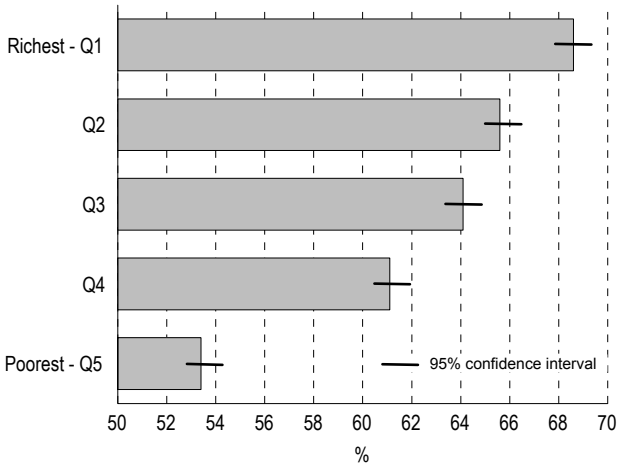
Between 1971 and 1996, men's chances of surviving to age 75 improved by an average of 16 percentage points, whereas women's chances (which were already much better) improved by 9 percentage points. Improvements were spread nearly evenly across the quintiles, so the magnitude of the inter-quintile differences was approximately the same over the 25-year period.

Table 7
Probability of survival to age 75 (as percentage) by neighbourhood income quintile and sex, urban Canada, 1971 to 1996 (95% confidence intervals in parentheses)

Income quintile	Males								Females							
	1971		1986		1991		1996		1971		1986		1991		1996	
Total	45.8	(45.4,46.3)	55.2	(54.8,55.6)	59.4	(59.0, 59.7)	62.1	(61.8, 62.5)	67.9	(67.4, 68.3)	73.6	(73.2, 73.9)	75.9	(75.6, 76.2)	77.0	(76.7, 77.3)
Quintile 1 (richest)	53.2	(51.9,54.5)	63.0	(62.0,63.9)	67.6	(66.7, 68.5)	68.6	(67.8, 69.4)	70.8	(69.6, 71.9)	76.2	(75.4, 77.1)	78.9	(78.1, 79.7)	79.7	(79.0, 80.4)
Quintile 2	51.3	(50.2,52.5)	59.9	(58.9,60.8)	63.7	(62.8, 64.5)	65.6	(64.8, 66.4)	70.6	(69.6, 71.6)	76.0	(75.2, 76.8)	77.7	(77.0, 78.5)	78.5	(77.8, 79.1)
Quintile 3	47.5	(46.5,48.6)	57.2	(56.4,58.1)	61.0	(60.2, 61.8)	64.1	(63.3, 64.8)	68.2	(67.3, 69.2)	74.4	(73.7, 75.2)	77.2	(76.5, 77.8)	78.2	(77.6, 78.8)
Quintile 4	46.8	(45.8,47.7)	54.1	(53.3,54.9)	57.7	(56.9, 58.4)	61.1	(60.4, 61.9)	67.5	(66.6, 68.4)	73.5	(72.8, 74.2)	75.4	(74.8, 76.1)	76.9	(76.3, 77.5)
Quintile 5 (poorest)	36.7	(35.9,37.5)	45.4	(44.7,46.2)	49.7	(48.9, 50.4)	53.4	(52.7, 54.2)	63.8	(63.0, 64.7)	69.2	(68.5, 69.9)	71.7	(71.0, 72.4)	73.0	(72.3, 73.6)
Q1 - Q5	16.5		17.5		17.9		15.2		6.9		7.1		7.2		6.7	
Q1 - Total	7.4		7.7		8.2		6.5		2.9		2.7		3.0		2.7	

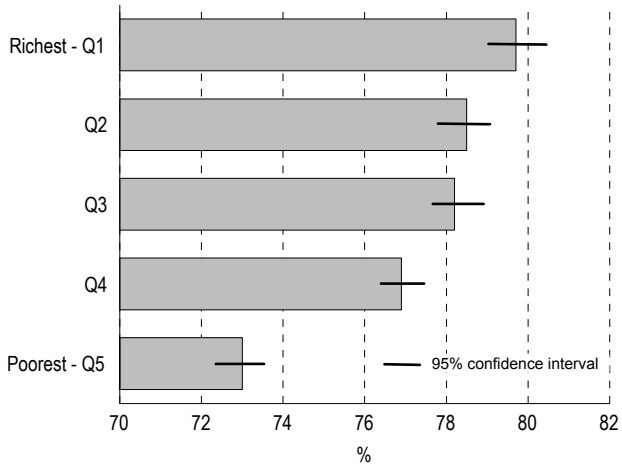
Data source: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
Notes: *Rate differences calculated with unrounded data.*

Chart 7
Probability of survival to age 75, by neighbourhood income quintile, males, urban Canada, 1996



Data sources*: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Chart 8
Probability of survival to age 75, by neighbourhood income quintile, females, urban Canada, 1996



Data sources*: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

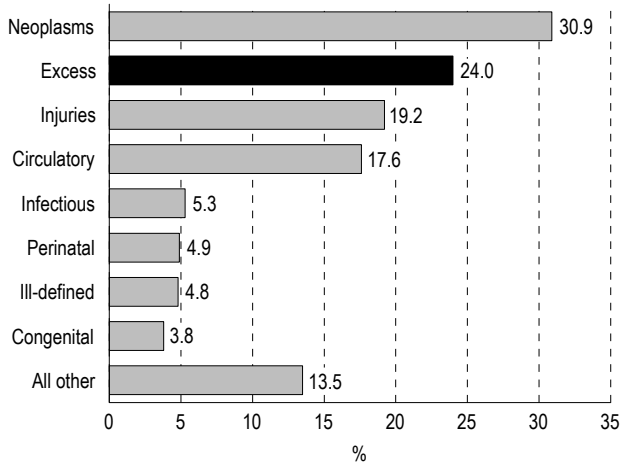
Potential years of life lost before age 75

In 1996, the most important causes of potential years of life lost (PYLL) from birth to age 74 were neoplasms (all cancers), followed by injuries (both intentional and unintentional) and circulatory diseases (Chart 9). Excess PYLL—the percentage of total PYLL that was related to income differences—was 24%, which is greater than that due to all injuries or to circulatory diseases. Elimination of excess PYLL would result in gains in potential years of life equivalent to eradicating one of the three leading causes of death.

The major causes of death contributing to income-related excess PYLL in 1996 were circulatory diseases, injuries, neoplasms, and infectious diseases (Chart 10). The first three of these were the same as for total PYLL, except in reverse order. Circulatory diseases also accounted for the greatest proportion of excess PYLL in the Netherlands.[64]

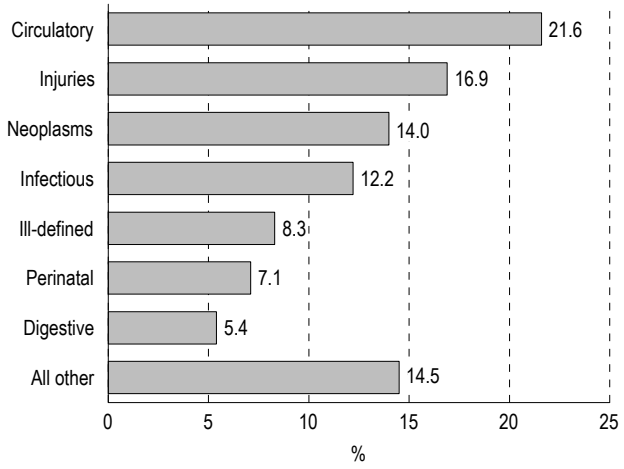
If all income quintiles had experienced the mortality rates of the richest quintile, and the same rates of excess deaths also applied to rural and small town Canada, then 13,000 fewer males and 5,000 fewer females would have died before age 75 in 1996 (Table 8 - notes). From 1971 to 1996, the rate of excess PYLL before age 75 per thousand population declined by 35% (from nearly 2000 in 1971 to about

Chart 9
Total potential years of life lost (PYLL) (0-74) by cause of death (International Classification of Diseases chapters) and income-related excess PYLL (0-74), urban Canada, 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
***Note:** Excess PYLL is defined as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population.*

Chart 10
Income-related excess potential years of life lost (PYLL) by cause of death (International Classification of Diseases chapters), urban Canada, 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
***Note:** Excess PYLL is defined as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population.*

Table 8
Income-related excess deaths and excess potential years of life lost (PYLL) before age 75, by sex, all causes of death together, urban Canada, 1971 to 1996

	Deaths			PYLL			Non-institutional population ('000)	Rates†	
	Total	Excess	% excess	Total	Excess	% excess		Excess deaths	Excess PYLL
Total									
1971	46,513	8,290	17.8	1,000,318	221,378	22.1	11,262	73.6	1,966
1986	51,983	9,951	19.1	918,510	188,981	20.6	14,446	68.9	1,308
1991	52,040	11,144	21.4	906,347	202,768	22.4	15,879	70.2	1,277
1996	53,588	10,775	20.1	903,702	216,442	24.0	16,953	63.6	1,277
Males									
1971	29,450	6,001	20.4	633,329	149,182	23.6	5,596	107.2	2,666
1986	32,401	7,520	23.2	585,242	142,965	24.4	7,129	105.5	2,005
1991	32,374	8,249	25.5	580,228	149,372	25.7	7,857	105.0	1,901
1996	32,920	7,740	23.5	568,320	154,282	27.1	8,373	92.4	1,843
Females									
1971	17,063	2,289	13.4	366,990	72,196	19.7	5,665	40.4	1,274
1986	19,582	2,431	12.4	333,269	46,016	13.8	7,316	33.2	629
1991	19,666	2,896	14.7	326,119	53,396	16.4	8,022	36.1	666
1996	20,668	3,035	14.7	335,383	62,161	18.5	8,581	35.4	724

***Data sources:** Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
***Notes:** If the same rate of excess premature deaths also applied to rural and small town Canada, there would have been almost 18,000 excess premature deaths in the non-institutional population for all of Canada in 1996 (13,000 males and 5,000 females).*
† Excess deaths and excess PYLL before age 75 per 100,000 non-institutional population aged 0 to 74.

Other studies on socio-economic differentials in circulatory diseases

In addition to the large socio-economic differentials for ischemic heart disease found in this study, an earlier Canadian study found similar but less striking differential mortality by income for stroke.[28, 31] Another study showed that differentials in health care after acute myocardial infarction (heart attack) in Canada were not responsible for most of the differences in survival across socio-economic categories.[65] Similar results were also found with respect to socio-economic differentials in treatment and survival after stroke.[23] Thus, for both heart attack and stroke in Canada, socio-economic differentials in mortality rates appear to be due primarily to differences in incidence rather than differences in treatment and survival.

In Scotland, socio-economic deprivation was found to have a profound effect on the risk of having a first heart attack, the chance of reaching hospital alive, and the probability of surviving the first month.[66] This study concluded that reducing mortality from heart disease requires a focus on primary prevention that explicitly addresses socio-economic inequalities.

In Finland, about half the excess mortality among men in lower social classes and a smaller proportion among women was found to be associated with their more adverse cardiovascular risk profile, so improvements in health behaviours would be helpful (though not sufficient) in reducing death rates.[67] Furthermore, the study concluded that health inequalities would have to be dealt with at multiple levels, including general social policy.

In the United States, living in a disadvantaged neighbourhood was associated with a greater incidence of coronary artery disease, even after adjustment for established risk factors.[68]

For occupation-based social classes in Australia, rate differences (but not rate ratios) in deaths due to coronary artery disease declined from the late 1970s to the mid-1990s,[47] paralleling the trends observed in this study.

In a 12-year follow-up study of middle-aged Swedish men, age-adjusted odds ratios by occupational classes were of about the same magnitude for death from coronary artery disease as for all-cause mortality,[69] similar to what was found for ASMR rate ratios for Canada. After further adjustment for 11 other risk factors, the odds ratios were reduced by 25% for all-cause mortality and by 30% for death due to coronary artery disease. For Swedish women, exposure to socio-economic disadvantage in both early and later life was associated with substantially increased risk of coronary artery disease, even after adjustment for marital status and traditional risk factors for heart disease.[70]

Thus, the differentials found for Canada appear to be reasonable estimates of what might have been found with individual-level methods and longitudinal study designs and are not simply due to differences in risk factors across the quintiles.

Although risk factors clearly do not account for all of the socio-economic differentials observed, they undoubtedly contribute substantially to death due to cardiovascular disease and other causes of death in Canada. The risk of coronary artery disease in Ontario was about twice as high among people with less education, largely because of a higher prevalence of smoking and elevated cholesterol.[71]

Marked socio-economic differentials were also apparent in the prevalence of smoking, sedentary living, and overweight in Canada, and there was little progress from 1985 to 1991 in narrowing those differentials.[72] Except for higher alcohol intake among richer people, all measures of unhealthy behaviours were inversely associated with various measures of socio-economic status (education, occupation, source of income, and income).[73] In addition, there were substantial socio-economic differentials in the prevalence of food insecurity in Canadian households, with poorer households at much higher risk.[74]

In a 10-year mortality follow-up study from the Nutrition Canada Survey of the early 1970s, important risk factors for death, as well as all-cause mortality in adults, were associated with indicators of lower socio-economic status.[10]

Based on mortality and disability across two waves of Canada's National Population Health Survey,[24] there were also substantial differences in disability-free life expectancy by income and education, as well as by behavioural risk factors such as smoking, physical activity, and abnormal body mass index. The socio-economic differentials were reduced but not eliminated by control for the behavioural risk factors.

1300 in 1996), almost all of that decline occurring by 1986. The trends for excess PYLL were not the same as those for differences in the probability of survival to age 75, since delaying a death from age 25 to age 50 results in a saving of 25 years of potential life (for PYLL), but no change in the probability of survival to age 75.

In 1971, 39% of the excess PYLL was accounted for by deaths among children aged less than 15 (data not shown). By 1996, deaths at younger ages had declined to such an extent that only 12% of excess PYLL was accounted for by that age group. The changing socioeconomic differentials in mortality by certain causes of death and possible reasons for those changes are discussed below.

Causes of death showing progress toward "Health for All"

For several causes of death—including ischemic heart disease, most injuries, liver cirrhosis, uterine cancer and perinatal conditions—age-standardized mortality rates declined over the 25-year study period and differences among income quintiles narrowed (Chart 11, plus upper panels of Table 9).

The mortality rate ratios for ischemic heart disease were only moderate, but the rate differences—although considerably narrowed since 1971—remained huge. Rates declined considerably more for males than for females, and rates for the poorest males declined the most (Chart 11A). Nevertheless, the heart disease mortality gradient in 1996 was evenly stepped from richest to poorest, and the differences between successive quintiles were still very large in absolute terms. The differences for females were smaller than those for males, but still substantial (Chart 11B), with successively higher rates in poorer quintiles.

For injuries except motor vehicle crashes and suicide (Chart 11C)—that is, for falls, poisoning, drowning, fires, and so forth—mortality rates and differences by income narrowed considerably over time, but the poorest quintile continued to be at a relatively greater disadvantage.

For all external causes of death (that is to say, for all accidents, poisoning and violence), mortality rates and differences by income also diminished markedly over time (data not shown). As was previously noted for the reduction of all injury-related deaths among children,[35] the explanation for this success probably relates to many factors beyond the health care system, including legislative, regulatory, policy, educational, product-safety, transportation-safety, school and occupational health and safety, public health, and other improvements over time. Although it was not possible to apportion the declines in mortality rates that were due to specific interventions, the reduction in deaths due to motor vehicle crashes, for example, was probably related to changes in the design and use of seatbelts, infant seats, and air bags, improvements in tires and brakes, vehicle safety design, and helmets for bicyclists, as well as increased school busing, improved emergency treatment of trauma, and stricter enforcement of laws against speeding and drunk driving. Analogous regulatory, policy, educational, emergency treatment, and product-safety improvements also apply to the prevention of deaths due to drowning, fire, and poisoning.

For liver cirrhosis among males (Chart 11D), great progress was achieved, particularly for the poorest quintile, but the differences remained substantial. For liver cirrhosis among females (Chart 11E), income differentials in mortality rates appear to have been eliminated.

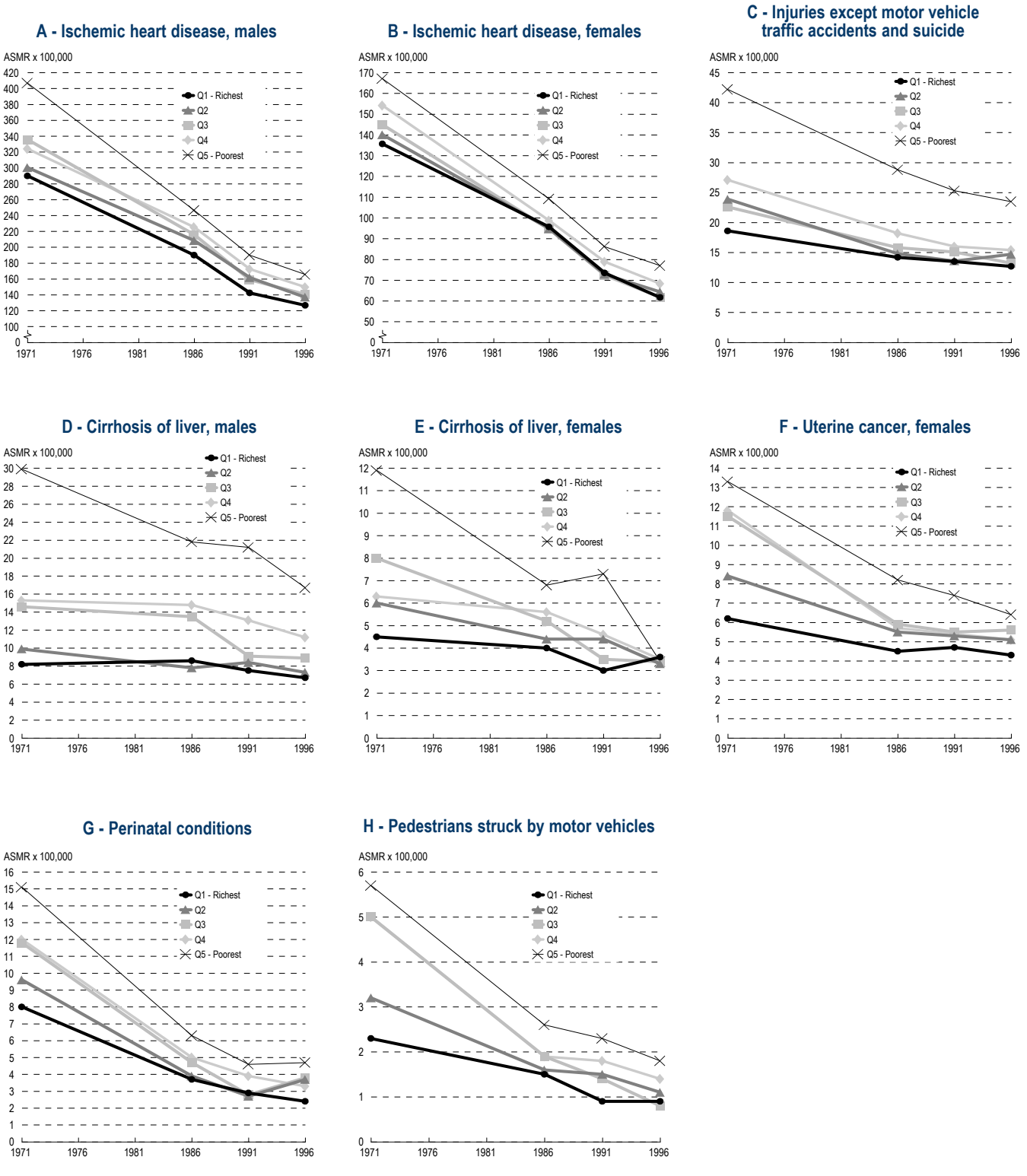
Income differentials in mortality rates also declined for deaths caused by uterine (including cervical) cancer (Chart 11F). The most rapid reductions were achieved among the poorest quintiles, within which the rates were highest throughout the 25-year period. Nevertheless, the remaining socio-economic differentials in uterine cancer mortality are still important, and the overall rates in Canada are relatively high compared with the best international standards. Cervical cancer screening in Canada was less common among older and single women, as well as among women with lower education, non-English language, or birth outside of Canada, and among those with negative health and lifestyle characteristics, so there remains considerable scope for improvement in avoiding unnecessary death through early detection.[75]

The trends for perinatal conditions (Chart 11G) resembled those reported for all infant deaths. ASMRs declined rapidly in all quintiles, but the gains were most rapid in the poorer quintiles, so the inter-quintile rate difference diminished from 7.1 in 1971 to 2.3 in 1996. With respect to socio-economic differentials in perinatal and all infant mortality rates, a thorough review of the best available evidence examined many years of census-linked medical birth registry data for the Nordic countries:[76] this review showed that although behavioural and socio-demographic risk factors are important explanatory variables for feto-infant mortality, so are socio-economic status variables such as maternal education and income. For Canada, low maternal education was strongly associated with excess fetal and infant mortality in Quebec, largely because of excess deaths due to perinatal conditions and sudden infant death syndrome.[20]

Death rates for pedestrians struck by motor vehicles (Chart 11H) declined rapidly and income differences for this cause of death diminished.

Chart 11

Causes of death showing progress toward "Health for All": age-standardized mortality rates, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Table 9

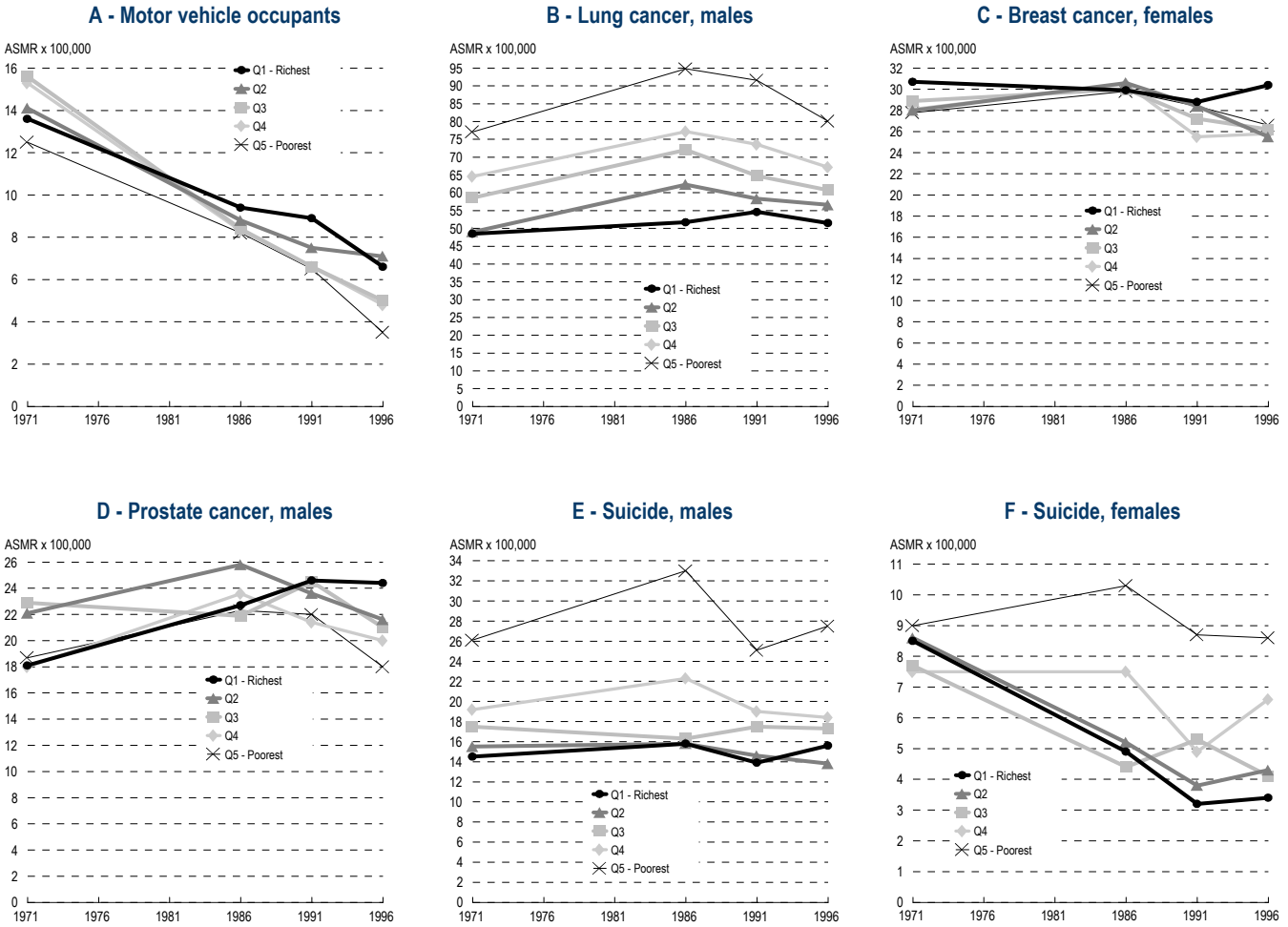
Age-standardized mortality rates per 100,000 population, all ages, for selected causes of death, by sex and neighbourhood income quintile, urban Canada, 1971 to 1996

	Total	Q1	Q2	Q3	Q4	Q5	RR†	RD‡	Excess§	% excess††
All causes‡‡										
Both sexes										
1971	712.8	615.9	641.9	701.9	710.6	847.1	1.38	231.2	96.9	13.6
1986	589.7	526.9	547.5	566.1	595.8	702.9	1.33	175.9	62.8	10.6
1991	526.3	468.3	492.6	497.3	541.9	630.5	1.35	162.2	58.0	11.0
1996	502.0	450.0	472.8	474.6	505.1	593.1	1.32	143.1	51.9	10.3
Males										
1971	961.7	801.4	849.3	936.1	942.5	1,186.9	1.48	385.5	160.2	16.7
1986	792.4	675.3	713.3	752.9	808.9	983.9	1.46	308.7	117.1	14.8
1991	706.7	588.1	645.9	669.3	735.5	880.4	1.50	292.3	118.6	16.8
1996	663.9	567.9	608.5	630.6	672.8	813.5	1.43	245.6	96.0	14.5
Females										
1971	523.1	474.4	483.2	524.7	533.2	584.8	1.23	110.3	48.7	9.3
1986	440.0	420.9	426.1	428.0	437.3	489.1	1.16	68.1	19.1	4.3
1991	394.4	380.8	384.6	372.3	399.2	440.9	1.16	60.1	13.7	3.5
1996	385.2	367.2	376.6	363.0	383.7	427.7	1.16	60.5	18.0	4.7
Ischemic heart disease										
Males										
1971	338.3	289.9	300.4	335.6	324.0	406.8	1.40	116.9	48.4	14.3
1986	217.8	190.1	208.4	215.7	225.2	246.4	1.30	56.3	27.7	12.7
1991	165.7	142.5	161.7	159.1	172.4	190.1	1.33	47.6	23.2	14.0
1996	145.3	126.8	137.0	140.6	149.7	165.7	1.31	38.8	18.5	12.7
Females										
1971	150.2	135.7	140.1	144.9	154.2	167.1	1.23	31.4	14.5	9.7
1986	99.0	95.7	94.8	94.6	98.7	109.2	1.14	13.5	3.3	3.3
1991	76.9	73.5	72.8	72.4	78.9	86.2	1.17	12.7	3.4	4.4
1996	67.3	61.7	64.4	61.8	68.3	77.0	1.25	15.3	5.6	8.3
Injuries except motor vehicle traffic accidents and suicide										
Both sexes										
1971	27.1	18.6	23.9	22.6	27.1	42.2	2.27	23.6	8.5	31.5
1986	18.4	14.2	14.8	15.8	18.2	28.8	2.03	14.6	4.2	22.7
1991	16.6	13.5	13.6	15.1	16.0	25.3	1.88	11.8	3.1	18.7
1996	16.0	12.7	14.7	13.2	15.4	23.5	1.85	10.8	3.3	20.8
Cirrhosis of liver										
Males										
1971	16.2	8.2	9.9	14.6	15.3	29.9	3.66	21.7	8.1	49.7
1986	13.4	8.6	7.8	13.5	14.8	21.8	2.55	13.3	4.9	36.2
1991	11.9	7.5	8.4	9.1	13.1	21.2	2.85	13.8	4.4	37.2
1996	10.2	6.7	7.3	8.9	11.2	16.7	2.50	10.0	3.5	34.2
Females										
1971	7.5	4.5	6.0	8.0	6.3	11.9	2.66	7.4	3.0	40.1
1986	5.3	4.0	4.4	5.2	5.6	6.8	1.67	2.7	1.2	23.1
1991	4.6	3.0	4.4	3.5	4.6	7.3	2.42	4.3	1.6	34.3
1996	3.4	3.6	3.3	3.4	3.5	3.4	0.95	-0.2	-0.2	-5.6
Uterine cancer										
Females										
1971	10.4	6.2	8.4	11.5	11.8	13.3	2.16	7.1	4.2	40.6
1986	6.0	4.5	5.5	5.9	5.7	8.2	1.82	3.7	1.5	24.6
1991	5.7	4.7	5.3	5.5	5.4	7.4	1.58	2.7	1.0	17.9
1996	5.3	4.3	5.1	5.6	5.1	6.4	1.50	2.1	1.1	20.2
Perinatal conditions										
Both sexes										
1971	11.4	8.0	9.6	11.8	12.0	15.1	1.90	7.1	3.4	30.1
1986	4.7	3.7	3.9	4.7	5.0	6.3	1.70	2.6	1.0	21.4
1991	3.4	2.9	2.7	2.8	3.9	4.6	1.57	1.7	0.5	13.4
1996	3.6	2.4	3.7	3.8	3.3	4.7	1.94	2.3	1.2	33.6
Pedestrians in motor vehicle traffic accidents										
Both sexes										
1971	4.4	2.3	3.2	5.0	5.0	5.7	2.45	3.4	2.0	46.7
1986	1.9	1.5	1.6	1.9	1.9	2.6	1.78	1.2	0.4	22.9
1991	1.6	0.9	1.5	1.4	1.8	2.3	2.44	1.4	0.7	42.1
1996	1.2	0.9	1.1	0.8	1.4	1.8	2.13	1.0	0.4	31.5
Motor vehicle occupants										
Both sexes										
1971	14.1	13.6	14.1	15.6	15.3	12.5	0.92	-1.1	0.5	3.7
1986	8.6	9.4	8.8	8.4	8.3	8.2	0.87	-1.2	-0.9	-10.1
1991	7.1	8.9	7.5	6.6	6.6	6.5	0.74	-2.3	-1.7	-24.5
1996	5.4	6.6	7.1	5.0	4.8	3.5	0.53	-3.1	-1.2	-22.3

	Total	Q1	Q2	Q3	Q4	Q5	RR†	RD‡	Excess§	% excess††
Lung cancer										
Males										
1971	61.4	48.5	49.0	58.6	64.6	77.1	1.59	28.6	12.9	21.0
1986	73.0	51.7	62.3	72.0	77.2	94.8	1.83	43.0	21.2	29.1
1991	69.2	54.6	58.3	64.8	73.6	91.6	1.68	37.0	14.5	21.0
1996	63.6	51.5	56.6	60.7	67.2	80.1	1.56	28.6	12.1	19.1
Breast cancer										
Females										
1971	28.5	30.7	28.0	28.9	28.1	27.8	0.90	-3.0	-2.2	-7.7
1986	30.2	29.9	30.6	30.0	30.5	29.8	1.00	-0.1	0.3	0.9
1991	27.7	28.8	28.4	27.2	25.5	28.4	0.99	-0.3	-1.0	-3.8
1996	26.7	30.4	25.5	26.2	25.8	26.6	0.88	-3.8	-3.7	-13.8
Prostate cancer										
Males										
1971	19.8	18.1	22.1	22.9	18.0	18.7	1.03	0.6	1.7	8.7
1986	23.1	22.7	25.8	21.9	23.6	22.3	0.99	-0.3	0.5	2.0
1991	23.1	24.6	23.6	24.5	21.4	22.0	0.90	-2.5	-1.5	-6.6
1996	20.9	24.4	21.6	21.0	20.0	18.0	0.74	-6.4	-3.5	-16.5
Suicide										
Males										
1971	18.8	14.5	15.5	17.5	19.2	26.1	1.80	11.6	4.3	22.8
1986	20.8	15.8	15.8	16.3	22.3	33.0	2.10	17.3	5.0	24.2
1991	18.1	13.9	14.6	17.5	19.0	25.1	1.81	11.2	4.2	23.4
1996	18.7	15.6	13.8	17.3	18.4	27.5	1.76	11.9	3.2	16.9
Females										
1971	8.2	8.5	8.6	7.7	7.5	9.0	1.06	0.5	-0.3	-3.2
1986	6.4	4.9	5.2	4.4	7.5	10.3	2.11	5.4	1.5	23.7
1991	5.2	3.2	3.8	5.3	4.9	8.7	2.75	5.5	2.1	39.3
1996	5.5	3.4	4.3	4.1	6.6	8.6	2.53	5.2	2.1	38.4
Lung cancer										
Females										
1971	8.8	7.7	8.5	6.8	10.3	10.1	1.32	2.5	1.1	12.7
1986	23.1	18.7	21.6	21.8	23.7	28.0	1.49	9.2	4.3	18.8
1991	27.8	25.6	25.6	26.9	27.8	32.6	1.27	7.0	2.2	7.9
1996	30.7	27.0	30.0	30.4	30.5	34.8	1.29	7.8	3.7	12.0
Infectious diseases										
Both sexes										
1971	4.6	3.4	2.9	3.9	4.5	7.6	2.25	4.2	1.3	27.2
1986	5.8	3.9	3.6	4.7	6.4	10.1	2.58	6.2	1.9	32.6
1991	10.2	5.1	6.4	8.0	11.3	20.4	3.99	15.3	5.0	49.5
1996	10.5	6.0	7.5	7.6	11.0	20.5	3.41	14.5	4.5	42.7
Ill-defined conditions										
Both sexes										
1971	4.4	2.6	3.7	3.6	4.1	6.9	2.62	4.3	1.8	40.5
1986	8.0	5.3	5.0	7.0	8.0	13.8	2.60	8.5	2.7	33.6
1991	11.5	8.1	8.4	10.0	12.3	18.3	2.27	10.3	3.4	29.6
1996	10.0	6.7	7.3	8.2	10.6	17.0	2.52	10.2	3.3	32.8
Mental disorders										
Both sexes										
1971	2.7	1.6	1.8	2.1	1.8	5.9	3.74	4.3	1.2	42.2
1986	5.9	4.3	4.9	4.6	5.2	10.1	2.35	5.8	1.6	27.2
1991	6.1	5.6	5.4	5.2	5.9	9.0	1.62	3.5	0.6	9.6
1996	8.2	7.7	7.5	7.1	8.8	10.1	1.30	2.3	0.5	6.2
Diabetes										
Males										
1971	15.5	15.0	13.4	15.7	15.6	17.1	1.14	2.1	0.5	3.0
1986	13.0	10.5	14.3	12.5	13.1	14.6	1.39	4.1	2.4	18.8
1991	13.7	11.3	11.5	12.2	14.5	18.8	1.67	7.5	2.5	17.9
1996	16.1	13.5	13.5	14.5	16.8	21.2	1.56	7.6	2.6	16.1
Females										
1971	13.3	10.5	10.1	13.4	13.3	17.2	1.64	6.7	2.8	20.9
1986	9.2	8.0	8.8	9.3	9.7	10.1	1.26	2.1	1.2	12.5
1991	9.2	9.1	8.2	8.6	9.8	10.6	1.17	1.6	0.2	1.7
1996	9.9	9.1	7.8	9.5	8.9	13.4	1.47	4.3	0.7	7.6

Data sources: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
Notes: *Causes are shown in the order they appear in Charts 11, 12 and 13. See Appendix Table A for International Classification of Diseases codes corresponding to each cause. See Appendix Table C for standard errors.*
† Inter-quintile rate ratio (Q5/Q1).
‡ Inter-quintile rate difference (Q5 - Q1).
§ Population-attributable risk (Total - Q1).
†† Population-attributable risk percentage [100 × (Total - Q1)/Total].
‡‡ Includes causes for which detailed data are not shown.

Chart 12
Causes of death with little change, mixed results, or inverted gradients: age-standardized mortality rates, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*

Causes of death with little change, mixed results, or inverted gradients

A few causes of death showed little change or mixed results, or the gradients by income were reversed from the usual pattern. These causes included deaths to motor vehicle occupants of both sexes, lung cancer, prostate cancer and suicide for males, and breast cancer for females (Chart 12, plus middle panels of Table 9).

For deaths to vehicle occupants of both sexes involved in traffic accidents (Chart 12A), the gradient by income was inverted, with the lowest rates in the poorest quintiles and higher rates in richer quintiles. This may be due in part to differential exposure to risk, as residents of poorer quintiles may travel fewer vehicle-kilometres.

For lung cancer among males (Chart 12B), there was little net change from 1971 to 1996 in either income-related disparities or mortality rates. However, both rates and rate differences peaked in 1986.

For female breast cancer (Chart 12C), the mortality gradient by income was also inverted, with the richest quintile having somewhat higher rates than the other quintiles. Another study found that the multivariate-adjusted risk for having (as opposed to dying from) post-menopausal breast cancer in Canada was 1.3 for high versus low income adequacy and 1.4 for high versus low educational attainment.[77] Control variables included various factors that differ by socio-economic status, such as age at menarche, age at first pregnancy, number of live births, months of breastfeeding, and maternal height. These findings

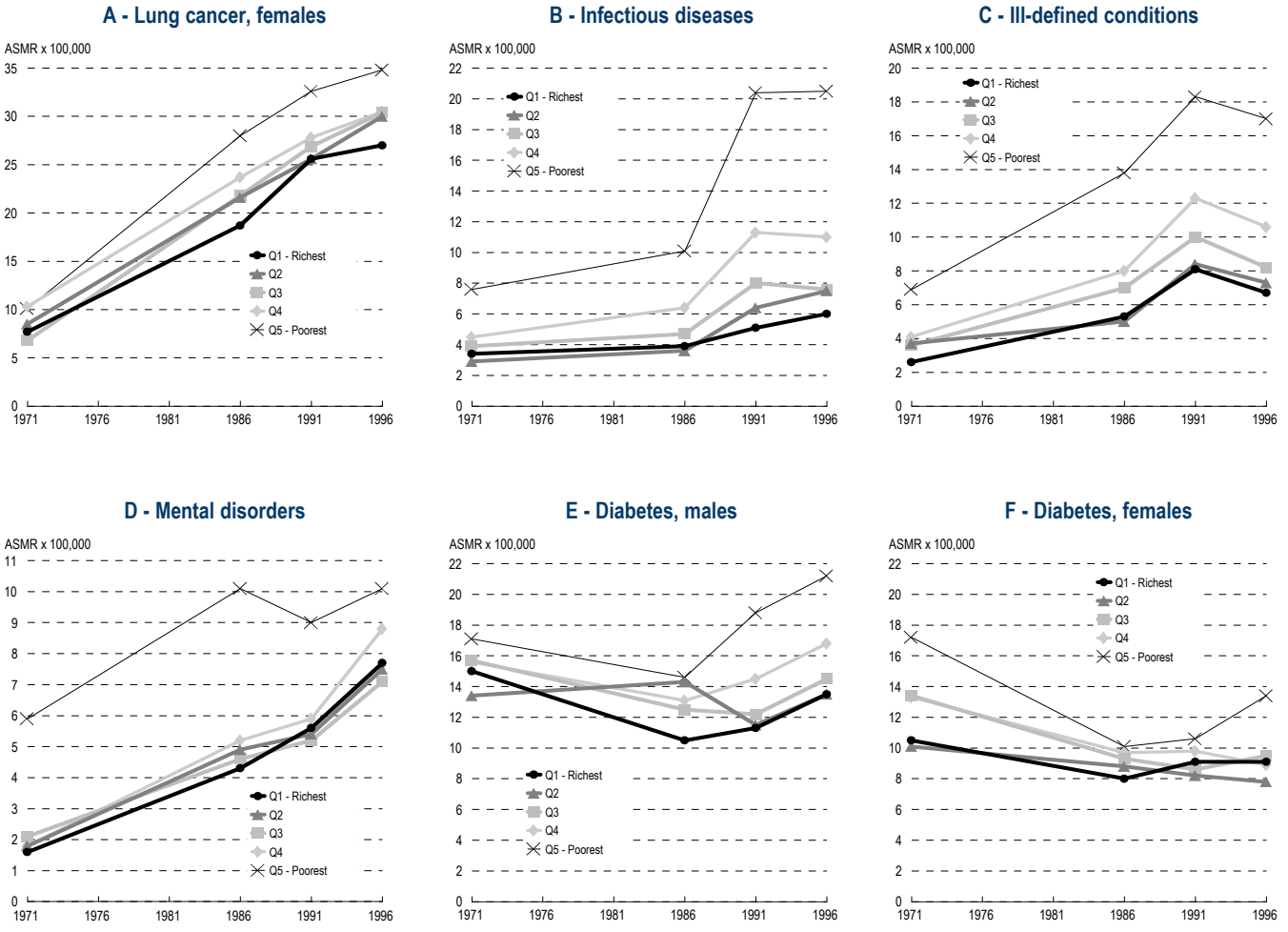
suggest that in the case of breast cancer, socio-economic differentials in risk factors may be protective for women of lower socio-economic status.

For prostate cancer (Chart 12D), the mortality rate for males in the richest quintile increased from among the lowest in 1971 to clearly the highest in 1996. By that time a clear inverse gradient was evident. However, the modest decline in mortality rates for prostate cancer in Canada during the early 1990s was probably not the result of increased screening.[78]

With the exception of uterine cancer, for which reductions in mortality rates and socio-economic disparities have been impressive, relatively little progress toward the goal of "Health for All"[1, 79] has been achieved in Canada with respect to most of the other cancer causes of death. However, an international comparison of cancer survival in Toronto and Detroit found that cancer incidence rates were similar in the two cities, but post-incidence mortality rates were lower in Toronto than in Detroit, especially for the poorest areas. These findings suggest that treatment outcomes were not strongly related to income in Canada, contrary to what was found for the United States.[80]

There was little net change in the pattern of suicide rates for males (Chart 12E), in terms of either levels or disparities. However, suicide rates for women (Chart 12F) generally decreased, except within the poorest quintile. High suicide mortality rates, especially among males, represent a continuing problem in Canada. As

Chart 13
Causes of death with increased mortality rates and wider disparities by income: age-standardized mortality rates, by neighbourhood income quintile, urban Canada, 1971 to 1996



***Data sources**: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
***Note:** Infectious diseases include 1986 AIDS recoded from metabolic to infectious diseases.*

mortality rates for other causes decline, the relative importance of such currently intractable causes of death increases and constitutes a larger portion of the overall burden of excess mortality related to socio-economic disparities.

Causes of death with increased mortality rates and wider disparities by income

For a few causes of death, mortality rates increased while disparities by income widened. These causes included lung cancer for females, as well as infectious diseases, ill-defined conditions, mental disorders, and diabetes for both sexes (Chart 13, plus lower panels of Table 9).

Mortality rates for lung cancer increased rapidly for females of all income quintiles (Chart 13A), and the gap between rich and poor widened. From 1986 onward, the rates in the poorest quintile were substantially higher than those of the other quintiles (see *Differential vulnerability to lung cancer among smokers …*).

Partly because of AIDS, mortality rates due to infectious diseases (Chart 13B) increased substantially, particularly from 1986 to 1996, and the gradient by income became much steeper. Follow-up studies in Vancouver showed that after HIV infection (the cause of AIDS), low-income men had shorter survival,[86] while higher-income men experienced slower disease progression, despite receiving the same treatment.[87] In both Vancouver and Toronto, tuberculosis cases were approximately 4 times more frequent in the lowest than in the highest neighbourhood income decile.[88] Among immigrants to Ontario, the risk of developing tuberculosis after coming to Canada was higher for persons coming from countries where the disease is endemic, but even after adjustment for country of origin and other risk factors, low educational attainment was associated with higher risk.[89] In the United States, neighbourhood socio-economic status accounted for much of the increased risk of tuberculosis that had previously been attributed to race and ethnicity.[90]

Differential vulnerability to lung cancer among smokers, and effects of environmental tobacco smoke

Wide socio-economic disparities in lung cancer mortality are a continuing problem among men and a rapidly growing problem among women in Canada. While the most obvious causes are certainly the increased prevalence of smoking among women—particularly those of lower socio-economic status—and the previously high rates of smoking among men, several studies in the international literature have found that the sharp socio-economic disparities in lung cancer incidence and mortality cannot be fully explained by differential prevalence of one's own smoking across socio-economic groups. From 17 years of mortality follow-up in the Copenhagen study, it was found that even among smokers, lung cancer incidence rates were 3 times higher among lower-class than upper-class males.[81] Differences in vulnerability to lung cancer were said to be the most likely explanation for the differences, since only about 20% of the excess risk could be explained by differences in smoking among the social classes. Two Scottish cohort studies also concluded that there was a difference in lung cancer risk between social classes, in addition to the effect of smoking, and that this difference in risk could be attributed to poor lung health, deprivation, and poor socio-economic conditions throughout life.[82] Among Finnish males aged 50 to 69 with full smoking history and 7 years of mortality follow-up, lung cancer mortality among less-educated men who smoked heavily was about a third higher than that of their better-educated counterparts, and the excess risk remained practically unchanged after additional adjustment for inhalation and duration of smoking and partial adjustment for occupational exposures.[83]

However, in addition to differentials in the prevalence of smoking by various measures of socio-economic status, both residential and occupational exposure to second-hand smoke may also be associated with greater risk of lung cancer in never-smoking Canadian women.[84] In fact, according to a study in the early 1990s, about half of the greater incidence of lung cancer among non-smoking women with 9 or fewer years of education than among all other women was apparently related in part to higher lifetime exposures to second-hand smoke at home and in the workplace. Another recent Canadian case–control study found that, compared with the highest-income group, the adjusted relative risks of lung cancer were 1.5 and 1.7 for low-income men and women, respectively.[85] Similar differentials in risk were found with respect to low versus high education. These findings strongly suggest that the mortality rate ratios by neighbourhood income reported here yielded a reasonable, if conservative, estimate of the excess risk associated with individual-level indicators of socio-economic status, and that the excess risks for the groups with low socio-economic status were not simply due to differences in behavioural risk factors such as their own smoking.

For ill-defined conditions (Chart 13C), mortality rates increased and disparities among the quintiles widened. These changes may reflect the secular decline in the proportion of deaths subject to autopsy (vital statistics autopsy data, not shown). Had specific causes of death been coded for those deaths, the extent of socio-economic disparities for other causes of death would have been somewhat greater. However, because most of the deaths coded to ill-defined conditions were likely due to major causes of death such as cardiovascular diseases or cancer, it is unlikely that the trends in socio-economic disparities for any specific cause of death would have been unduly influenced by the existing coding.

Rates of death due to mental disorders (Chart 13D) increased rapidly, and the poorest quintile retained relatively higher rates. Alcoholism was included in this category but was not responsible for the increases (data not shown).

For diabetes among males (Chart 13E), mortality rates for most quintiles decreased from 1971 to 1986, but then increased from 1986 to 1996. Because the increases in the latter period were especially large for the poorest quintiles, the inter-quintile rate differences widened from 1986 to 1996. For diabetes among females (Chart 13F), mortality rates for all quintiles declined from 1971 to 1986 and then changed little from 1986 to 1996, except for the poorest quintile, in which rates increased rapidly. Therefore, the inter-quintile rate difference was considerably greater in 1996 than it had been in 1986. The trends with respect to the overall rates and socio-economic disparities in diabetes mortality are disquieting and deserve further study. Possible relationships to trends in obesity and sedentary lifestyles should be examined, as well as differences by ethnic origin and place of birth.[91]

Timing of changes in mortality rates

The timing of the changes in mortality rates varied by cause of death. For some causes, most progress occurred in the 1971–1986 period, immediately after the introduction of universal medicare in Canada. For others, progress continued fairly steadily throughout the entire 25-year study period or even accelerated during the last decade (1986 to 1996). For a few causes, the situation deteriorated over the last decade, notably during the 5 years from 1991 to 1996, a period of increasing unemployment and higher prevalence and intensity of low income in urban Canada,[94,95] as well as of increased wealth inequality.[96] Nevertheless, for Canada as a whole from 1985 to 1995, after including the effects of government income taxes and transfers, families' disposable incomes became more equal.[97]

Income or other factors?

Although the quintiles for this study were based on CTs ranked by a measure of income adequacy, they also differed systematically with respect to sources of income, tenancy status, education, occupation, unemployment, and period of immigration, among other socio-economic factors. Thus, the strong relationships between mortality and income that were observed do not necessarily mean that income, rather than one or more of the other characteristics, was the causal factor. It is not just a question of determining which characteristic was most closely related to mortality or of statistically "controlling" for the other factors. Rather, various socio-economic factors tend to be determined during and act at different periods of a person's life. Hence educational attainment—typically reached by the mid-20s—qualifies a person for an occupation, which in turn produces a flow of income throughout the person's economically active life and after retirement. Effects related to income may thus be determined to a greater or lesser extent by education or occupation, rather than by income itself. Conversely, income may affect health beyond other closely related socio-economic factors such as education and occupation.[98-99] Furthermore, effects related to neighbourhood differences are not necessarily the same as effects at the individual or family level. (For further critical comments on various other aspects of the study, see *Limitations*.) Longitudinal mortality data with individual-level information for various measures of socio-economic status are thus needed to help sort out the effects of each of these determinants and to provide more relevant information for health and social planning and policy analysis.

Concluding remarks

On the basis of small-area data for urban Canada from 1971 to 1996, socio-economic disparities in mortality appear to have diminished substantially over time, for both all-cause mortality and for most specific causes of death. Nonetheless, such differentials are still of major concern in Canada.

To be more directly relevant to policies intended to reduce socio-economic inequities in health outcomes, mortality data linked to individual- and family-level socio-economic characteristics (such as education, occupation, aboriginal origins, language, visible minority status, race or ethnicity, period of immigration, and activity limitation status) are clearly required. Given that such data are currently not available for most Canadian vital statistics registration data—nor are they likely to become available in the near future—

Limitations

Generalizability of the findings. This study was based on neighbourhood rather than individual or family income, and its findings apply only to the 60% of Canada's population who live in metropolitan areas. However, the results of other Canadian studies[8-22, 24] suggest that the pattern of disparity in mortality rates between socio-economic groups observed here is a reasonable, if somewhat conservative, reflection of what might be expected in an individual-level analysis. Furthermore, these studies indicate that the disparities are not limited to residents of census metropolitan areas (CMAs) nor to non-institutional residents. Indeed, follow-up studies based on individual-level income appear to show greater disparities by income, even after adjustment for initial health status and known risk factors, than do the analyses of the current study, which are based on group-level income measures.

Lower mortality of immigrants. The mortality rates of immigrants, especially recent immigrants, are lower than those of the Canadian-born population.[92] Since the foreign-born percentage of population was higher in poorer quintiles and this percentage increased in recent years, the expected effect would be a reduction in the visibility of the relationship between income and mortality, and that confounding effect should have increased over time, particularly in the period 1991 to 1996. For the 1986 data,[28] the inter-quintile difference in life expectancy at birth was 1.1 year greater for the Canadian-born population than for the entire non-institutional population of the CMAs.

Differential under-coverage of census. The differential impact of net census under-coverage by income was also estimated for 1986. A rough correction for net under-coverage reduced the inter-quintile difference in life expectancy at birth by about 0.5 year. Because of increasing net under-coverage in more recent censuses, it is likely that the effect of a correction would be somewhat greater for 1991 and 1996. In 1986 the combined effect of the two adjustments (restriction to people born in Canada and correction for differential net under-coverage) was to increase the inter-quintile disparity in life expectancy at birth by 0.6 year.

Crossover in mortality at advanced ages. The greatest disparity in mortality rate ratios occurred in infancy and during the prime working years. However, at ages 85 and older, rate ratios for females in the poorest quintile compared to the richest were less than 1.00, a crossover that has also been observed for elderly blacks in the United States.[93] This effect may be due partly to differential survival and partly to the exclusion of institutional residents, who account for about one-third of that age group. There may also be numerator–denominator bias because the methods used to exclude institutional residents from the population (based on the census classification of collective dwelling type) was different from the method used to exclude them from the deaths (based on provincially recognized lists of health-related facilities).

Changes over time. Caution is clearly advisable in interpreting changes over time based on neighbourhood income variables. For example, had the homes of the poor been dispersed much more equally throughout all neighbourhoods in 1996, rather than being concentrated in poorer neighbourhoods as they were in 1971 (and 1996), then the disparities between quintiles—as measured in this type of study—would have been smaller, even in the absence of changes in relative mortality rates at the individual level. However, for CTs within Canada's largest metropolitan areas, residential segregation by income appears to have become stronger rather than weaker from 1991 to 1996.[94]

Cost of living differentials across CMAs. By constructing the quintiles within each CMA before aggregating to the national level, we minimized the potential effect of inter-metropolitan differences in income, housing, and other living costs. CMA-based quintiles also revealed greater inter-quintile differences in life expectancy than did national quintiles (data not shown). In addition, if all CTs had been ranked nationally before the quintiles were constructed, 36% of the population of metropolitan Toronto would have been placed into the richest quintile in 1986, whereas 4 metropolitan areas in eastern Canada would have had no population in that quintile.

other approaches are called for. Among the various options, mortality follow-up for a large sample from a recent census appears to offer the most feasible and effective approach.[100-101] Most other highly industrialized countries, including the United States,[102-104] Great Britain,[105-107] France,[108-109] Italy,[110-111] Spain,[112] Denmark,[113-114] Norway,[38, 115] Sweden,[76, 116-119] Finland,[44-46] Lithuania,[120] Israel,[121-123] and New Zealand[124] have already produced such linked data. In Canada, census-linked mortality follow-up studies have so far been limited to particular occupations[125-126] or a single province.[13, 18] A national study of this kind would permit the wealth of socio-economic variables already collected through the census to be analyzed with respect to mortality for Canada as a whole.

Because socio-economic data for people living in institutions are not available from recent Canadian censuses, socio-economic differentials in mortality for

this segment of the population would still present a problem. Accoring to Statistics Canada Advisory Committee on Health Statistics,[127] the most straightforward solution would be to collect a limited amount of socio-economic data—similar to the few questions collected for the institutional samples in the Health and Activity Limitation Surveys—during future Canadian censuses.

Socio-economic differentials in health are not limited to mortality. When measures of disability or dependence are also taken into account, the disparities between socio-economic groups widen substantially.[17, 24, 128-132] Thus, future studies should evaluate socio-economic differentials not only for mortality, but also for more comprehensive measures of health expectancy.

Because of the multiple pathways through which such disparities are believed to arise, continued progress in reducing socio-economic disparities in mortality in Canada may require both broad-based intersectoral policies[133] and highly targeted interventions, as well as better data on the nature of the existing disparities with respect to socio-economic characteristics other than neighbourhood income.

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Appendix

Table A
Low-income cut-offs in census metropolitan areas, by economic family size and metropolitan area size, Canada, for income received in 1970, 1985, 1990, and 1995 (in current dollars)

Economic family size (persons)	Metropolitan area size							
	100,000 to 499,999				500,000 and over			
	1970	1985	1990	1995	1970	1985	1990	1995
1	$ 2,515	$ 9,719	$ 12,433	$ 14,473	$ 2,686	$ 10,233	$ 14,155	$ 16,874
2	3,647	12,815	16,854	18,091	3,895	13,501	19,187	21,092
3	4,654	17,115	21,421	22,500	4,970	18,061	24,389	26,232
4	5,534	19,779	24,662	27,253	5,910	20,812	28,081	31,753
5	6,186	22,963	26,946	30,445	6,607	24,252	30,680	35,494
6	6,791	25,026	29,248	33,654	7,253	26,488	33,303	39,236
7+	7,446	27,606	31,460	36,864	7,953	29,155	35,818	42,978

Data sources: *Statistics Canada catalogues.*[49-52]

Table B
International Classification of Diseases (ICD) codes corresponding to each cause of death

Cause of death	Code
All causes	001-999
ICD Chapters	
Infectious and parasitic diseases	001-136 8th; 001-139 9th
Neoplasms	140-239
Endocrine, nutritional and metabolic diseases	240-279
Blood diseases	280-289
Mental disorders	290-315 8th; 290-319 9th
Diseases of the nervous system and sense organs	320-389
Circulatory diseases	390-458 8th; 390-459 9th
Respiratory diseases	460-519
Digestive system diseases	520-577 8th; 520-579 9th
Genitourinary diseases	580-629
Complications of pregnancy	630-678 8th; 630-676 9th
Skin and subcutaneous tissue	680-709
Musculoskeletal diseases	710-738 8th; 710-739 9th
Congenital anomalies	740-759
Perinatal conditions	760-779
Symptoms, signs and ill-defined conditions	780-796 8th; 780-799 9th
External causes (all injuries)	E800-E999
Specific causes	
All cancers	140-209 8th; 140-208 9th
Lung cancer	162-163 8th; 162-163, 164.2-164.3,164.8-164.9, 165 9th
Breast cancer	174 8th, 174-175 9th
Uterine cancer	180-182 8th; 179-182 9th
Prostate cancer	185
Diabetes	250
Ischemic heart disease	410-413 8th; 410-414 9th
Cirrhosis of liver	571
Motor vehicle traffic accidents (MVTA)	E810-E819
Pedestrians in MVTA	E814
Suicide	E950-E959

Note: *For cause of death coding in Canada, the 8th revision of the ICD*[53] *(ICDA-8) was used for 1971, and the 9th revision*[54] *(ICD-9) was used for 1986, 1991 and 1996. Codes shown apply to both 8th and 9th revisions unless otherwise specified.*

Table C

Standard errors of age-standardized mortality rates per 100,000 population, all ages, selected causes of death, by sex and neighbourhood income quintile, urban Canada, 1971 to 1996

	Total	Q1	Q2	Q3	Q4	Q5
All causes						
Both sexes						
1971	2.59	6.43	5.88	5.82	5.55	5.62
1986	1.93	4.78	4.46	4.21	4.16	4.38
1991	1.69	4.18	3.91	3.57	3.62	3.99
1996	1.55	3.58	3.54	3.33	3.31	3.71
Males						
1971	4.57	11.29	10.36	10.31	9.71	9.88
1986	3.47	8.33	7.86	7.55	7.53	7.96
1991	3.02	7.07	6.91	6.39	6.51	7.20
1996	2.73	6.11	6.16	5.91	5.87	6.64
Females						
1971	2.97	7.49	6.78	6.67	6.40	6.36
1986	2.20	5.72	5.24	4.82	4.65	4.80
1991	1.94	5.11	4.61	4.09	4.08	4.40
1996	1.80	4.37	4.23	3.85	3.80	4.16
Ischemic heart disease						
Males						
1971	2.79	7.02	6.37	6.36	5.85	5.89
1986	1.88	4.62	4.41	4.17	4.08	4.08
1991	1.50	3.62	3.57	3.19	3.23	3.42
1996	1.31	2.97	3.01	2.85	2.81	3.06
Females						
1971	1.59	4.11	3.70	3.51	3.40	3.27
1986	1.04	2.83	2.52	2.26	2.15	2.15
1991	0.84	2.31	2.02	1.76	1.75	1.84
1996	0.73	1.80	1.73	1.53	1.51	1.68
Injuries except motor vehicle traffic accidents and suicide						
Both sexes						
1971	0.51	1.05	1.11	1.03	1.10	1.35
1986	0.35	0.79	0.74	0.73	0.77	0.95
1991	0.31	0.71	0.67	0.65	0.66	0.85
1996	0.29	0.63	0.65	0.59	0.63	0.78
Cirrhosis of liver						
Males						
1971	0.59	1.05	1.10	1.28	1.26	1.63
1986	0.45	0.86	0.80	0.99	1.02	1.23
1991	0.39	0.77	0.76	0.75	0.89	1.17
1996	0.34	0.65	0.67	0.71	0.78	1.00
Females						
1971	0.37	0.74	0.78	0.86	0.73	1.00
1986	0.25	0.56	0.55	0.56	0.56	0.63
1991	0.22	0.47	0.51	0.42	0.47	0.63
1996	0.18	0.45	0.41	0.41	0.40	0.41
Uterine cancer						
Females						
1971	0.44	0.89	0.93	1.04	1.01	1.05
1986	0.27	0.61	0.61	0.59	0.56	0.67
1991	0.24	0.57	0.56	0.52	0.50	0.62
1996	0.22	0.48	0.51	0.50	0.46	0.54
Perinatal conditions						
Both sexes						
1971	0.29	0.58	0.60	0.66	0.66	0.74
1986	0.18	0.35	0.35	0.40	0.41	0.46
1991	0.14	0.29	0.28	0.29	0.34	0.36
1996	0.15	0.27	0.34	0.35	0.32	0.36
Pedestrians in motor vehicle traffic accidents						
Both sexes						
1971	0.20	0.35	0.38	0.47	0.46	0.48
1986	0.11	0.23	0.23	0.25	0.25	0.30
1991	0.10	0.18	0.22	0.21	0.23	0.26
1996	0.08	0.17	0.18	0.15	0.20	0.22
Motor vehicle occupants						
Both sexes						
1971	0.37	0.88	0.83	0.86	0.84	0.74
1986	0.24	0.60	0.56	0.53	0.52	0.51
1991	0.21	0.56	0.51	0.46	0.45	0.45
1996	0.18	0.47	0.48	0.39	0.38	0.32

	Total	Q1	Q2	Q3	Q4	Q5
Lung cancer						
Males						
1971	1.20	2.86	2.60	2.68	2.65	2.60
1986	1.07	2.31	2.33	2.36	2.37	2.53
1991	0.96	2.16	2.10	2.02	2.11	2.39
1996	0.87	1.86	1.90	1.87	1.90	2.16
Breast cancer						
Females						
1971	0.72	1.93	1.68	1.62	1.55	1.48
1986	0.61	1.52	1.44	1.34	1.31	1.28
1991	0.55	1.40	1.29	1.17	1.10	1.21
1996	0.50	1.29	1.14	1.10	1.07	1.12
Prostate cancer						
Males						
1971	0.70	1.87	1.82	1.74	1.42	1.27
1986	0.63	1.68	1.63	1.36	1.35	1.24
1991	0.57	1.54	1.42	1.27	1.14	1.16
1996	0.50	1.33	1.22	1.11	1.03	1.00
Suicide						
Males						
1971	0.62	1.28	1.28	1.34	1.38	1.55
1986	0.54	1.13	1.07	1.07	1.24	1.48
1991	0.48	0.99	0.98	1.05	1.08	1.23
1996	0.47	1.02	0.92	1.03	1.03	1.26
Females						
1971	0.40	0.95	0.92	0.85	0.85	0.92
1986	0.29	0.61	0.60	0.53	0.69	0.82
1991	0.25	0.45	0.48	0.55	0.52	0.72
1996	0.25	0.44	0.50	0.48	0.60	0.69
Lung cancer						
Females						
1971	0.40	0.98	0.94	0.78	0.94	0.88
1986	0.53	1.23	1.22	1.13	1.13	1.22
1991	0.54	1.37	1.24	1.16	1.14	1.27
1996	0.54	1.24	1.25	1.19	1.15	1.27
Infectious diseases						
Both sexes						
1971	0.21	0.46	0.38	0.44	0.45	0.56
1986	0.20	0.42	0.37	0.40	0.45	0.56
1991	0.24	0.43	0.45	0.48	0.56	0.77
1996	0.23	0.42	0.46	0.44	0.52	0.73
Ill-defined conditions						
Both sexes						
1971	0.20	0.40	0.43	0.41	0.41	0.51
1986	0.23	0.49	0.43	0.49	0.50	0.65
1991	0.26	0.55	0.52	0.52	0.58	0.72
1996	0.23	0.46	0.46	0.47	0.52	0.67
Mental disorders						
Both sexes						
1971	0.16	0.32	0.31	0.33	0.29	0.50
1986	0.20	0.45	0.44	0.39	0.40	0.54
1991	0.18	0.48	0.42	0.36	0.38	0.48
1996	0.20	0.48	0.45	0.40	0.43	0.48
Diabetes						
Males						
1971	0.61	1.64	1.37	1.39	1.31	1.22
1986	0.46	1.12	1.17	1.00	0.99	1.00
1991	0.44	1.02	0.96	0.89	0.94	1.08
1996	0.44	0.98	0.96	0.93	0.95	1.10
Females						
1971	0.49	1.18	1.02	1.12	1.04	1.11
1986	0.32	0.83	0.78	0.72	0.70	0.69
1991	0.30	0.82	0.69	0.63	0.65	0.68
1996	0.29	0.72	0.62	0.61	0.57	0.75

Data sources: *Canadian Mortality Data Base and supplemental address files; special tabulations of census population data*
Note: *See Appendix Table B for International Classification of Diseases codes corresponding to each cause. See Table 9 for ASMRs. Data for "all causes" include causes not shown.*

The health of the off-reserve Aboriginal population

- *Inequalities in health persisted between off-reserve Aboriginal and non-Aboriginal people after socio-economic and health behaviour factors were taken into account.*
- *Health determinants such as low socio-economic status, smoking, and obesity were more prevalent in the off-reserve Aboriginal population.*
- *Northern and southern off-reserve Aboriginal people reported similar levels of fair or poor health.*
- *In the provinces, contacts with publicly funded health care professionals were generally similar for the off-reserve Aboriginal and non-Aboriginal populations. In the territories, Aboriginal people living off reserve had fewer contacts with doctors than did non-Aboriginal persons.*

Abstract

Objectives

To compare the off-reserve Aboriginal population with the rest of the Canadian population in terms of health status, health behaviours, and health care utilization.

Data source

Statistics Canada's 2000/01 Canadian Community Health Survey.

Analytical techniques

Age-standardized cross-tabulations were used to compare health status, heath behaviours, and health care utilization between the off-reserve Aboriginal and non-Aboriginal populations. Multiple logistic regression was used to determine if, after adjustment for socio-demographic and health behaviour factors, the Aboriginal population had greater odds of reporting selected health outcomes.

Main results

The off-reserve Aboriginal population reported poorer health than the non-Aboriginal population. These inequalities in health persisted after socio-economic and health behaviour factors were taken into account. Contact with a general practitioner at least once in the previous year was similar between off-reserve Aboriginal and non-Aboriginal people living in the provinces. In the territories, Aboriginal people living off reserve had fewer contacts with doctors than did non-Aboriginal persons.

Key words

off-reserve Aboriginal Canadians, health status indicators, health behaviours, health care utilization, income, north

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Overall, Aboriginal people have poorer health than other Canadians.[1] Although the gap in life expectancy between Registered Indians (those persons with legally recognized Indian status, according to the Indian Act of Canada) and the general population is narrowing, the life expectancy of Registered Indians is estimated to be about 6 to 8 years shorter.[2-4] Furthermore, in the past several decades, diseases that were previously rare in Aboriginal communities have become more common.[5] It is thought that the rise of these "new" diseases, such as diabetes and cardiovascular disease, can be attributed to the rapid social, dietary, and lifestyle changes experienced by some Aboriginal communities over this period.[6-8] These health inequalities are explained, in part, by the fact that Aboriginal people have lower socio-economic status than other Canadians, a characteristic that is widely known to be associated with poorer health.[1,9,10]

Methods

Data sources

This article is based on data from the 2000/01 Canadian Community Health Survey (CCHS). See Annex for a description of the CCHS.

Analytical techniques

The analysis was based on data from 123,994 respondents who indicated their cultural and racial background. The 1,043 respondents who did not indicate their cultural and racial background were excluded. Proportions were estimated from the CCHS sample weights, which sum to the target population at the time of data collection. Confidence intervals for the estimates were calculated with the formula for simple random sampling and incorporated an estimate of design effect of 2, to account for the complex sampling design of the CCHS. In comparisons of any two estimates, the estimates were considered significantly different if their 95% confidence intervals did not overlap.

For the multiple logistic regression analysis, (see *The influence of socio-demographic and health behaviour characteristics on the health status of the off-reserve Aboriginal population*) weights were normalized and 99% confidence intervals were used to test significance. This technique was used because of the complex sampling design of the CCHS.

The age distribution differed between the Aboriginal and non-Aboriginal populations. Therefore, to allow for fair comparisons, all estimates were age-standardized to the Canadian population as measured by the CCHS. See the appendix for unadjusted estimates, percentages and sample sizes.

Limitations

As with all self-reported data, the CCHS results are subject to recall errors and misinterpretation of questions. In addition, cultural differences between Aboriginal and non-Aboriginal people with respect to the appropriateness of reporting various health conditions, behaviours, and service utilization could affect the results of the analysis. Several studies have shown that cultural groups interpret questions differently and differ in their willingness to respond to sensitive questions.[11-15] The extent of these reporting biases is unknown; however, to reduce bias, CCHS questions were thoroughly tested so as to capture accurate and complete responses.

Only respondents who identified their cultural and racial background as "Aboriginal peoples of North America" were considered Aboriginal. Respondents who did not state their cultural and racial background were excluded from the analysis. Some research has shown that respondents' views of their own cultural and racial background change with time,[16] and there could be many reasons why a respondent would choose not to disclose culture and race. The extent to which the Aboriginal respondents to the CCHS represent the entire Canadian off-reserve Aboriginal population is unknown.

Household size and income were used to determine income adequacy. The largest household size category was 5 or more persons. Because off-reserve Aboriginal people are more likely than non-Aboriginal people to live in households with 5 or more people, the number of low-income Aboriginal households might have been underestimated.

A greater proportion of Aboriginal respondents were found at the lower end within each household income category (low, middle, and high), especially for the high-income group. Therefore, the effects of income were not entirely controlled for data presented by income level and for the multiple logistic regression models using these income categories.

Data from the CCHS are cross-sectional, so no temporal or causal relationships among variables can be inferred.

Much of the research on Aboriginal health has focused on Aboriginal people living on reserve, Registered Indians, and the Inuit. In contrast, relatively little is known about the Aboriginal population (including Registered and non-status) living off reserve in cities and towns across Canada. Furthermore, research that compares Aboriginal health with that of the rest of the Canadian population usually controls only for differences in age and does not account for differences in socio-economic status.[1]

The Canadian Community Health Survey (CCHS) allows for such an analysis. This article compares the health status of the off-reserve Aboriginal population with that of the non-Aboriginal population by controlling for differences in age, household income and geographic region. Furthermore, differences in health behaviours and health care utilization are also explored.

In Canada, the Aboriginal population consists of three broad groups: North American Indian, Métis, and Inuit people. Together, they encompass a diverse range of smaller groups differing from each other and from other Canadians in terms of their history, culture, and traditions.[17,18]

The off-reserve Aboriginal population is much younger than the general population and is disproportionately located in the northern, western, and rural parts of the country.[19] According to the 1996

Census, 46% of the off-reserve Aboriginal population aged 15 or older were Registered. As well, 57% of the Aboriginal population living off reserve indicated they were North American Indian, 38% indicated Métis, and 6% Inuit. Because respondents could give more than one answer, the total adds to more than 100%.

According to the 2000/01 CCHS, an estimated 337,000 people aged 15 or older living off reserve, or about 1.4% of the Canadian population (excluding reserves), indicated that they belonged to an Aboriginal cultural or racial group (see *Defining the off-reserve Aboriginal population*).

Self-perceived health

A measure of health status commonly used in population health surveys is self-perceived health.[20] This measure has been shown to be reliable across different cultures.[21] In 2000/01, 23.1% of Aboriginal people living off reserve rated their health as either fair or poor, a level 1.9 times higher than for the non-Aboriginal population (Table 1). This finding corroborates the results of another study, which examined a different measure of health status; in that study, the premature mortality rate of Registered First Nations people in Manitoba was double that of other Manitoba residents.[2]

In each geographic region (urban, rural, and the territories), the off-reserve Aboriginal population reported higher levels of fair or poor health than their non-Aboriginal counterpart in that region. As well, the percentage of Aboriginal people reporting fair or poor health did not vary significantly between regions (Table 1).

As household income increased, the proportion of people reporting fair or poor health decreased. However, the gap between Aboriginal and non-Aboriginal people persisted for all three income levels (Chart 1).

Within the off-reserve Aboriginal population, the proportion of people reporting fair or poor health was lower among high-income households than among low- and middle-income households.

Chronic conditions

In 2000/01, 60.1% of the off-reserve Aboriginal population but only 49.6% of the non-Aboriginal population reported at least one chronic condition (see *Definitions*). Three chronic conditions that are known to be more prevalent in the Aboriginal population were selected for further analysis: high blood pressure, diabetes, and arthritis.[22,23] Of these three conditions, arthritis had the highest prevalence in the Aboriginal population (26.4%), followed by high blood pressure (15.4%) and diabetes (8.7%). The prevalence of each of these conditions was higher in the off-reserve Aboriginal population than the non-Aboriginal population (Table 1). The disparity was greatest for diabetes, for which the prevalence within the Aboriginal population was double that within the non-Aboriginal population. However, this ratio for diabetes was lower than that observed in two previous studies: in one,

Defining the off-reserve Aboriginal population

The term "Aboriginal" has many different meanings, depending on the context and who is using the term. For this article, the term encompasses only Aboriginal people living off reserve in households. In the Canadian Community Health Survey (CCHS), respondents were first asked the following question: "To which ethnic or cultural group(s) did your *ancestors* belong? (For example: French, Scottish, Chinese)" By first asking a respondent about his or her ancestors' background, it was assumed that the next question would be clearer to the respondent. That question, which was used to define Aboriginal people for this article, read: "People living in Canada come from many different cultural and racial backgrounds. Are you … Aboriginal peoples of North America (North American Indian, Métis, Inuit/Eskimo)?" The question incorporated a list of 12 categories (including the one quoted here), and multiple responses were permitted. Any respondent who answered yes to being a member of the Aboriginal peoples of North America was considered Aboriginal. For this analysis there were 3,555 respondents (representing 337,000 people) who indicated being an Aboriginal person of North America. Within this group, there were 573 respondents (representing 88,000 people in the Canadian population) who reported a combination of Aboriginal and non-Aboriginal racial background. Respondents who answered this question but did not indicate having an Aboriginal culture or race were considered non-Aboriginal. There were 1,043 respondents (representing 196,000 people in the Canadian population) who chose not to answer this question. These respondents were excluded from the analysis.

The CCHS data collection method and the definition of Aboriginal people used for this article (see above) differ from those of the 1996 Census.[24] For collecting data, the CCHS used personal or telephone interviews, whereas the Census used self-completed questionnaires. For defining Aboriginal people, the CCHS used the concept of cultural and racial background, whereas the 1996 Census used the concept of identity (whereby respondents identified themselves as being Aboriginal). The CCHS estimated that there were 337,000 Aboriginal people aged 15 or older living off reserve. In contrast, the 1996 Census estimated there were 374,400 people who identified themselves as Aboriginal. Therefore, caution should be used when comparing data from the CCHS and the Census.

Definitions

To measure *self-perceived health*, respondents were asked "In general, would you say your health is excellent, very good, good, fair, or poor?" Responses were grouped into three categories: poor or fair, good, and very good or excellent.

Canada was divided into three *geographic regions*. Respondents living in the Yukon, the Northwest Territories, or Nunavut were classified as the territories. In the provinces, respondents living in either a Census Metropolitan area (CMA) or a Census Agglomeration area (CA) were classified as urban, and those living outside a CMA or CA but within a province were classified as rural. Generally, a CMA is a geographic area with a population of at least 100,000 and a CA is a geographic area of at least 10,000 people. See the 1996 Census Dictionary[24] for complete definitions of a CMA and CA.

Household income was based on total annual income and number of household members. The following income groups were derived:

Household income group	People in household	Total household income
Low	1 or 2	Less than $15,000
	3 or 4	Less than $20,000
	5 or more	Less than $30,000
Middle	1 or 2	$15,000 to $29,999
	3 or 4	$20,000 to $39,999
	5 or more	$30,000 to $59,999
Highest	1 or 2	$30,000 or more
	3 or 4	$40,000 or more
	5 or more	$60,000 or more

Respondents aged 25 or older were grouped into four categories according to the highest level of *education* attained: less than secondary school graduation, secondary school graduation, some post-secondary education, and post-secondary graduation.

Respondents aged 15 to 75 were grouped into five categories according to their *work status* over the past year: worked entire year, worked part of the year and looked for work part of the year, worked part of the year and did not look for work, did not work during the past year and looked for work, and did not work during the past year and did not look for work.

To measure the prevalence of *chronic conditions*, respondents were asked if they had any long-term conditions that had lasted or were expected to last 6 months or more and that had been diagnosed by a health care professional. A checklist of conditions was read to the respondents. Conditions considered in this analysis were asthma, fibromyalgia, arthritis or rheumatism, back problems (excluding fibromyalgia and arthritis or rheumatism), high blood pressure, migraine headaches, chronic bronchitis, emphysema or chronic obstructive pulmonary disease, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, urinary incontinence, Alzheimer's disease or any other dementia, cataracts, and glaucoma. Respondents were classified as having either none or at least one of these conditions in 2000/01.

The CCHS measures a *major depressive episode* by means of a subset of questions from the Composite International Diagnostic Interview, according to the method of Kessler et al.[25] The questions cover a cluster of symptoms for depressive disorder, which are listed in the *Diagnostic and Statistical Manual of Mental Disorders*, third revised edition.[26] Responses to these questions are scored and transformed into a probability estimate of a diagnosis of major depressive episode. If the estimate was 0.9 or greater (that is, 90% certainty of a positive diagnosis), the respondent was considered to have experienced a major depressive episode in the previous 12 months.

To measure *long-term activity restriction*, respondents were asked "Does a long-term physical or mental condition or health problem reduce the amount or kind of activity you can do at home, at work or school, or other activities, for example, transportation or leisure?" Long-term conditions refer to conditions that have lasted or are expected to last 6 months or more. Respondents who indicated that their activities were often affected were considered to have a long-term activity restriction.

Respondents were classified into five groups on the basis of their *smoking status*. Those who usually smoked 20 or more cigarettes a day were defined as heavy smokers. Daily smokers (fewer than 20 cigarettes a day) were classified as light smokers. Respondents who currently smoked but not daily were classified as occasional smokers. Former daily smokers were those who had smoked daily at some point in the past, but not at the time of their interview. All other respondents were considered never to have smoked daily.

To derive respondents' level of *physical activity*, their energy expenditure was estimated for each activity in which they engaged during leisure time. Energy expenditure was calculated by multiplying the number of times a respondent engaged in an activity over a 12-month period (a 3-month recall period multiplied by 4) by the average duration in minutes and the energy cost of the activity (expressed in kilocalories expended per kilogram of body weight per hour of activity). To calculate the average daily energy expenditure for the activity, the yearly estimate was divided by 365. This calculation was repeated for all leisure time activities reported, and the resulting estimates were summed to provide the aggregate average daily energy expenditure. Respondents with an estimated energy expenditure below 1.5 kcal/day were considered physically inactive, those with an estimated energy expenditure of 1.5 to 2.9 kcal/day, moderately active, and those with an estimated energy expenditure of 3.0 kcal/day or more, active. This index does not take into account physical activity in the workplace.

Body mass index (BMI) was calculated by dividing weight in kilograms by the square of height in metres. Three weight categories were identified: acceptable or underweight (BMI less than 25), overweight (BMI 25 to less than 30), and obese (BMI 30 or more). Pregnant women were excluded from this aspect of the analysis.

To establish *type of drinker*, respondents were asked "During the past 12 months, how often did you drink alcoholic beverages?" They were categorized as being weekly drinkers, former drinkers (those who did not drink in the past 12 months, but did drink at some point in the past), or occasional drinkers or abstainers (less than once a week or never drank).

Heavy drinking was measured by asking respondents the number of times they had consumed five or more alcoholic drinks on one occasion in the past 12 months. Those who answered once a month or more often were classified as *heavy drinkers*.

Respondents' *contact with health care professionals* was determined by asking "In the past 12 months, how many times have you seen, or talked on the telephone, about your physical, emotional, or mental health with" any of a list of several health care professionals? Respondents were asked to exclude instances when they were admitted for an overnight stay in a health care facility. The list of health care professionals consisted of family doctor or general practitioner, eye specialist (such as an ophthalmologist or optometrist), any other medical doctor (such as a surgeon, allergist, orthopedist, gynecologist, or psychiatrist), nurse for care or advice, and dentist or orthodontist.

To determine whether a person had a *regular doctor*, respondents were asked "Do you have a regular medical doctor?"

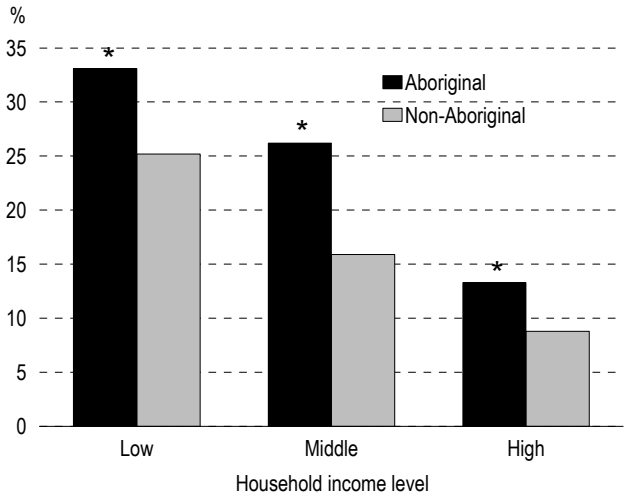
To measure *unmet health care needs*, respondents were asked "During the past 12 months, was there ever a time when you felt that you needed health care but didn't receive it?" Respondents who answered "yes" were asked the reasons for the most recent episode. The reasons were classified into three groups, depending on whether they were due to service *availability* (service not available where or when required or waiting time too long), *accessibility* (cost or transportation), or *acceptability* (responses that concerned attitudes and competing responsibilities).

Table 1
Health status indicators, household population aged 15 or older, by off-reserve Aboriginal status and geographic region, Canada, 2000/01

	Canada		Provinces				Territories(T)		Regional comparison for Aboriginal population†
			Urban areas (U)		Rural areas (R)				
	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	
	%	%	%	%	%	%	%	%	
Self-perceived health									
Very good or excellent	42.4*	61.2	43.2*	61.5	42.8*	60.2	38.2*	60.3	
Good	34.4*	26.6	34.8*	26.5	31.5	27.1	40.2*	28.6	R<T
Fair or poor	23.1*	12.2	22.0*	12.1	25.8*	12.7	21.6*	11.1	
One or more chronic conditions	60.1*	49.6	62.6*	49.4	59.6*	50.3	45.2	48.0	U,R>T
Type of chronic condition									
High blood pressure	15.4*	13.2	15.7	13.2	15.8	13.4	12.7	12.7	
Diabetes	8.7*	4.3	8.8*	4.2	9.2*	4.6	4.3E1	4.0	U,R>T
Arthritis	26.4*	15.8	28.7*	15.6	24.7*	16.9	15.9	16.9	U,R>T
Long-term activity restriction	16.2*	10.3	15.5*	10.2	18.1*	10.5	13.4	11.6	
Major depressive episode in past 12 months‡	13.2*	7.3	13.8*	7.4	13.1*	6.8	9.0	7.5	

Data source: *2000/01 Canadian Community Health Survey*
Note: *Percentages have been age-standardized to the total Canadian population.*
† Only significant differences between geographic regions are reported for the Aboriginal population.
‡ Excludes two health regions: Brant Public Health Unit, Ontario and Northern Health Services Branch, Saskatchewan.
** Significantly different from the non-Aboriginal estimate.*
E1 Coefficient of variation between 16.6% and 25.0%.

Chart 1
Percentage of those reporting fair or poor health by household income and off-reserve Aboriginal status, Canada, 2000/01



Data source*: 2000/01 Canadian Community Health Survey*
Note: *Percentages have been age-standardized to the Canadian population.*
** Significantly different from the non-Aboriginal estimate.*

the prevalence of diabetes among Registered First Nations people in Manitoba was 4.2 times that of the non-Aboriginal population,[2] and in the other, the rate for the on-reserve Aboriginal population was 3.3 times (for males) or 5.3 times (for females) the rate for the non-Aboriginal population.[23]

In urban and rural areas, the off-reserve Aboriginal population reported higher levels of chronic conditions than their non-Aboriginal counterparts (Table 1). However, in the territories, Aboriginal and non-Aboriginal people reported similar levels of chronic conditions. In contrast, in an earlier study, Aboriginal northerners reported lower levels of chronic conditions than other territorial residents.[27]

The off-reserve Aboriginal population living in the territories had a lower prevalence of chronic conditions than the provincial off-reserve Aboriginal population (Table 1). Similarly, another study found that northern Manitoba Aboriginal communities reported better health status than southern Manitoba Aboriginal communities.[2] This pattern may indicate that northern Aboriginal communities have not experienced lifestyle changes to the same degree as southern ones.[28,29] Another explanation could be that northern Aboriginal people have less opportunity to be diagnosed with a chronic condition because of their infrequent contacts with doctors.[27] Furthermore, cultural differences in

reporting health-related information between northern (primarily Inuit) and southern (primarily First Nations and Métis) populations might also explain these differences.[27]

Off-reserve Aboriginal people in low- and middle-income households reported higher levels of chronic conditions than other Canadians with the same socio-economic status (Chart 2). Aboriginal and non-Aboriginal Canadians in high-income households reported similar levels of chronic conditions.

The benefit of high income was also apparent within the off-reserve Aboriginal population, where the high-income population had a lower percentage of people reporting one or more chronic conditions than the low- and middle-income populations.

Long-term activity restriction

In 2000/01, 16.2% of the off-reserve Aboriginal population reported a long-term activity restriction (see Definitions), 1.6 times higher than the non-Aboriginal population (Table 1). This ratio was smaller than that reported in a previous study, in which the disability rate for the Aboriginal population was 2.4 times higher than the rate for all Canadians.[30]

The off-reserve Aboriginal population living in the provinces had higher levels of activity restriction than their non-Aboriginal provincial counterparts. However, in the territories, Aboriginal and non-Aboriginal residents reported similar levels of activity restriction (Table 1).

The middle-income off-reserve Aboriginal population had a higher proportion of activity restriction than other middle-income Canadians (Chart 3); for the other income groups, levels of activity restriction were similar between off-reserve Aboriginal and non-Aboriginal populations.

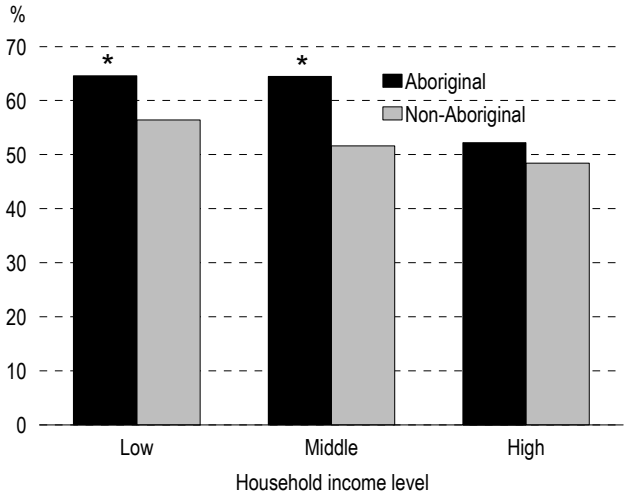
Within the off-reserve Aboriginal population, people in the high-income group reported lower levels of activity restriction than those in low- and middle-income households.

Depression

In 2000/01, 13.2% of the off-reserve Aboriginal population had experienced a major depressive episode in the past year (see *Definitions*), 1.8 times higher than the non-Aboriginal population (Table 1). Other researchers have documented high levels of mental health problems in Canadian Aboriginal communities.[1,31,32] One study found that in northwestern Ontario, depression appeared to be under-diagnosed within the Aboriginal population.[33]

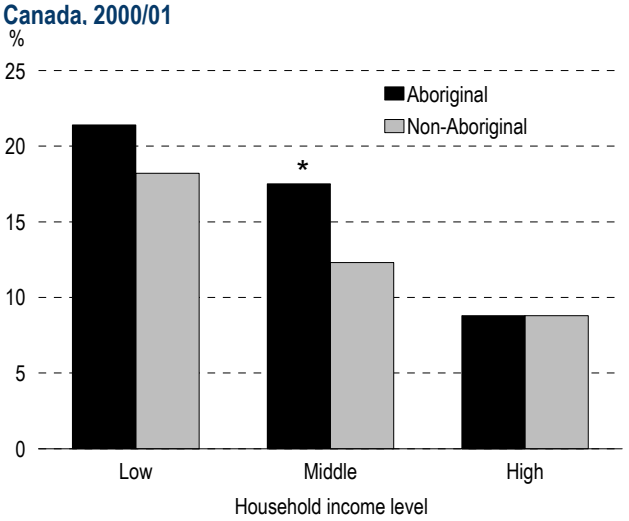
In the provinces, the prevalence of depression was higher within the off-reserve Aboriginal population than the non-Aboriginal population, but in the territories, the prevalence was similar for these two groups (Table 1). However, the percentage of the off-reserve Aboriginal population that had experienced a depressive episode did not vary significantly by region.

Chart 2
Percentage of those reporting one or more chronic conditions, by household income off-reserve and Aboriginal status, Canada, 2000/01



***Data source**: 2000/01 Canadian Community Health Survey*
***Note:** Percentages have been age-standardized to the Canadian population.*
** Significantly different from the non-Aboriginal estimate.*

Chart 3
Percentage of those reporting long-term activity restriction, by household income and off-reserve Aboriginal status, Canada, 2000/01



***Data source**: 2000/01 Canadian Community Health Survey*
***Note:** Percentages have been age-standardized to the Canadian population.*
** Significantly different from the non-Aboriginal estimate.*

Among low- and middle-income households, an Aboriginal person living off reserve was more likely than a non-Aboriginal person to have experienced a depressive episode. Among high-income households, Aboriginal and non-Aboriginal people reported similar levels of depression (Chart 4).

Health Determinants

There are many determinants of health. One well-known link is that between low socio-economic status and poor health.[7,9,18] In this article, socio-economic status was primarily measured using household income. However, both educational attainment and employment status are presented here and used in the logistic regression models (see *The influence of socio-demographic and health behaviour characteristics on the health status of the off-reserve Aboriginal population*). In 2000/01, the off-reserve Aboriginal population, as a whole and in the various geographic regions, had lower levels of education attainment and household income and was less likely to have worked the entire year than the non-Aboriginal population (Table 2). Previous research has also shown that the Aboriginal population has a lower socio-economic status than the non-Aboriginal population.[1,10]

Within the off-reserve Aboriginal population there were some differences in socio-economic status by region. Aboriginal people living in the provinces were more likely to have graduated from secondary school than those living in the territories. However, despite this difference in educational attainment, household income and work status were generally similar across all regions (Table 2).

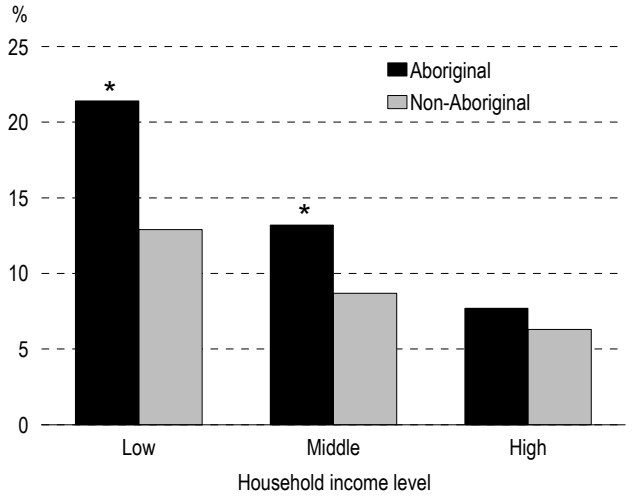
In addition to socio-economic status, many health behaviours have been associated with health status. For example, smoking has been associated with certain types of cancer, heart disease, and stroke.[34] In 2000/01, 51.4% of the off-reserve Aboriginal population were smokers - 1.9 times higher than the non-Aboriginal population. The majority were light daily smokers (27.2%), followed by heavy daily smokers (14.3%) and occasional smokers (9.9%). The largest difference between the off-reserve Aboriginal and non-Aboriginal populations was observed for light daily and occasional smokers (Table 2). Numerous other studies have reported high smoking rates within the Aboriginal population.[7,27,35,36] Furthermore, it appears that smoking rates among Aboriginal people are not decreasing.[37]

In all geographic regions, the off-reserve Aboriginal population was more likely to be current smokers than the non-Aboriginal population. Within the off-reserve Aboriginal population, the highest smoking rate was found in the territories (58.7%); the provincial rate was about 50%. These rates are similar to earlier estimates.[27,36].

Research has shown that being physically active has positive health benefits such as reducing the risk of heart disease.[6,38] Reported leisure-time physical activity was one health behaviour for which there was little difference between the off-reserve Aboriginal and non-Aboriginal populations. In 2000/01, 23.3% of the off-reserve Aboriginal population was active and 54.1% was inactive (the remaining group was moderately active). In the provinces, there was little difference between the off-reserve Aboriginal and non-Aboriginal populations, but in the territories, Aboriginal people were less likely to be active than other northern residents (Table 2).

Being overweight or obese (see *Definitions*) has been associated with several chronic conditions, such as asthma, high blood pressure, and diabetes.[39] In 2000/01, 33.5% of off-reserve Aboriginal people were overweight and an additional 24.7% were obese. Off-reserve Aboriginal people were just as likely as non-Aboriginal people to be overweight and 1.8 times more likely to be obese (Table 2). Several studies have documented that Aboriginal children and adults weigh more than other Canadians.[7,35,40] The exact reasons are not known, but genetic and environmental factors and rapid changes in lifestyle and diet have been suggested.[8,41] In the territories, Aboriginal and non-

Chart 4
Percentage of those experiencing a major depressive episode in past year by household income and off-reserve Aboriginal status, Canada, 2000/01



***Data source**: 2000/01 Canadian Community Health Survey*
***Note:** Percentages have been age-standardized to the Canadian population. Excludes two health regions (Brant Public Health Unit, Ontario and Northern Health Services Branch, Saskatchewan).*
** Significantly different from the non-Aboriginal estimate.*

Aboriginal residents reported similar levels of obesity (Table 2), but in the provinces, off-reserve Aboriginal people were more likely to be obese than non-Aboriginal counterparts.

In 2000/01, a smaller proportion of off-reserve Aboriginal people than non-Aboriginal people reported weekly drinking. This pattern held for all three geographic regions, the largest difference occurring in the territories (Table 2). In fact, northern Aboriginal residents living off reserve were less likely to drink weekly than Aboriginal people living off reserve in the provinces. This difference may be due in part to liquor restrictions in the territories.[27] Although off-reserve Aboriginal people were less likely than the rest of the Canadian population to be weekly drinkers, they did report higher levels of heavy drinking (Table 2).Similarly, another study found that alcohol consumption was less frequent among Aboriginal women in northern Quebec but that they consumed higher quantities of alcohol.[35] Within the off-reserve Aboriginal population, the proportion of heavy drinkers was similar across the three geographic regions. In the north, Aboriginal and non-Aboriginal people reported similar levels of heavy drinking.

Table 2
Health determinants, household population aged 15 or older, by off-reserve Aboriginal status and geographic region, Canada, 2000/01

	Canada		Provinces				Territories (T)		Regional comparison for Aboriginal population†
			Urban areas (U)		Rural areas (R)				
	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	
	%	%	%	%	%	%	%	%	
Education (aged 25+)									
Less than secondary school graduation	43.9*	23.1	39.6*	20.9	48.0*	32.1	61.3*	18.8	U,R<T
Secondary school graduation	13.5*	19.4	14.3*	19.5	13.8*	19.2	6.7*	13.8	U,R>T
Some post-secondary education	10.2*	6.7	11.4*	6.8	9.0	6.0	4.0	4.5	U,R>T
Post-secondary graduation	32.5*	50.8	34.6*	52.8	29.3*	42.6	28.0*	62.8	
Household income									
Low	27.3*	10.1	28.0*	9.7	23.3*	11.5	32.1*	9.7	R<T
Middle	24.8*	19.9	23.5*	18.6	26.1	25.0	29.1*	14.2	
High	37.0*	60.1	38.4*	61.9	36.2*	53.1	31.3*	66.6	
Missing	10.9	9.9	10.0	9.8	14.4*	10.4	7.5	9.6	R>T
Work status past year (aged 15 to 75)									
Worked entire year	38.1*	53.2	39.6*	53.8	36.2*	50.5	35.5*	52.7	
Worked part of year and looked for work	13.4*	8.3	12.4*	8.0	15.1*	9.4	15.8	10.8	
Worked part of year and did not look for work	13.2	14.6	11.8	14.3	14.9	15.8	17.5	19.0	
Did not work and looked for work	4.6*	1.7	5.9*	1.7	1.8[E2]	1.5	3.7	1.9[E2]	U>R
Did not work and did not look for work	30.7*	22.3	30.3*	22.2	31.9*	22.7	27.4*	15.6	
Smoking status									
Light daily smoker	27.2*	12.6	26.9*	12.4	24.4*	13.2	38.0*	15.8	U,R<T
Heavy daily smoker	14.3*	9.5	14.1*	8.8	16.0*	12.4	10.6	12.5	
Occasional smoker	9.9*	4.4	10.4*	4.5	8.4*	4.1	10.1*	4.8	
Former daily smoker	23.5	23.2	21.8	22.8	27.2	24.9	23.0	23.2	
Never smoked daily	25.2*	50.2	26.8*	51.5	23.9*	45.3	18.3*	43.7	U>T
Physical activity									
Active	23.3	21.8	23.3	21.9	23.5	21.5	20.3*	29.0	
Moderately active	22.6	23.5	23.0	23.6	23.3	22.8	18.1	24.1	
Inactive	54.1	54.7	53.8	54.5	53.2	55.7	61.6*	47.0	
Body mass index									
Acceptable or underweight	41.8*	54.3	41.9*	55.6	40.7*	48.8	41.8	48.5	
Overweight	33.5	31.7	32.5	31.1	35.8	34.0	33.7	31.5	
Obese	24.7*	14.0	25.6*	13.2	23.5*	17.3	24.5	20.1	
Alcohol consumption									
Weekly drinker	27.2*	38.4	29.4*	39.0	26.0*	36.0	14.6*	41.3	U,R>T
Former drinker	22.7*	11.9	21.0*	11.5	22.8*	13.4	31.7*	14.6	U,R<T
Less than weekly drinker or abstainer	50.1	49.8	49.6	49.5	51.2	50.6	53.6*	44.2	
Heavy drinker	22.6*	16.1	22.5*	15.6	22.9*	18.3	24.4	24.3	

Data source: *2000/01 Canadian Community Health Survey*
Note: *Percentages have been age-standardized to the total Canadian population.*
† Only significant differences between geographic regions are reported for the Aboriginal population.
** Significantly different from the non-Aboriginal estimate.*
E2 Coefficient of variation between 25.1% and 33.3%.

The influence of socio-demographic and health behaviour characteristics on the health status of the off-reserve Aboriginal population

To examine whether the off-reserve Aboriginal population had greater odds of reporting a health outcome than the non-Aboriginal population after adjustment for socio-demographic and health behaviour variables, four series of multiple logistic regression models were run, one series for each of four specific health outcomes. In each model, the dependent variable was the percentage of the population reporting the health outcome of interest. The four health outcomes were fair or poor health, one or more chronic conditions, long-term activity restriction, and major depressive episode in the past year. In the first set of regression models (age/sex), these four outcomes were examined separately with adjustment for age, sex, and Aboriginal status. The second set of models (socio-demographic) built on the age/sex models by including the following variables: geographic region (urban, rural, territories), marital status (single, married, previously married, not stated), educational status (less than secondary school graduation, secondary school graduation, some post-secondary education, post-secondary graduation), income level (low, middle, high, not stated), and work status (worked entire year, worked part of year and looked for work, worked part of year and did not look for work, had no job in past 12 months and looked for work, had no job in past 12 months and did not look for work). The final set of models (health behaviours) included all of the variables in the previous models as well as the following factors: physical activity (inactive, moderately active, active), smoking status (heavy daily smoker, light daily smoker, occasional smoker, former daily smoker, never smoked daily), body mass index (acceptable or underweight, overweight, obese), and heavy drinking.

The age/sex models showed that the off-reserve Aboriginal population had greater odds of reporting fair or poor health, one or more chronic conditions, long-term activity restrictions, and experiencing a major depressive episodes. The odds ratios for the Aboriginal population ranged from 1.6 (for one or more chronic conditions) to 2.3 (for fair or poor health) (Table 3).

Within the off-reserve Aboriginal population, the odds ratios after adjustment for selected socio-demographic variables were lower than the odds ratios in the age/sex models, which indicates that part of the difference in health status between the Aboriginal and non-Aboriginal populations can be attributed to differences in these socio-demographic variables. On average, the Aboriginal population had about 1.5 times greater odds of reporting any of the four health outcomes than the non-aboriginal population.

In the health behaviour models, the odds ratios for the off-reserve Aboriginal population were lower than the corresponding odds ratios in the socio-demographic model. However, the Aboriginal population still had greater odds of reporting fair or poor health, one or more chronic conditions, and experiencing a depressive episode than the non-Aboriginal population. The odds ratios for long-term activity restriction were no longer statistically different between the off-reserve Aboriginal and non-Aboriginal populations. On average, the Aboriginal population had about 1.3 times greater odds of reporting one of these health outcomes than the non-Aboriginal population.

These results suggest that differences in health status between the Aboriginal and non-Aboriginal populations can be partly explained by their differences in age, socio-demographic, and health behaviour characteristics, as measured by this analysis.

Table 3
Adjusted odds ratios for selected health status variables, by off-reserve Aboriginal status, with adjustment for socio-economic and health behaviours, household population aged 15 or older, Canada, 2000/01

	Fair or poor health		One or more chronic conditions		Long-term activity restriction		Major depressive episode in past year†	
Off-reserve Aboriginal status	Odds ratio	99% confidence interval	Odds ratio	99% confidence interval	Odds ratio	99% confidence interval	Odds ratio	99% confidence interval
Age/sex model								
Non-Aboriginal‡	1.0	...	1.0	...	1.0	...	1.0	...
Off-reserve Aboriginal	2.3*	1.9, 2.7	1.6*	1.4, 1.9	1.8*	1.5, 2.2	1.9*	1.6, 2.3
Socio-demographic model								
Non-Aboriginal‡	1.0	...	1.0	...	1.0	...	1.0	...
Off-reserve Aboriginal	1.5*	1.3, 1.8	1.5*	1.3, 1.7	1.4*	1.1, 1.7	1.5*	1.3, 1.9
Health behaviours model								
Non-Aboriginal‡	1.0	...	1.0	...	1.0	...	1.0	...
Off-reserve Aboriginal	1.3*	1.1, 1.7	1.3*	1.1, 1.5	1.2	1.0, 1.5	1.3*	1.1, 1.6

Data source: *2000/01 Canadian Community Health Survey*
Note: *Independent variables in each model (as follows) are not presented except for off-reserve Aboriginal status.*
Age/sex model: independent variables = off-reserve Aboriginal status, age, sex
Socio-demographic model: independent variables = off-reserve Aboriginal status, age, sex, geographic region, marital status, education, household income, work status.
Health behaviours model: independent variables = off-reserve Aboriginal status, age, sex, geographic region, marital status, education, household income, work status, smoking, physical activity, body mass index, heavy drinking.
† Excludes two health regions: Brant Public Health Unit, Ontario and Northern Health Services Branch, Saskatchewan.
‡ Reference category for which odds ratio is always 1.0.
** The off-reserve Aboriginal population has a significantly greater odds ratio than the non-Aboriginal population.*
··· Not applicable

Health care utilization

In addition to supplying measures of health status and health determinants, the CCHS allowed analysis of health care utilization. Previous research has shown that for the Aboriginal population, geographic location affects a person's use of physician services.[18] In the territories, the Aboriginal population reported fewer contacts with general practitioners and dentists and more contacts with nurses than other territorial residents.[27] In a more recent study, reported levels of visiting a physician were similar for Registered First Nations people in Manitoba and other Manitobans (81.5% versus 83.0%).[2]

In 2000/01, 76.8% of the off-reserve Aboriginal population reported seeing a general practitioner at least once in the previous 12 months, a proportion not significantly different from that for the non-Aboriginal population. However, the Aboriginal population living in the territories was much less likely to have had contact with a general practitioner than other northern residents (58.8% versus 75.9%). The proportion of provincial Aboriginal people living off reserve who reported having a regular doctor was slightly lower than for other provincial residents. However, the greatest disparity was found in the territories, where only 31.1% of off-reserve Aboriginal people but 67.0% of non-Aboriginal northerners reported having a regular doctor.

Contacts with eye specialists and other medical doctors were generally similar for off-reserve Aboriginal and non-Aboriginal people living in the provinces. In the territories, Aboriginal people reported fewer contacts with other medical doctors. Contacts with nurses were somewhat higher for Aboriginal people living in the provinces and much higher for those living in the territories (Table 4).

The off-reserve Aboriginal population was less likely to have contact with dentists, who are not publicly funded, than the non-Aboriginal population. This was true for all geographic regions. Past research has indicated that on-reserve Aboriginal people have poor dental health and are in need of dental services.[42]

In 2000/01, 19.6% of off-reserve Aboriginal people cited an unmet health care need, a proportion higher than for the non-Aboriginal population. Research has shown that individuals with poor health are more likely than individuals with good health to cite unmet needs.[43] Therefore, the higher proportion found in the off-reserve Aboriginal population could, in part, be the result of differences in health status between Aboriginal and non-Aboriginal people. Further analysis which controlled for differences in self-perceived health showed that off-reserve Aboriginal people continued to cite an unmet health care need more frequently than non-Aboriginal people (data not shown).

Table 4
Health care utilization, household population aged 15 or older, by off-reserve Aboriginal status and geographic region, Canada, 2000/01

	Canada		Provinces				Territories (T)		Regional comparison for Aboriginal population†
			Urban areas (U)		Rural areas (R)				
	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	
	%	%	%	%	%	%	%	%	
Contact with health care professionals in past 12 months									
General practitioner	76.8	78.7	79.4	79.3	76.4	76.5	58.8*	75.9	U,R>T
Eye specialist	37.9	38.0	37.1	38.3	40.0	36.9	35.3	39.1	
Other medical doctor	24.7*	28.9	26.3	29.9	23.6	25.4	15.1*	24.1	U,R>T
Nurse	16.8*	9.8	12.6*	9.5	16.3*	10.9	49.0*	22.0	U,R<T
Dentist	45.2*	59.4	46.6*	61.5	41.6*	50.9	45.0*	53.5	
Has a regular doctor	76.4*	83.9	81.5	84.0	79.0*	83.6	31.1*	67.0	U,R>T
Unmet health care needs	19.6*	12.7	18.8*	12.7	21.3*	12.8	18.4	13.6	
Acceptability‡	51.3	46.3	56.0	46.7	43.0	44.9	37.2	36.9	
Availability‡	47.5	50.9	42.8	50.1	51.4	53.6	59.1	62.2	
Accessibility‡	16.9*	11.9	18.9	12.4	16.1	10.0	8.8	7.6[E2]	

Data source: *2000/01 Canadian Community Health Survey*
Note: *Percentages have been age standardized to the total Canadian population.*
† Only significant differences between geographic regions are reported for the Aboriginal population.
‡ Multiple responses permitted.
** Significantly different from the non-Aboriginal estimate.*
E2 Coefficient of variation between 25.1% and 33.3%.

The type of unmet health care needs most often cited by the off-reserve Aboriginal population related to acceptability (51.3%) and availability (47.5%) reasons; similar levels to the non-Aboriginal population. However, accessibility reasons, such as cost and transportation, were more likely cited among off-reserve Aboriginal people than non-Aboriginal people (Table 4). A previous report found that off-reserve Aboriginal people had a higher prevalence of acceptability-related unmet needs than did non-Aboriginal people, a relationship that held when the effects of household income and health status were considered.[43]

Regardless of geographic region, off-reserve Aboriginal people were more likely to cite an unmet health care need than non-Aboriginal people. The type of unmet needs cited appeared to differ between urban Aboriginal and urban non-Aboriginal people, however, the differences did not reach significance (Table 4).

Concluding remarks

Through their responses to the CCHS, the off-reserve Aboriginal population as a whole reported poorer health than the non-Aboriginal population. This overall difference held true for those living in the provinces and for those in low- or middle-income households. However, it was not always the case for those living in the territories or in high-income households, for whom only self-perceived health (one of the four health status measures analyzed here) was significantly worse than among their non-Aboriginal counterparts.

Within the off-reserve Aboriginal population, those living in high-income households had better health than those living in low- and middle-income households. As well, the territorial off-reserve Aboriginal population reported fewer chronic conditions than their southern counterparts.

Generally, health determinants such as low socio-economic status, smoking, and obesity were more common in the off-reserve Aboriginal population than the non-Aboriginal population.

In the multivariate analysis (see *The influence of socio-demographic and health behaviour characteristics on the health status of the off-reserve Aboriginal population*), which controlled for socio-economic and health behaviour variables, the off-reserve Aboriginal population had greater odds of reporting fair or poor health, one or more chronic conditions, long-term activity restriction, and experiencing a major depressive episode in the previous year. With the exception of long-term activity restriction, these odds ratios were significant. Many of the health inequalities that exist between the Aboriginal and non-Aboriginal populations were attributable to differences in socio-economic and health behaviour characteristics.

Contacts with publicly funded health care professionals were generally similar between off-reserve Aboriginal and non-Aboriginal people living in the provinces. In the territories, Aboriginal people living off reserve were much less likely to have seen either a general practitioner or another medical doctor and were much less likely to have a regular doctor. Contacts with dentists (who are not publicly funded) were significantly lower for the off-reserve Aboriginal population regardless of where they lived. Overall, off-reserve Aboriginal Canadians reported a higher proportion of unmet health care needs than the non-Aboriginal population.

This article is a first attempt to compare the off-reserve Aboriginal population with the non-Aboriginal population in terms of health status, health behaviours, and health care utilization with adjustment for age, income, and geographic region. Further analyses examining these health inequalities in greater detail and monitoring Aboriginal health over time would prove beneficial.

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Appendix

Table A

Sample size and estimated population (unadjusted) for health indicators, off-reserve Aboriginal population aged 15 or older living in households, by geographic region, Canada, 2000/01

	Canada			Provinces						Territories		
				Urban areas			Rural areas					
	Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%		'000	%		'000	%
Total	3,555	337	100.0	1,369	218	100.0	1,164	89	100.0	1,022	30	100
Sex												
Male	1,567	158	47.0	555	101	46.3	499	43	47.7	513	15	50.2
Female	1,988	179	53.0	814	117	53.7	665	47	52.3	509	15	49.8
Age group												
15-24	869	82	24.4	328	53	24.1	261	21	23.9	280	8	28.4
25-34	908	83	24.5	356	54	24.8	283	21	23.2	269	8	25.7
35-44	766	81	24.0	311	53	24.2	232	22	24.4	223	6	21.5
45-54	507	53	15.8	206	35	16.2	185	14	16.2	116	3	11.5
55-64	265	20	6.0	83	12[E1]	5.5[E1]	114	6	7.1	68	2	6.5
65+	240	18	5.3	85	11	5.2	89	5	5.1	66	2	6.5
Marital status												
Married or common-law	1,551	161	47.9	526	97	44.7	539	49	54.6	486	15	51.4
Separated, divorced, widowed	580	46	13.7	262	33	15.2	200	10	11.6	118	3	9.0
Single (never married)	1,420	129	38.4	578	87	40.1	425	30	33.8	417	12	39.6
Education (aged 25+)												
Less than secondary school graduation	1,216	95	38.0	383	56	34.3	401	27	40.9	432	12	57.8
Secondary school graduation	296	35	14.2	136	23	14.2	112	11	16.3	48	2	7.3
Some post-secondary education	246	30	12.1	130	22	13.7	79	7	10.4	37	1	4.4
Post-secondary graduation	872	89	35.7	375	61	37.8	284	21	32.4	213	6	30.4
Household income												
Low	1,130	91	27.1	482	63	28.7	304	19	21.6	344	9	31.6
Middle	880	82	24.3	323	51	23.3	282	23	25.2	275	9	28.7
High	1153	127	37.8	428	83	38.1	398	35	38.8	327	10	32.5
Missing	392	36	10.8	136	21	9.8	180	13	14.4	76	2	7.2
Work status past year (aged 15 to 75)												
Worked entire year	1,244	128	39.2	486	85	40.6	425	32	37.7	333	10	33.4
Worked part of year and looked for work	541	50	15.5	168	29	13.8	176	16	18.4	197	6	19.2
Worked part of year and did not look for work	551	49	15.0	201	28	13.5	170	15	17.1	180	6	20.2
Did not work and looked for work	169	19	5.7	82	15	7.3	32	2[E2]	2.3[E2]	55	1	4.8
Did not work and did not look for work	894	80	24.5	376	52	24.9	298	21	24.5	220	6	22.3
Self-perceived health												
Very good or excellent	1,549	157	46.6	612	103	47.2	492	41	46.1	445	13	43.6
Good	1,293	120	35.5	474	77	35.1	398	31	34.9	421	12	40.5
Fair or poor	712	60	17.9	283	39	17.7	273	17	19.0	156	5	15.9
One or more chronic conditions	1,727	180	53.8	752	122	56.3	616	47	53.6	359	10	35.4
Type of chronic condition												
High blood pressure	392	36	10.6	147	24	10.8	163	10	10.9	82	2	8.2
Diabetes	210	19	5.6	96	12	5.6	86	6	6.6	28	1[E1]	2.8[E1]
Arthritis	618	64	19.0	278	44	20.4	236	17	18.6	104	3	10.1
Long-term activity restriction	459	45	13.4	198	29	13.4	176	13	15.0	85	2	8.4
Major depressive episode in past 12 months[†]	413	46	14.3	195	32	15.1	129	11	13.9	89	3	9.1

	Canada			Provinces						Territories		
				Urban areas			Rural areas					
	Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%		'000	%		'000	%
Smoking status												
Light daily smoker	1,220	106	31.5	429	68	31.4	336	25	28.1	455	13	42.4
Heavy daily smoker	459	46	13.7	177	28	13.1	177	15	16.3	105	3	9.8
Occasional smoker	393	36	10.8	162	24	11.0	118	9	10.0	113	4	12.2
Former daily smoker	658	63	18.8	257	39	18.0	242	19	21.7	159	5	15.9
Never smoked daily	810	85	25.2	338	57	26.5	289	21	24.0	183	6	19.7
Physical activity												
Active	842	80	26.0	336	51	25.9	282	22	26.8	224	6	24.0
Moderately active	738	72	23.3	294	46	23.4	268	20	24.1	176	5	20.5
Inactive	1,723	156	50.7	644	100	50.7	552	40	49.1	527	15	55.4
Body mass index												
Acceptable or underweight	1,473	146	45.2	575	96	45.5	455	37	43.7	443	13	48.1
Overweight	1,087	103	32.0	419	66	31.6	377	28	33.2	291	9	31.0
Obese	787	74	22.8	309	48	22.9	272	20	23.1	206	6	21.0
Alcohol consumption												
Weekly drinker	766	92	27.5	344	64	29.6	266	23	26.3	156	5	15.6
Former drinker	799	62	18.5	274	38	17.6	259	16	18.1	266	8	25.8
Less than weekly drinker or abstainer	1,962	181	54.1	738	114	52.8	636	50	55.6	588	17	58.6
Heavy drinker	941	87	26.1	375	56	26.0	297	23	25.9	269	8	27.5
Contact with health care professionals in past 12 months												
General practitioner	2,491	249	74.4	1,086	167	77.1	858	66	74.4	547	16	54.1
Eye specialist	1,280	118	35.1	510	75	34.4	451	34	38.4	319	9	30.4
Other medical doctor	776	84	25.0	371	60	27.5	256	20	22.5	149	4	14.8
Nurse	877	56	16.5	184	26	12.1	209	15	16.8	484	14	47.7
Dentist	1,663	164	48.9	685	109	50.0	507	41	46.3	471	14	48.2
Has a regular doctor	2,216	247	73.2	1,073	170	77.9	865	68	76.4	278	9	29.4
Unmet health care needs	697	69	20.4	287	44	19.9	234	20	22.3	176	5	18.4
Acceptability‡	331	36	52.4	158	26	58.8	104	9	42.2	69	2	39.3
Availability‡	354	31	44.4	131	18	40.6	115	10	48.0	108	3	61.0
Accessibility‡	108	11	15.4	49	7[E1]	15.6[E1]	46	4[E2]	17.6[E1]	13	0	6.0

Data source: *2000/01 Canadian Community Health Survey*
Note: *Values in each category may not add up to the total because missing data (non-response) are not presented for most variables.*
† Excludes two health regions: Brant Public Health Unit, Ontario and Northern Health Services Branch, Saskatchewan.
‡ Multiple responses permitted.
E1 Coefficient of variation between 16.6% and 25.0%.
E2 Coefficient of variation between 25.1% and 33.3%.

Table B

Sample size and estimated population (unadjusted) for health indicators, non-Aboriginal population aged 15 or older living in households, by geographic region, Canada, 2000/01

	Canada			Provinces						Territories		
				Urban areas			Rural areas					
	Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%		'000	%		'000	%
Total	120,439	24,114	100.0	76,638	19,259	100.0	42,546	4,815	100.0	1255	39	100.0
Sex												
Male	55,463	11,845	49.1	34,716	9,396	48.8	20,119	2,428	50.4	628	21	53.3
Female	64,976	12,268	50.9	41,922	9,862	51.2	22,427	2,387	49.6	627	18	46.7
Age Group												
15-24	17,763	4,106	17.0	11,813	3,296	17.1	5,786	804	16.7	164	6	14.1
25-34	18,089	4,045	16.8	12,000	3,323	17.3	5,808	714	14.8	281	9	22.0
35-44	24,537	5,206	21.6	15,900	4,204	21.8	8,301	991	20.6	336	11	26.9
45-54	21,073	4,361	18.1	13,347	3,485	18.1	7,450	867	18.0	276	9	22.1
55-64	15,181	2,799	11.6	9,214	2,172	11.3	5,848	623	13.0	119	4	9.8
65+	23,796	3,598	14.9	14,364	2,779	14.4	9,353	817	17.0	79	2	5.0
Marital Status												
Married or common-law	66,427	14,680	60.9	40,595	11,512	59.8	25,161	3,143	65.3	671	25	62.2
Separated, divorced, widowed	23,666	3,050	12.7	15,399	2,480	12.9	8,076	565	11.8	191	4	10.6
Single (never married)	30,201	6,362	26.4	20,552	5,249	27.3	9,258	1,103	22.9	391	11	27.2
Education (aged 25+)												
Less than secondary school graduation	27,884	4,599	23.2	14,989	3,264	20.6	12,736	1,330	33.6	159	5	14.6
Secondary school graduation	18,695	3,840	19.4	12,058	3,090	19.5	6,495	745	18.8	142	5	13.8
Some post-secondary education	6,666	1,318	6.6	4,551	1,082	6.8	2,057	234	5.9	58	2	4.8
Post-secondary graduation	48,349	10,067	50.8	32,643	8,393	53.0	14,986	1,652	41.7	720	22	66.8
Household income												
Low	15,882	2,432	10.1	9,598	1,866	9.7	6,175	563	11.7	109	3	7.6
Middle	26,468	4,802	19.9	15,389	3,578	18.6	10,905	1,219	25.3	174	5	12.6
High	65,758	14,488	60.1	44,046	11,935	62.0	20,830	2,524	52.4	882	28	71.9
Missing	12,331	2,392	9.9	7,605	1,879	9.8	4,636	509	10.6	90	3	7.9
Work status past year (aged 15 to 75)												
Worked entire year	55,055	12,042	53.1	36,189	9,817	54.1	18,144	2,202	49.1	722	23	59.0
Worked part of year and looked for work	9,024	1,867	8.2	5,557	1,456	8.0	3,336	407	9.1	131	4	11.4
Worked part of year and did not look for work	15,925	3,293	14.5	9,788	2,585	14.3	5,909	701	15.6	228	7	18.3
Did not work and looked for work	1,822	383	1.7	1,240	314	1.7	560	68	1.5	22	1[E2]	1.9[E2]
Did not work and did not look for work	28,158	5,077	22.4	17,558	3,962	21.8	10,484	1,111	24.8	116	4	9.4
Self-perceived health												
Very good or excellent	70,072	14,739	61.1	45,221	11,869	61.6	24,039	2,844	59.1	812	25	64.5
Good	33,091	6,419	26.6	20,780	5,086	26.4	11,993	1,323	27.5	318	11	26.6
Fair or poor	17,235	2,950	12.2	10,613	2,300	11.9	6,497	647	13.4	125	4	8.9
One or more chronic conditions	64,681	11,901	49.6	40,577	9,412	49.1	23,541	2,471	51.7	563	17	43.2
Type of chronic condition												
High blood pressure	18,822	3,196	13.3	11,399	2,493	13.0	7,306	699	14.5	117	4	8.9
Diabetes	6,069	1,033	4.3	3,651	793	4.1	2,376	239	5.0	42	1	2.9
Arthritis	23,744	3,831	15.9	14,421	2,960	15.4	9,161	867	18.0	162	5	12.9
Long-term activity restriction	14,441	2,477	10.3	9,174	1,948	10.1	5,152	526	10.9	115	4	9.2
Major depressive episode in past 12 months[†]	9,137	1,735	7.3	6,215	1,417	7.5	2,821	315	6.6	101	3	8.1

	Canada			Provinces						Territories		
				Urban areas			Rural areas					
	Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%		'000	%		'000	%
Smoking status												
Light daily smoker	15,493	3,027	12.6	9,949	2,402	12.5	5,327	619	12.9	217	6	16.0
Heavy daily smoker	12,684	2,282	9.5	7,544	1,692	8.8	4,978	585	12.2	162	5	13.1
Occasional smoker	4,951	1,062	4.4	3,228	868	4.5	1,662	192	4.0	61	2	5.3
Former daily smoker	30,579	5,609	23.3	19,052	4,366	22.7	11,248	1,235	25.7	279	9	21.8
Never smoked daily	56,510	12,081	50.2	36,724	9,890	51.5	19,255	2,173	45.2	531	17	43.8
Physical activity												
Active	25,436	4,832	21.8	16,386	3,861	21.8	8,738	961	21.4	312	10	28.3
Moderately active	27,073	5,214	23.5	17,473	4,188	23.7	9,287	1,017	22.7	313	9	25.9
Inactive	60,781	12,163	54.8	38,014	9,642	54.5	22,235	2,504	55.9	532	16	45.8
Body mass index												
Acceptable or underweight	60,105	12,727	54.2	40,017	10,439	56.6	19,494	2,269	48.4	594	19	49.2
Overweight	38,478	7,463	31.8	23,749	5,848	31.2	14,354	1,603	34.2	375	12	31.1
Obese	18,310	3,308	14.1	10,647	2,487	13.2	7,420	813	17.4	243	8	19.8
Alcohol consumption												
Weekly drinker	43,359	9,231	38.4	28,815	7,503	39.1	14,027	1,711	35.6	517	17	43.1
Former drinker	16,814	2,864	11.9	9,954	2,192	11.4	6,705	668	13.9	155	5	12.2
Less than weekly drinker/Abstainer	59,936	11,957	49.7	37,665	9,516	49.5	21,693	2,424	50.5	578	18	44.8
Heavy drinker	19,878	3,860	16.1	12,413	3,010	15.7	7,145	839	17.5	320	10	26.1
Contact with health care professionals in past 12 months												
General practitioner	95,695	18,948	78.7	61,433	15,220	79.2	33,336	3,699	77.0	926	29	73.5
Eye specialist	47,432	9,171	38.1	30,402	7,341	38.1	16,571	1,815	37.7	459	15	36.9
Other medical doctor	33,570	6,978	29.0	22,643	5,738	29.8	10,638	1,231	25.6	289	9	22.7
Nurse	13,043	2,353	9.8	7,885	1,820	9.5	4,853	525	10.9	305	8	21.4
Dentist	66,867	14,292	59.3	45,523	11,853	61.6	20,645	2,417	50.2	699	22	56.0
Has a regular doctor	102,467	20,234	83.9	65,675	16,155	83.9	36,007	4,053	84.2	785	25	64.5
Unmet health care needs	15,848	3,064	12.7	10,448	2,455	12.8	5,193	603	12.5	207	6	14.6
Acceptability‡	7,169	1,445	46.9	4,732	1,167	47.3	2,355	275	45.3	82	2	40.3
Availability‡	8,372	1,547	50.2	5,417	1,220	49.5	2,816	323	53.2	139	4	64.9
Accessibility‡	1,865	369	12.0	1,320	309	12.5	532	60	9.9	13	0[E2]	6.1[E2]

Data source: *2000/01 Canadian Community Health Survey*
Note: *Values in each category may not add up to the total because missing data (non-response) are not presented for most variables.*
† Excludes two health regions (Brant Public Health Unit, Ontario and Northern Health Services Branch, Saskatchewan).
‡ Multiple responses permitted.
E2 Coefficient of variation between 25.1% and 33.3%.

Health status and health behaviour among immigrants

- *Relative to non-immigrants, immigrants had superior health in terms of chronic conditions in general, even when accounting for age, education, and income. Immigrants' odds for reporting any chronic condition increased with time living in Canada.*
- *Newly arrived men had lower odds than non-immigrants of reporting heart disease. The same was true for women and cancer. With respect to diabetes, high blood pressure, heart disease in women, and cancer in men, immigrant and non-immigrant health were comparable; and there was no clear gradient of worsening health with time since immigration.*
- *Health behaviours such as smoking and heavy drinking differed between immigrant and Canadian-born respondents and varied with length of residence in Canada, but these differences did not generally explain the patterns in health outcomes.*

Abstract

Objectives

This article compares the health of immigrants at different times since immigration with that of the Canadian-born population, in terms of chronic conditions in general, heart disease, diabetes, high blood pressure, and cancer. Health behaviour outcomes were also explored, as was their role in explaining observed health outcomes.

Data source

The data are from Statistics Canada's cross-sectional 2000/01 Canadian Community Health Survey. The sample comprised 131,535 household respondents aged 12 or older, representing almost 26 million Canadians.

Analytical techniques

The prevalence of health outcomes and behaviours was estimated for Canadian-born respondents and immigrants, defined by their time since immigration. Logistic regression was used to estimate odds of reporting health outcomes, both unadjusted and adjusted for socio-demographic variables and health behaviours. Odds for reporting health behaviours were also estimated.

Main results

Both male and female immigrants had lower odds of reporting chronic conditions in general, but odds increased with time spent in Canada. Only recently-arrived men had healthier heart disease outcomes than non-immigrant men. The same was true for women and cancer. In all other cases, there appeared to be no health advantage for immigrants, nor a gradient of worsening health with time since immigration. Patterns in health behaviours accounted for very few differences between immigrant and non-immigrant health.

Key words

healthy immigrant effect, chronic conditions, cross-sectional study

Author

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Canada accepts proportionately more immigrants and refugees than any other country.[1] Since World War II, this country has received an average of approximately 150,000 immigrants yearly; since 1990, the yearly average has remained in the 200,000 range.[1,2] Understanding the health patterns of the immigrant community is important not only because immigrants constitute a sizeable proportion of the population,[3] but also because such an understanding can help in analyzing the health of all Canadians.

Methods

Data sources

This analysis uses data from the 2000/01 Canadian Community Health Survey (CCHS), a cross-sectional survey conducted by Statistics Canada. The CCHS collects information on the health of the Canadian population, covering 136 health regions across the country. The sample consists of 131,535 respondents aged 12 or older living in households in all provinces and territories, weighted to represent almost 26 million Canadians (Appendix Table A). The overall response rate for this cycle of the CCHS was 84.7%.

Analytical techniques

Respondents were divided into categories on the basis of their immigration status (versus Canadian-born), length of residence in Canada (see *Definitions*), and by sex. The prevalence of selected health outcomes and health behaviours was estimated for these groups.

Logistic regression models were fitted to estimate the odds of different immigrant groups reporting the presence of chronic conditions, both unadjusted and adjusted for socio-demographic variables (age, education, and household income) and for health behaviours (smoking, overweight and obesity, heavy drinking, physical inactivity, and fruit and vegetable consumption), with Canadian-born respondents as the reference group. Models were also fitted with dichotomous health behaviour variables as outcomes, with and without socio-demographic adjustment. Means were estimated for a continuous scale representing frequency of fruit and vegetable consumption. The least squares method was used to adjust means for socio-demographic factors.

Multiple logistic models were also fitted for the immigrant population only, to examine how well place of origin explained health differences among immigrants, grouped by time since immigration, after adjustment for socio-demographic factors and health behaviours.

Weights were used to account for unequal probabilities of selection. To account for the complex sample design, the bootstrap technique was used to estimate coefficients of variation and to test for statistical significance of differences ($p < 0.05$).

Limitations

The data from the Canadian Community Health Survey (CCHS) are self-reported or proxy-reported, and the degree to which they are inaccurate because of reporting error is unknown.

Although respondents were asked if chronic conditions had been diagnosed by a health care professional, no independent source was available to confirm diagnoses. New immigrants (and other respondents) may experience cultural, linguistic, or other barriers that might deter them from consulting health care professionals, which could lead to under-diagnosis of chronic conditions. Body mass index based on self-reported weight and height may be somewhat inaccurate, especially for people aged 65 or older. Heavy drinkers are defined as those who had more than two alcoholic beverages, on average, per day in the previous week. Respondents who experienced an atypical week of drinking before responding to the survey might have been misclassified. In terms of physical activity, people may expend considerable energy at work or while doing household chores (and the level of energy expenditure may differ between immigrants and non-immigrants and by type of immigrant), but information on non-leisure-time physical activity is not available from the survey. The nutrition questions in the CCHS ask about the number of times any fruits or vegetables are consumed but not about the amount consumed. In addition, significant variations in the performance of these questions have been reported for different ethnic populations in the United States[4]. The nutrition questions have not been tested in specific Canadian sub-populations, and it is possible that response accuracy, and thus the classification of respondents, may vary between ethnic or cultural sub-groups.

Although the health of refugees is significantly poorer than that of other types of immigrants, refugee status is not collected in the CCHS.

The identified place of origin may not be an immigrant's most recent place of residence. Residence in a country other than the country of birth before moving to Canada might dilute findings analyzed according to place of origin. Period of residence in Canada is measured from the date when a respondent first came to live in Canada. However, a person might have left Canada after initial arrival, spent time in other countries, and later returned to Canada, which again might affect the findings.

Finally, responses and response rates for newer immigrants may be affected by linguistic and cultural factors.

Research has revealed that immigrants, especially recent arrivals, enjoy better health than their Canadian-born counterparts.[5] Although not applicable to certain infectious diseases, such as tuberculosis,[6] this pattern has been observed to various degrees for outcomes such as chronic diseases, disability, dependency, life expectancy, and disability-free life expectancy.[7-9] These findings are consistent with results for other industrialized nations.[10,11] Moreover, they are not surprising, given that healthier people self-select into the immigration process and candidates for immigration must meet certain health status criteria, as stipulated in the Immigration Act.[2]

However, many of these studies have also shown that immigrants who have resided in Canada for decades do not enjoy this health advantage.[7,11] It has been speculated that this is due to a deterioration in the health of immigrants over time, leading to a convergence with the health of the Canadian-born population. The adoption of new health behaviours, such as smoking, during the process of acculturation[12,13] has also been speculated to play a substantial role in this worsening of health.

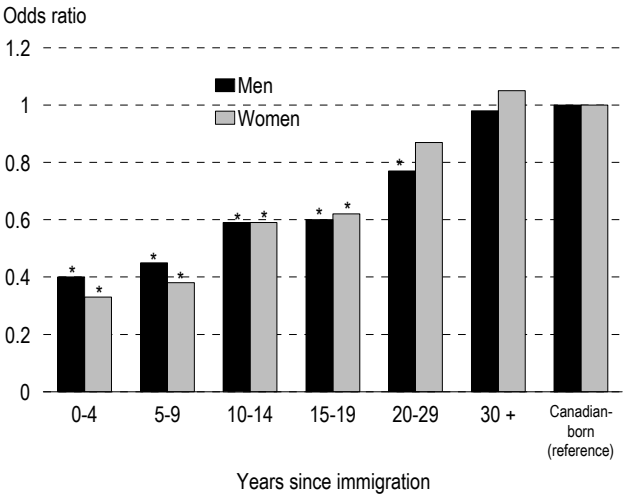
Because of sample size considerations, previous studies have been limited in the extent to which they could explore the phenomenon of apparent convergence, with time since immigration, of immigrants' health status with that of the Canadian-born population. This analysis, based on 131,535 respondents (of whom 16,901 were immigrants for whom time since immigration was known) from the 2000/01 cross-sectional Canadian Community Health Survey (CCHS) conducted by Statistics Canada, explores how the health of immigrants compares with that of the Canadian-born population as time since immigration increases, in terms of chronic conditions in general and the specific conditions of heart disease, diabetes, high blood pressure, and cancer. Because these specific conditions are linked with lifestyle factors such as smoking, physical inactivity, and diet, patterns in health behaviours of immigrants are also explored, as is the role of these behaviours in explaining health patterns.

General chronic disease prevalence rises with time since immigration

The results for chronic conditions in general corroborate previous findings based on other survey data,[7,9] that is, immigrants were healthier overall than non-immigrants. The prevalence of chronic conditions among immigrants was 59.6%, significantly lower than the 65.2% observed for the Canadian-born population (Table 1). Adjusting for differences in age, education, and income between these two groups widened the gap: the odds ratio for immigrants reporting the presence of chronic conditions, relative to non-immigrants, was 0.79 before and 0.63 after adjustment. The pattern was similar for the two sexes. Although immigrant and non-immigrant women had a higher prevalence of chronic conditions than men, the relative advantage of immigrant women over Canadian-born women was similar to that for men (adjusted odds ratios 0.65 for immigrant men and 0.62 for immigrant women).

The sample size of the CCHS allows for a finer division of immigrants by length of residence than has previously been possible. The results for chronic conditions in general indicate a gradient, the health of immigrants becoming progressively worse with increasing length of residence in Canada (Table 1, Chart 1). In fact, among both men and women, after adjustment for age, education, and income, the odds ratios for reporting a chronic condition, relative to non-immigrants, climbed steadily across groups, with those who had resided in Canada the longest (30 years or more) being indistinguishable from their Canadian-born counterparts. It should be noted that the chronic conditions reported had to have been diagnosed by a health care professional, so these findings may in part reflect differences in doctor consultation rates between immigrants and non-immigrants or some inability among recent immigrants to communicate their health problems.[14,15]

Chart 1
Odds ratios for chronic conditions in general, by sex and years since immigration, adjusted for age, education, and income



***Data source**: 2000/01 Canadian Community Health Survey*
** Significantly different from the reference category (p < 0.05).*

Table 1
Prevalence of and odds ratios for selected health outcomes, by sex and years since immigration, household population aged 12 or older, Canada, 2000/01

Condition by years since immigration	All respondents				Men				Women			
	Prevalence (%)†	Unadjusted odds ratio‡	Adjusted odds ratio§	Adjusted odds ratio††	Prevalence (%)†	Unadjusted odds ratio‡	Adjusted odds ratio§	Adjusted odds ratio††	Prevalence (%)†	Unadjusted odds ratio‡	Adjusted odds ratio§	Adjusted odds ratio††
All chronic conditions												
All immigrants	59.6*	0.79*	0.63*	0.65*	54.4*	0.80*	0.65*	0.67*	64.7*	0.77*	0.62*	0.66*
0-4 years	37.4*	0.32*	0.36*	0.35*	33.8*	0.34*	0.40*	0.35*	41.3*	0.29*	0.33*	0.40*
5-9 years	42.7*	0.40*	0.41*	0.42*	39.9*	0.45*	0.45*	0.49*	45.4*	0.35*	0.38*	0.39*
10-14 years	50.8*	0.55*	0.59*	0.61*	43.4*	0.52*	0.59*	0.64*	57.6*	0.57*	0.59*	0.61*
15-19 years	55.0*	0.65*	0.60*	0.61*	48.5*	0.64*	0.60*	0.63*	61.5*	0.67*	0.62*	0.62*
20-29 years	65.2	1.00	0.82*	0.83*	58.5	0.95	0.77*	0.82*	71.7	1.06	0.87	0.88
30+ years	78.2*	1.91*	1.00	0.99	73.5*	1.87*	0.99	0.96	82.7*	2.01*	1.05	1.07
Canadian-born‡‡	65.2	1.00	1.00	1.00	59.7	1.00	1.00	1.00	70.4	1.00	1.00	1.00
Heart disease												
All immigrants	5.4*	1.10*	0.85*	0.88*	5.6	1.06	0.79*	0.81*	5.1*	1.14*	0.90	0.92
0-9 years	1.8*E1	0.36*	0.66*	0.90	1.4*E1	0.26*	0.44*	0.67	2.2*E1	0.48*	0.92	1.13
10-19 years	2.3*	0.45*	0.59*	0.60*	1.5*E1	0.27*	0.39*	0.41*	3.0*E1	0.67*	0.82	0.78
20-29 years	4.1	0.84	0.90	0.84	5.2E1	0.97	1.03	1.02	3.2E1	0.69	0.73	0.63
30+ years	11.0*	2.41*	0.95	0.94	12.2*	2.47*	0.89	0.86	9.9*	2.34*	0.96	0.98
Canadian-born‡‡	4.9	1.00	1.00	1.00	5.3	1.00	1.00	1.00	4.5	1.00	1.00	1.00
Diabetes												
All immigrants	5.0*	1.29*	1.00	1.06	5.2*	1.25*	0.93	0.98	4.8*	1.34*	1.04	1.11
0-9 years	1.4*	0.36*	0.50*	0.67*	1.6*E1	0.37*	0.56*	0.74	1.3*E1	0.34*	0.41*	0.57
10-19 years	3.1	0.80	0.94	1.02	2.8E1	0.67	0.90	0.90	3.4E1	0.94	0.99	1.11
20-29 years	5.8*	1.53*	1.47*	1.56*	6.0E1	1.47*	1.40	1.51*	5.7	1.60*	1.52*	1.55*
30+ years	8.7*	2.36*	1.04	1.03	9.4*	2.37*	0.93	0.92	8.1*	2.35*	1.13	1.12
Canadian-born‡‡	3.9	1.00	1.00	1.00	4.2	1.00	1.00	1.00	3.6	1.00	1.00	1.00
High blood pressure												
All Immigrants	15.2*	1.31*	1.01	1.05	13.8*	1.33*	1.01	1.07	16.5*	1.30*	1.01	1.04
0-9 years	5.9*	0.46*	0.76*	0.90	5.6*	0.49*	0.78	0.93	6.2*	0.43*	0.75*	0.88
10-19 years	8.5*	0.68*	0.86	0.98	7.4*	0.66*	0.93	1.06	9.5*	0.69*	0.77	0.91
20-29 years	15.6*	1.36*	1.31*	1.37*	15.8*	1.56*	1.41*	1.55*	15.4	1.20	1.21	1.20
30+ years	27.2*	2.74*	1.04	1.02	24.2*	2.64*	0.99	0.98	30.2*	2.85*	1.10	1.07
Canadian-born‡‡	12.0	1.00	1.00	1.00	10.8	1.00	1.00	1.00	13.2	1.00	1.00	1.00
Cancer												
All immigrants	1.9	1.13	0.92	0.92	2.1*	1.31*	0.98	0.98	1.8	0.98	0.87	0.86
0-9 years	0.5*E2	0.31*	0.56	0.59	--F	0.52	1.03	1.19	--F	0.13*	0.21*	0.27*
10-19 years	0.9*E2	0.52*	0.74	0.64	--F	0.72	1.26	1.32	0.7*E2	0.35*	0.45*	0.26*
20-29 years	0.8*E2	0.49*	0.42*	0.49*	--F	0.19*	0.15*	0.18*	1.4E2	0.74	0.67	0.75
30+ years	4.3*	2.60*	1.19	1.16	4.6*	2.99*	1.10	1.07	4.1*	2.27*	1.27	1.22
Canadian-born‡‡	1.7	1.00	1.00	1.00	1.6	1.00	1.00	1.00	1.8	1.00	1.00	1.00

Data source: *2000/01 Canadian Community Health Survey*
† Prevalence estimates expressed as percentages. Estimates exclude records with missing values for the dependent variable.
‡ Unadjusted odds ratios.
§ Odds ratios adjusted for age, education, and household income.
†† Odds ratios adjusted for age, education, household income, smoking, heavy drinking, overweight or obesity, physical inactivity, and fruit and vegetable consumption.
‡‡ Reference category
** Significantly different from reference category (p < 0.05).*
E1 Coefficient of variation between 16.6% and 25.0%.
E2 Coefficient of variation between 25.1% and 33.3%.
F Coefficient of variation greater than 33.3%, estimate suppressed.

Definitions

Respondents were asked to name the country in which they were born. Those who specified a country other than Canada were asked if they had been born a Canadian citizen. If not, they were asked what year they first came to live in Canada. On the basis of responses to these questions, immigrant respondents were categorized by *length of residence* in Canada (0-4, 5-9, 10-14, 15-19, 20-29, 30+ years). The first four categories were collapsed into two categories for the analysis of specific chronic conditions.

Age in years was treated as a continuous variable.

Respondents were grouped into four categories on the basis of the highest level of *education* attained as of the completion of the first cycle of the CCHS: less than secondary school graduation, secondary school graduation, some post-secondary education, and post-secondary degree or diploma.

Household income groups were based on household size, as follows:

Household income group	People in household	Total household income
Lowest	1 to 4	Less than $10,000
	5 or more	Less than $15,000
Lower-middle	1 or 2	$10,000 to $14,999
	3 or 4	$10,000 to $19,999
	5 or more	$15,000 to $29,999
Middle	1 or 2	$15,000 to $29,999
	3 or 4	$20,000 to $39,999
	5 or more	$30,000 to $59,999
Upper-middle	1 or 2	$30,000 to $59,999
	3 or 4	$40,000 to $79,999
	5 or more	$60,000 to $79,999
Highest	1 or 2	$60,000 or more
	3 or more	$80,000 or more

Respondents were asked if they had any long-term conditions that had lasted or were expected to last 6 months or more and that had been diagnosed by a health professional. The presence of *chronic conditions* was defined as a reported diagnosis of at least one of the following conditions: food allergies, other allergies, asthma, fibromyalgia, arthritis or rheumatism, back problems, high blood pressure, migraine headaches, chronic bronchitis, chronic obstructive pulmonary disease, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, urinary incontinence, Crohn's disease or colitis, Alzheimer's disease or any other dementia, cataracts, glaucoma, a thyroid condition, Parkinson's disease, multiple sclerosis, chronic fatigue syndrome, multiple chemical sensitivities, or any other long-term condition that had been diagnosed by a health professional.

Occurrence of four specific chronic conditions, *heart disease, diabetes*, *high blood pressure*, and *cancer*, was determined from the relevant responses to the question above.

Smokers were identified by asking individuals if they smoked cigarettes daily, occasionally, or not at all. Smokers include daily and occasional smokers.

Body mass index (BMI) is calculated by dividing reported weight in kilograms by the square of reported height in metres. In this analysis, people with a BMI of 25 or more were classified as *overweight* or *obese*, which follows World Health Organization (WHO) standards. BMI was not calculated for pregnant respondents.

Respondents were asked a series of questions about alcohol consumption. Those who reported having had at least one drink in the past 12 months were asked if they had had any drinks over the past week. If so, they were asked how many drinks they had consumed on each day of the past week. *Heavy drinkers* were those who reported an average of more than 2 drinks per day (rounded off to the nearest unit) over the past week.

Level of physical activity was based on total energy expenditure during leisure time. Values for energy expenditure were calculated from information on the frequency and average duration of respondents' reported leisure-time activities in the previous 3 months, as well as the metabolic energy demand of each of those activities. Respondents were defined as being *physically inactive at leisure* if they expended less than 1.5 kcal/kg daily.

The *frequency of fruit and vegetable consumption* was assessed by means of the following questions: "The next questions are about the foods you usually eat or drink. Think about all the foods you eat, both meals and snacks, at home and away from home.

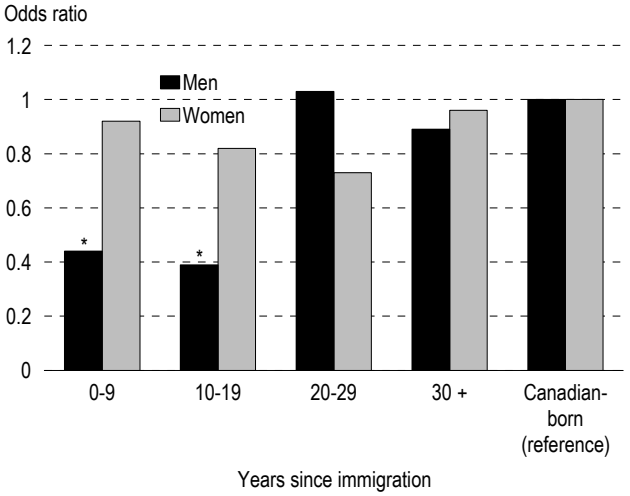
(1) How often do you usually drink fruit juices such as orange, grapefruit, or tomato? (for example, once a day, three times a week, twice a month)
(2) Not counting juice, how often do you usually eat fruit?
(3) How often do you (usually) eat green salad?
(4) How often do you usually eat potatoes, not including French fries, fried potatoes, or potato chips?
(5) How often do you (usually) eat carrots?
(6) Not counting carrots, potatoes, or salad, how many servings of other vegetables do you usually eat?"

Because the data were skewed, total frequency of daily fruit and vegetable consumption was transformed by means of the log value to yield a final consumption *index* (zero values were given the next-lowest value, 0.005, before the log was calculated).

Respondents were also categorized by the following seven *places of origin*: Canada (non-immigrants), other North America (United States and Mexico), Europe, Africa, South and Central America (including the Caribbean), Asia, and Australia (including all of Oceania). The last two categories were collapsed for the purposes of analysis.

The exact wording and order of the questions may be obtained from CCHS documentation.

Chart 2
Odds ratios for heart disease, by sex and years since immigration, adjusted for age, education, and income



***Data source**: 2000/01 Canadian Community Health Survey*
** Significantly different from the reference category ($p < 0.05$).*

Only recently arrived men had lower odds of heart disease

For heart disease, unlike the situation for chronic conditions in general, the health advantage of immigrants as a whole over the Canadian-born population was apparent only after adjustment for age, education, and household income. When immigrants are broken down into smaller groups, however, this health advantage is observed only among immigrant men, specifically those who resided in Canada less than 20 years. Men who had immigrated to this country earlier were comparable to men born in Canada. By contrast, immigrant women exhibited no such advantage, regardless of time since immigration.

Immigrants and non-immigrants were similar in terms of diabetes, high blood pressure, and cancer

For the three other specific conditions that were studied, there appeared to be no overall advantage for either male or female immigrants over non-immigrants. In fact, immigrant men and women overall fared worse than other Canadians by these measures before adjustment for the selected socio-demographic characteristics (the exception being that immigrant and non-immigrant women had comparable odds of a diagnosis of cancer). But after adjustment for age, education, and income, the odds of reporting these conditions were similar for immigrants and the Canadian-born population.

Accounting for socio-demographic factors

Tables 1 and 2 and Appendix Table B show both unadjusted results and results adjusted for age, education, and income. The unadjusted results provide an overall picture of the health of immigrants and non-immigrants. However, the age structure of these groups varies significantly, new immigrants being much younger and those who have resided in Canada for decades being considerably older than the overall population.[7] Immigrants are also heterogeneous in terms of socio-economic status. Longer-term residents are better established than newer immigrants, which is reflected in their education and household income.[7] But even among immigrants with comparable length of residence in Canada, there exists wide variation in education and income. "Independent" immigrants, including skilled workers and business people, are selected for their potential economic contribution to the country and tend to have relatively high levels of education and income. "Family class" immigrants are sponsored by Canadian citizens or residents and include spouses, dependent children, and parents. "Refugees" are people who have been admitted for humanitarian reasons.[2] The latter group, which accounted for 13% of all immigrants in 1999,[2] is the most economically disadvantaged and is in the worst health.[14]

Given the well-established link between health status and education, income, and (especially) age, results that do not take these factors into account may be misleading; therefore, the discussion in this paper focuses on the adjusted results.

Again with the exception of cancer among women, there was no clear gradient of higher adjusted odds of reporting these conditions with increasing time since immigration. In fact, the female immigrant cohort with the highest adjusted odds for a diagnosis of diabetes, relative to non-immigrants, was that which arrived in Canada between 20 and 29 years ago. The same is true for immigrant men and high blood pressure. Paradoxically, that same male cohort was the only one to have significantly lower adjusted odds than Canadian-born men of having a cancer diagnosis. It must be noted that cancer is of particularly low prevalence in some of these groups, which may lead to relatively unstable odds ratio estimates. Thus, among women, although the adjusted odds of reporting cancer increased with time since

immigration, and the immigrant cohort that had spent 30 or more years in Canada had elevated odds of such a diagnosis (1.27), this estimate did not achieve statistical significance.

Immigrants exhibited mixed patterns of health behaviours

From the time that immigrants arrive in Canada, they undergo an acculturation process by which ideas and behaviours associated with their place of origin are replaced by Canadian ideas and behaviours. Lifestyle behaviours related to health may change over time as a result of this acculturation, coming to more closely resemble the behaviours of Canadians in general. This section examines patterns in health behaviours among immigrants with different lengths of time since immigration and compares them with those of Canadian-born respondents.

Smoking was consistently less prevalent among immigrants than among their Canadian-born counterparts (Table 2). This was especially true for immigrant women - the odds ratios (adjusted for age, education, and income) for reporting smoking ranged from 0.20 for the most recent arrivals to 0.61 for the earliest arrivals. Among men, the gap between immigrants and non-immigrants was smaller, but the adjusted odds ratios for smoking never surpassed 0.75, the estimate for men who had spent 20 to 29 years in Canada.

In terms of overweight and obesity, the situation also differed between men and women. The prevalence of body mass index (BMI) of at least 25 was higher among men than among women. However, after controlling for socio-demographic factors, all immigrant men had healthier BMI profiles than Canadian-born men. For women, this advantage applied only to recent arrivals, that is, those who arrived in Canada less than 10 years ago.

Heavy drinking, defined as consuming an average of more than 2 drinks daily in the week before being interviewed for the CCHS, was rare, at least as measured by these self-reported data. For women in particular, and especially immigrant women, the prevalence of heavy drinking was low. Both male and female immigrants displayed significantly lower adjusted odds of heavy drinking, except women who had lived in Canada 30 or more years, for whom odds were comparable to those for women born in Canada.

Physical inactivity at leisure time differed from the other health behaviours studied, in that the Canadian-born population displayed a healthier pattern than their immigrant counterparts. Furthermore, there appeared to be no clear pattern of convergence between the two groups with time since immigration (although immigrant men who had been in Canada the longest had lower adjusted odds of reporting physical inactivity than Canadian-born respondents).

Immigrants as a whole consumed fruits and vegetables more frequently than non-immigrants, and there was little evidence of acculturation-driven convergence. However, some immigrant cohorts reported fruit and vegetable consumption patterns that were similar to those of their Canadian-born counterparts (specifically men with 20 to 29 years since immigration and women with 15 to 29 years since immigration).

Health behaviours explained few health differences

Given the mixed patterns in health behaviours among immigrants relative to non-immigrants, it is perhaps not surprising that these behaviours played a weak role in explaining differences in health outcomes, above and beyond differences in socio-demographic characteristics. That is, the majority of differences and similarities in health outcomes between immigrants and non-immigrants that were observed when controlling for age, education and income remained after further adjustment for health behaviours. For example, in the case of chronic conditions in general, differences between immigrants and non-immigrants were generally attenuated after further controlling for health behaviours (Table 1). However, the changes were modest and no significant differences disappeared.

In terms of specific chronic conditions, there were few sex-specific cases where significant differences between immigrants and Canadian-born respondents vanished with further adjustment for health behaviours. In terms of heart disease and diabetes among men and diabetes and high blood pressure among women, the health advantage of the most recent immigrants (living less than 10 years in Canada) over non-immigrants disappeared. However, in the case of diabetes in particular, it appears that the loss of statistical significance is at least in part due to lack of statistical power (diabetes results for men and women combined did not show a loss of significance).

Convergence of health

The specific chronic conditions analyzed here did not display a clear gradient of increasing adjusted odds ratios with time since immigration, as was the case with chronic conditions in general. This lack of gradient is illustrated well by the example of cancer among men; the odds ratios for reporting such a diagnosis

Table 2
Prevalence of and odds ratios for selected health behaviours and means for frequency of fruit and vegetable consumption index, by sex and years since immigration, household population aged 12 or older, Canada, 2000/01

Health behaviour by years since immigration	All respondents			Men			Women		
	Prevalence (%)†	Unadjusted odds ratio‡	Adjusted odds ratio§	Prevalence (%)†	Unadjusted odds ratio‡	Adjusted odds ratio§	Prevalence (%)†	Unadjusted odds ratio‡	Adjusted odds ratio§
Smoker									
All immigrants	16.6*	0.50*	0.50*	21.3*	0.63*	0.64*	12.0*	0.37*	0.36*
0-4 years	15.5*	0.46*	0.36*	21.1*	0.62*	0.52*	9.5*	0.28*	0.20*
5-9 years	15.6*	0.47*	0.38*	21.7*	0.65*	0.53*	9.7*	0.29*	0.23*
10-14 years	16.5*	0.50*	0.44*	23.2*	0.70*	0.66*	10.3*	0.31*	0.25*
15-19 years	20.1*	0.63*	0.60*	25.2	0.79	0.73*	15.1*	0.48*	0.47*
20-29 years	17.0*	0.52*	0.55*	23.1*	0.70*	0.75*	11.2*	0.34*	0.36*
30+ years	16.5*	0.50*	0.64*	18.5*	0.53*	0.67*	14.5*	0.46*	0.61*
Canadian-born‡‡	28.5	1.00	1.00	30.0	1.00	1.00	27.0	1.00	1.00
Overweight or obese									
All immigrants	42.5*	0.89*	0.77*	46.6*	0.81*	0.67*	38.1	0.99	0.86*
0-4 years	28.3*	0.48*	0.55*	33.1*	0.46*	0.52*	21.9*	0.45*	0.52*
5-9 years	27.2*	0.45*	0.51*	29.7*	0.39*	0.43*	24.5*	0.52*	0.59*
10-14 years	37.6*	0.73*	0.81*	41.8*	0.67*	0.74*	33.3	0.80*	0.87
15-19 years	42.0	0.88	0.81*	47.5	0.84	0.69*	36.2	0.91	0.90
20-29 years	45.9	1.03	0.86*	50.6	0.95	0.75*	41.0	1.11	0.97
30+ years	54.7*	1.46*	0.92	59.4*	1.36*	0.79*	49.9*	1.59*	1.04
Canadian-born‡‡	45.3	1.00	1.00	51.8	1.00	1.00	38.5	1.00	1.00
Heavy drinker									
All immigrants	1.5*	0.40*	0.44*	2.7*	0.40*	0.42*	0.3*E2	0.35*	0.36*
0-4 years	--F	0.11*	0.13*	--F	0.10*	0.11*	--F	0.17*	0.17*
5-9 years	--F	0.19*	0.21*	--F	0.19*	0.21*	--F	0.12*	0.12*
10-14 years	1.2*E2	0.31*	0.34*	2.2*E2	0.32*	0.36*	--F	0.17*§§	0.13*§§
15-19 years	1.5*E2	0.41*	0.38*	3.2*E2	0.47*	0.42*			
20-29 years	1.9*E1	0.51*	0.54*	3.7*E1	0.56*	0.58*	--F	0.17*	0.20*
30+ years	2.2*	0.59*	0.70*	3.7*	0.56*	0.62*	0.7E2	0.75	1.08
Canadian-born‡‡	3.7	1.00	1.00	6.5	1.00	1.00	1.0	1.00	1.00
Physically inactive									
All immigrants	60.8*	1.46*	1.33*	57.7*	1.51*	1.35*	63.7*	1.42*	1.32*
0-4 years	60.2*	1.42*	1.53*	57.1*	1.47*	1.53*	63.6*	1.41*	1.58*
5-9 years	63.8*	1.65*	1.67*	61.0*	1.72*	1.75*	66.3*	1.59*	1.61*
10-14 years	63.7*	1.64*	1.78*	61.0*	1.73*	1.84*	66.1*	1.58*	1.74*
15-19 years	65.0*	1.74*	1.81*	60.5*	1.69*	1.71*	69.1*	1.81*	1.95*
20-29 years	63.8*	1.65*	1.58*	64.8*	2.03*	1.93*	62.8*	1.36*	1.30*
30+ years	56.3*	1.21*	0.85*	51.2*	1.16*	0.80*	61.1*	1.27*	0.91
Canadian-born‡‡	51.6	1.00	1.00	47.5	1.00	1.00	55.3	1.00	1.00
	Unadjusted mean	Adjusted mean††		Unadjusted mean	Adjusted mean††		Unadjusted mean	Adjusted mean††	
Fruit and vegetable consumption index									
All immigrants	1.44*	1.21*		1.39*	1.13*		1.49*	1.24*	
0-4 years	1.42*	1.24*		1.40*	1.20*		1.45	1.25*	
5-9 years	1.42*	1.23*		1.38*	1.17*		1.45	1.24*	
10-14 years	1.40	1.19*		1.31	1.08*		1.49	1.25*	
15-19 years	1.42*	1.19*		1.39*	1.14*		1.44	1.18	
20-29 years	1.42*	1.17		1.34*	1.06		1.50*	1.22	
30+ years	1.49*	1.21*		1.44*	1.14*		1.54*	1.24*	
Canadian-born‡‡	1.38	1.14		1.30	1.03		1.46	1.20	

Data source: *2000/01 Canadian Community Health Survey*
† Prevalence estimates expressed as percentages. Estimates exclude records with missing data for the dependent variable.
‡ Unadjusted odds ratios.
§ Odds ratio, adjusted for age, education, and household income.
†† Mean adjusted for age, education, and household income.
‡‡ Reference category
§§ Categories "10-14 years" and "15-19 years" have been collapsed.
** Significantly different from reference category (p < 0.05).*
E1 Coefficient of variation between 16.6% and 25.0%.
E2 Coefficient of variation between 25.1% and 33.3%.
F Coefficient of variation greater than 33.3%, estimate suppressed.

What about place of origin?

Health differences observed among immigrant groups may be due in part to a cohort effect, which may, in turn, be partially due to differences in place of origin. In fact, patterns in place of origin of immigrants can vary drastically from year to year, which might reflect differences in both population health and the health care systems of their countries of birth. Immigrants with longer-term residence in Canada are more likely to be of European origin, whereas nearly half of all immigrants now coming to Canada originate from Asia. Variations in mortality rates have also been observed for different ethnic populations[16]. It would not be unreasonable, then, for differences in place of origin to partially explain differences in health profiles across immigrant groups defined by time since immigration to Canada.

Performing the analysis again, but restricting it to the immigrant community only, allowed for the exploration of place of origin as a potential explanation for the presence of selected chronic conditions, while also accounting for the various socio-demographic and lifestyle factors considered elsewhere in this study. With immigrants who moved to Canada 30 or more years ago as the reference group, the data predictably showed a gradient of increasing odds of reporting any chronic condition with length of residence in Canada (Appendix Table B), much as was previously observed in analyses of immigrants with non-immigrants as the reference group. Once age, education, household income, smoking, heavy drinking, overweight or obesity, physical inactivity, and fruit and vegetable consumption were accounted for, the differences between immigrant groups declined substantially. For example, compared with immigrants who had lived in Canada for 30 years or more, the odds ratio among recent arrivals for reporting any chronic condition changed from 0.17 before to 0.42 after adjustment. However, the gradient remained, with the four most recent immigrant groups displaying significantly lower odds of reporting some chronic conditions in general than immigrants with the longest residency in Canada.

Adjusting for place of origin in addition to the factors changed the odds ratios again, but not as dramatically. Furthermore, sex-specific changes in significance occurred in rare cases. The differences in odds of reporting chronic conditions in general between immigrant women who had been in Canada between 10 and 19 years and non-immigrant women changed from approximately 0.67 to 0.76, after accounting for place of origin. Likewise, the odds ratio for reporting high blood pressure among immigrant men with 20 to 29 years of residence in Canada dropped from 1.50 to 1.33 after a similar adjustment. In cases where there existed significant differences between the newest and earliest immigrant cohorts, place of origin did not explain these differences.

were actually lowest among men who had resided in Canada between 20 and 29 years. Perhaps this is partially because these conditions are relatively rare, compared with chronic diseases in general and especially rare among newer immigrants. In all cases, however, immigrants who had resided in Canada 30 years or more had similar adjusted odds of reporting these conditions to those of their Canadian-born counterparts.

Nonetheless, the convergence in health status between immigrants and non-immigrants for chronic conditions in general should be interpreted with caution. Cross-sectional data cannot indicate if the health status of immigrants is truly deteriorating with increasing length of residence in Canada (relative to non-immigrants). Some of the differences among immigrant sub-groups may result from a cohort effect, whereby, for example, immigrants who had been in Canada for less than 5 years in 2000/01 simply had a better health profile when they entered the country than did other immigrants at their respective times of arrival. Possible reasons for such differences might be evolving immigration criteria and increasing competition to enter the country.

Another potential explanation for convergence of health status between immigrants and non-immigrants, in terms of chronic conditions in general, is that, after some time spent living in Canada, the healthiest immigrants emigrate again, at rates higher than the emigration rate for the healthy Canadian-born population. Such emigration would leave a comparatively sicker immigrant population. Some evidence exists to support this hypothesis. A current study that focuses on immigrants who obtained landed immigrant status in the 1980s has discovered that the most highly skilled immigrants and their dependents are those most likely to emigrate,[17] and it is precisely this group that is healthiest.[14]

Concluding remarks

With adjustment for socio-demographic factors, the findings for chronic conditions in general revealed a remarkable gradient of worsening immigrant health with increasing time since immigration. Moreover, immigrants who had been in Canada the longest had outcomes similar to those of their Canadian-born counterparts. The results were not as consistent for specific chronic conditions, perhaps in part because such outcomes were rarer. Immigrants' patterns of health-related lifestyle behaviours varied with length of residence in Canada, but the results did not necessarily show that immigrants become more like other Canadians in this respect with increasing time

in Canada. After adjustment for socio-demographic differences, health behaviours did not generally explain differences in health between immigrant groups and the Canadian-born population.

The evidence that immigrants adopt poor health behaviours and that their health (as measured by the selected chronic conditions) worsens with increasing time in Canada is weak. A longitudinal analysis in which immigrant respondents are followed over a period of time is needed to shed further light on these patterns.

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Appendix

Table A
Distribution of selected characteristics, by sex, household population aged 12 or older, Canada, 2000/01

Variable	All respondents			Men			Women		
	Sample size	Estimated population ('000s)	%	Sample size	Estimated population ('000s)	%	Sample size	Estimated population ('000s)	%
Total	**131,535**	**25,801.7**	**100.0**	**60,849**	**12,705.4**	**100.0**	**70,686**	**13,096.3**	**100.0**
Years since immigration									
0-4 years	1,872	742.2	2.9	923	385.3	3.0	949	356.9	2.7
5-9 years	1,849	740.5	2.9	862	366.3	2.9	987	374.2	2.9
11-14 years	1,924	767.8	3.0	882	369.3	2.9	1,042	398.5	3.0
15-19 years	1,032	384.2	1.5	483	190.8	1.5	549	193.4	1.5
20-29 years	2,615	892.1	3.5	1,183	436.1	3.4	1,432	456.0	3.5
30+ years	7,609	1,755.5	6.8	3,509	870.5	6.9	4,100	885.0	6.8
Canadian-born	112,954	20,144.9	78.1	52,223	9,907.0	78.0	60,731	10,237.9	78.2
Missing	1,680	374.5	1.5	784	180.1	1.4	896	194.4	1.5
Education									
Less than secondary school graduation	44,571	7,551.8	29.3	21,159	3,760.7	29.6	23,412	3,791.1	28.9
Secondary school graduation	22,982	4,778.2	18.5	10,068	2,215.3	17.4	12,914	2,563.0	19.6
Some post-secondary education	9,859	2,108.5	8.2	4,338	1,013.7	8.0	5,521	1,094.8	8.4
Post-secondary degree	52,848	11,144.8	43.2	24,640	5,598.6	44.1	28,208	5,546.1	42.3
Missing	1,275	218.4	0.8	644	117.1	0.9	631	101.3	0.8
Household income									
Lowest	5,717	890.1	3.4	2,325	392.8	3.1	3,392	497.3	3.8
Lower-middle	12,117	1,778.3	6.9	3,875	669.7	5.3	8,242	1,108.6	8.5
Middle	28,829	5,141.6	19.9	12,521	2,386.1	18.8	16,308	2,755.5	21.0
Upper-middle	41,057	8,172.0	31.7	20,158	4,130.6	32.5	20,899	4,041.3	30.9
Highest	29,445	7,073.7	27.4	15,932	3,865.8	30.4	13,513	3,207.9	24.5
Missing	14,370	2,746.0	10.6	6,038	1,260.4	9.9	8,332	1,485.7	11.3
Chronic conditions									
Yes	87,573	16,468.2	63.8	36,929	7,421.9	58.4	50,644	9,046.3	69.1
No	43,727	9,291.6	36.0	23,789	5,258.4	41.4	19,938	4,033.2	30.8
Missing	235	42.0	0.2	131	25.2	0.2	104	16.8	0.1
Heart disease									
Yes	8,004	1,289.0	5.0	3,888	682.2	5.4	4,116	606.8	4.6
No	123,417	24,492.4	94.9	56,912	12,011.5	94.5	66,505	12,480.9	95.3
Missing	114	20.3	0.1	49	11.7	0.1	65	8.7	0.1
Diabetes									
Yes	6,361	1,063.7	4.1	3,104	556.8	4.4	3,257	506.9	3.9
No	125,087	24,719.2	95.8	57,707	12,138.2	95.5	67,380	12,581.0	96.1
Missing	87	18.8	0.1	38	10.3	0.1	49	8.5	0.1
High blood pressure									
Yes	19,371	3,257.2	12.6	7,764	1,443.3	11.4	11,607	1,813.9	13.9
No	111,916	22,497.7	87.2	52,944	11,233.0	88.4	58,972	11,264.6	86.0
Missing	248	46.9	0.2	141	29.1	0.2	107	17.8	0.1
Cancer									
Yes	2,713	450.3	1.7	1,192	211.3	1.7	1,521	239.0	1.8
No	128,720	25,335.2	98.2	59,613	12,485.3	98.3	69,107	12,849.8	98.1
Missing	102	16.2	0.1	44	8.8	0.1	58	7.5	0.1
Smoker									
Yes	35,844	6,677.9	25.9	17,823	3,562.6	28.0	18,021	3,115.2	23.8
No	95,339	19,052.5	73.8	42,810	9,094.4	71.6	52,529	9,958.2	76.0
Missing	352	71.3	0.3	216	48.4	0.4	136	22.9	0.2
Overweight or obese									
Yes	59,302	11,017.9	42.7	32,138	6,381.5	50.2	27,164	4,636.5	35.4
No	66,691	13,676.4	53.0	28,105	6,213.4	48.9	38,586	7,463.0	57.0
Missing	5,542	1,107.4	4.3	606	110.5	0.9	4,936	996.8	7.6
Heavy drinker									
Yes	4,103	815.7	3.2	3,463	706.4	5.6	640	109.3	0.8
No	125,472	24,617.6	95.4	56,147	11,759.6	92.6	69,325	12,858.1	98.2
Missing	1,960	368.4	1.4	1,239	239.4	1.9	721	129.0	1.0
Physically inactive									
Yes	64,413	12,661.7	49.1	26,784	5,611.5	44.2	37,629	7,050.2	53.8
No	58,645	11,000.2	42.6	28,214	5,685.8	44.8	30,431	5,314.3	40.6
Missing	8,477	2,139.8	8.3	5,851	1,408.0	11.1	2,626	731.8	5.6
Place of origin									
North America (excluding Canada)	1,642	301.2	1.2	683	136.4	1.1	959	164.8	1.3
South or Central America or Caribbean	1,309	588.8	2.3	571	264.3	2.1	738	324.5	2.5
Europe	9,333	2,337.9	9.1	4,308	1,156.0	9.1	5,025	1,181.9	9.0
Africa	746	289.2	1.1	383	163.7	1.3	363	125.5	1.0
Asia or Australia (including Oceania)	4,711	1,960.7	7.6	2,265	989.9	7.8	2,446	970.8	7.4
Canada	112,954	20,144.9	78.1	52,223	9,907.0	78.0	60,731	10,237.9	78.2
Missing	840	179.1	0.7	416	88.1	0.7	424	91.0	0.7

Data source: *2000/01 Canadian Community Health Survey*

Table B
Odds ratios for selected health outcomes, by sex and length of residence in Canada, immigrant household population aged 12 or older, Canada, 2000/01

Condition by years since immigration	All respondents			Men			Women		
	Unadjusted odds ratio†	Adjusted odds ratio‡	Adjusted odds ratio§	Unadjusted odds ratio†	Adjusted odds ratio‡	Adjusted odds ratio§	Unadjusted odds ratio†	Adjusted odds ratio‡	Adjusted odds ratio§
All chronic conditions									
0-4 years	0.17*	0.42*	0.45*	0.18*	0.42*	0.42*	0.15*	0.45*	0.49*
5-9 years	0.21*	0.50*	0.54*	0.24*	0.59*	0.60*	0.17*	0.43*	0.49*
10-14 years	0.29*	0.71*	0.78*	0.28*	0.77	0.79	0.28*	0.67*	0.76
15-19 years	0.34*	0.70*	0.76*	0.34*	0.74	0.75	0.33*	0.68*	0.76
20-29 years	0.52*	0.92	0.98	0.51*	0.95	0.95	0.53*	0.91	0.99
30+ years††	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heart disease									
0-9 years	0.15*	0.91	1.07	0.10*	0.65	0.70	0.21*	1.24	1.63
10-19 years	0.19*	0.61*	0.72	0.11*	0.42*	0.46*	0.29*	0.84	1.12
20-29 years	0.35*	0.84	0.99	0.39*	1.07	1.18	0.30*	0.65	0.82
30+ years††	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Diabetes									
0-9 years	0.15*	0.68	0.45*	0.15*	0.62	0.42*	0.15*	0.73	0.47
10-19 years	0.34*	1.02	0.67	0.28*	0.79	0.54	0.40*	1.29	0.82
20-29 years	0.65*	1.54*	1.05	0.62*	1.43	0.99	0.68*	1.63	1.10
30+ years††	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
High blood pressure									
0-9 years	0.17*	0.87	0.78	0.19*	0.88	0.79	0.15*	0.85	0.75
10-19 years	0.25*	0.96	0.85	0.25*	1.01	0.91	0.24*	0.90	0.78
20-29 years	0.49*	1.33*	1.20	0.59*	1.50*	1.33	0.42*	1.15	1.05
30+ years††	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cancer									
0-9 years	0.12*	0.40*	0.43*	0.17*	0.74	0.94	0.06*	0.20*	0.17*
10-19 years	0.20*	0.47*	0.53	0.24*	0.89	1.21	0.15*	0.19*	0.18*
20-29 years	0.19*	0.37*	0.42*	0.06*	0.14*	0.18*	0.33*	0.57	0.54
30+ years††	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Data source: *2000/01 Canadian Community Health Survey*
† Unadjusted odds ratios.
‡ Odds ratios adjusted for age, education, household income, smoking, heavy drinking, overweight or obesity, physical inactivity, and fruit and vegetable consumption.
§ Odds ratios adjusted for age, education, household income, smoking, heavy drinking, overweight or obesity, physical inactivity, fruit and vegetable consumption, and place of origin.
†† Reference category
** Significantly different from reference category ($p < 0.05$).*

Mental health of Canada's immigrants

- *Immigrants had lower rates of depression and alcohol dependence than the Canadian-born population. Among immigrants, those who arrived in Canada recently had the lowest rates. Long-term immigrants reported the same rates of depression as the Canadian-born.*
- *Immigrants from Asia had the lowest rates of depression, and those from Africa had the lowest rates of alcohol dependence.*
- *After adjustment for time since arrival, age, sex, marital status, income, and education, all immigrants except those who had arrived at least 30 years ago had lower rates of alcohol dependence than the Canadian-born population. Similarly, adjustment for social factors did not affect the patterns for depression. These demographic and socio-economic factors do not explain the "healthy immigrant effect".*
- *Proficiency in English or French, employment status, and sense of belonging were not related to immigrants' lower rates of depression and alcohol dependence.*

Abstract

Objectives

This paper compares immigrants with the Canadian-born population in terms of depression and alcohol dependence. It explores whether the "healthy immigrant effect" observed for physical health holds for mental health. Several sources of diversity among immigrants are also considered.

Data source

The data are from the 2000/01Canadian Community Health Survey, which collected information on health status and health care utilization from over 131,000 respondents aged 12 or older in all provinces and territories.

Analytical techniques

Age- and sex-adjusted prevalence rates of depression and alcohol in immigrants and the Canadian-born population were compared. Variation by length of residence in Canada and country of birth was examined. Multivariate logistic regression models were run separately for depression and alcohol dependence, with adjustment for age, sex, marital status, income, and education. The model was elaborated to consider language barriers, employment status, and sense of belonging.

Main results

Immigrants had lower rates of both depression and alcohol dependence than the Canadian-born population. This "healthy immigrant effect" was strongest among recent immigrants and among immigrants from Africa and Asia. These two trends are related, since recent immigrants have tended to come from Africa and Asia, whereas the majority of long-term immigrants came from Europe. Long term immigrants have similar rates of depression as the Canadian-born. The lower rates observed for immigrants were not due to demographic or socio-economic differences (age, sex, marital status, income, and education) between immigrants and the Canadian-born population. After adjustment for all of these factors, recent immigrants still had the lowest risk for both depression and alcohol dependence. Furthermore, language barriers, immigrants' higher unemployment rates, and their lower sense of belonging to the local community did not diminish the gap between immigrants and the Canadian-born population.

Key words

depression, major depressive episode, alcohol dependence, mental health, immigrants, epidemiology, community health

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According to the 2001 report of the World Health Organization (WHO),[1] mental disorders are a common and growing health problem worldwide, expected to affect more than 25% of all people at some time in their lives. The WHO's 2000 analysis of the global burden of disease ranked depression as the fourth leading cause of burden on society and also cited the high burden of alcohol dependence.[1] Canadian trends reflect these worldwide trends. In 1998/99, about 4% of Canadians reported symptoms indicating that they had suffered an episode of major depressive disorder in the previous year.[2] Besides biological and genetic causes, evidence suggests that social and environmental factors play an important role in mental health. The necessity of identifying groups at risk, as well as groups who are relatively healthy and who can serve as models for understanding how to minimize mental health problems, is thus more important now than ever.

Methods

Data sources

The data used in this paper are from the 2000/01 Canadian Community Health Survey (CCHS 2000/01). The CCHS collected information on various aspects of health and health care utilization from over 131,000 Canadians aged 12 or older in all provinces and territories. Because individual health regions had the option of not using the depression module of the survey, a total of 1,180 respondents from the two health regions that did not select this module are excluded from the analysis (see below). Respondents who are missing data for any of the questions used in the analysis are excluded. The sample size for analysis is 92,379 Canadians between ages 15 and 75. If respondents spoke neither English nor French, they were interviewed in their own language, and almost 5% of immigrants were interviewed in a language other than English or French. Twenty-three percent of these respondents had been in Canada for less than 5 years, and 55% had been in Canada for less than 10 years.

Analytical techniques

Rates of depression and alcohol dependence were standardized by age and sex. The proportions of the Canadian-born population and immigrants with depression and alcohol dependence were estimated and elaborated by duration of residence in Canada, and region of origin. Multivariate logistic regression analyses were run to predict the odds of having an episode of depression and alcohol dependence when other factors influencing depression and alcohol dependence were taken into consideration. The basic model included length of residence in Canada, age, age squared, sex, marital status, income, and education. This model was elaborated through three additional models that added knowledge of one of the official languages, employment status, and sense of belonging individually to the basic model. All analyses were weighted with a normalized weight.

Limitations

Two of the 136 health regions decided not to ask the questions on depression. This resulted in the omission from the analysis of the 1,180 respondents from those health regions. Individuals' lifetime history of depression was unknown. Consequently, respondents who had previously experienced a depressive episode but not within the past year were not identified. Previous research has suggested the existence of some cultural differences in the interpretation of mental health questions.[3] In addition, there may be cultural differences in willingness to report symptoms of depression or alcohol dependence.[3] The extent of these reporting biases is unknown.

Because the study was cross-sectional, it was not possible to directly examine the effect on depression or alcohol dependence on the process of immigration or adjustment to and integration into Canadian society. The situation for immigrants who have now been in Canada for a long period is not necessarily predictive of the process for immigrants arriving now. For such analyses, longitudinal data would be required. Another limitation is the possibility of additional variability among immigrants who entered in different categories (e.g., refugee, independent, investment, family reunion). Immigrants' mental health may also be affected by their settlement and integration experiences in Canada, including the location where they settle. However, these distinctions cannot be determined from the current survey data.

Relatively little is known about the mental health of Canadian immigrants, despite the fact that they represent about 16% of Canada's population and form an important part of Canada's social, cultural, and economic institutions. There are several reasons for examining the mental health of immigrants as a specific group. Canada relies on immigrants to meet labour needs. Because mental health problems compromise labour productivity,[4-6] it is useful to know how immigrants compare with the Canadian-born population in this respect. Immigrants undergo health screening that denies entry to those who would impose an excessive burden on the health care system. However, this screening excludes only the most severe cases. The mental health of immigrants living in Canada is unknown. Moreover, experiences in Canada may affect an immigrant's mental health. Studying immigrants is therefore important for identifying potential impact on the health care system, as well as for understanding how immigrants fare once they are living in Canada and how their level of mental health compares with that of the Canadian-born population.

Previous research examining physical health suggests that immigrants in Canada exhibit a "healthy immigrant effect." Across a range of indicators of physical health, immigrants appear healthier than the Canadian-born population and also use the health care system less.[7-9] This effect is attributed in part to Canada's immigration policy, which screens out immigrants who might impose a burden on the health care system or pose a danger to public health.

Canada's immigrant population

Canada's immigrants comprise about 16% of the Canadian population and come from diverse backgrounds. Nearly half of the country's immigrant population has lived here for more than 20 years.[10] The places of origin of immigrants have changed over time. Immigrants who arrived before 1971 were mostly from Europe. Since then, the proportion of immigrants from Europe has declined, while the proportion from Asia and other non-European areas has steadily increased. For example, between 1981 and 1991, 48% of immigrants came from Asia and the Middle East.[10] The shift has continued in the past 10 years, with increasing representation from Asia, the Middle East, and Africa. Between 1991 and 1996, the top 10 places of birth for new immigrants were Hong Kong, China, India, the Philippines, Sri Lanka, Poland, Taiwan, Vietnam, the United States, and the United Kingdom.[11]

However, the same research suggests that, with time in Canada, immigrants' physical health and use of the health care system begin to more closely resemble those of the Canadian-born population. This research has focused on physical health, and it is of interest to determine whether the healthy immigrant effect extends to mental health.

Mental health research suggests that the pattern may be different for depression and alcohol dependence than it is for physical health, and the assumption cannot be made that immigrants have better mental health than the Canadian-born population. Mental health problems are more prevalent among people experiencing more stress, as well as among socially and economically disadvantaged groups. Therefore, immigrants may experience mental health problems if they have stress associated with their immigration experience or if they feel marginalized or encounter discrimination.[9,12,13]

Mental health research in Canada has focused on specific segments of the immigrant population, such as refugees or recent immigrants from Southeast Asia. Some research, particularly that focusing on recent refugees, has found that immigrants experience elevated levels of depression, substance abuse, and other psychiatric disorders, at least in the period soon after immigration.[14] However, less is known about the mental health of immigrants as a whole or about how different cohorts of immigrants compare with each other and with the Canadian-born population.

At the same time, immigrants constitute a diverse group. Length of residence in Canada, country of origin, and social and economic position in Canada may all contribute to variations in immigrants' mental health, as they do for physical health.[7,9,15]

In addition, some of the sources of immigrant diversity - age, marital status, income, and education - are themselves determinants of mental health. Inclusion of these factors in the present investigation of immigrant mental health allows some of the variation within the immigrant population to be taken into consideration.

This article examines depression and alcohol dependence, and compares the Canadian-born population with immigrants for these aspects of mental health. It explores whether the healthy immigrant effect observed for physical health holds for mental health and whether length of residence in Canada and place of origin or ethnicity are related to variation in immigrants' mental health.

Depression and alcohol dependence lower among immigrants

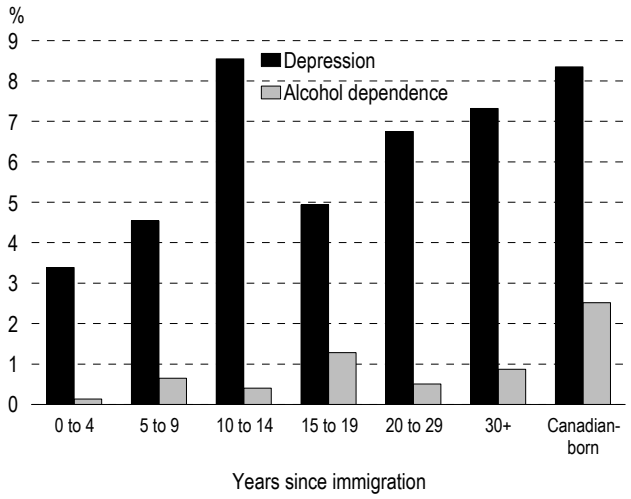
According to the Canadian Community Health Survey (CCHS, 2000/01), 7.9% of Canadians aged 12 or older reported symptoms suggesting that they had experienced at least one major depressive episode in the 12 months before the survey interview. The rate among those born in Canada was 8.3%, whereas the rate among immigrants was significantly lower, at 6.2% (Appendix Table A).

Immigrants also had lower rates of alcohol dependence than the Canadian-born population. Overall, 2.1% of Canadians reported symptoms suggesting that they had experienced problems with alcohol dependence in the 12 months before the interview. About 2.5% of the Canadian-born population but only 0.5% of immigrants reported such symptoms (Appendix Table A).

Lowest rates of depression and alcohol dependence among recent immigrants

Immigrants who had arrived in Canada in the previous few years had the lowest rates of both depression and alcohol dependence (Chart 1). Those who had arrived 10 to 14 years ago or more than 20 years ago were not significantly different from the Canadian-born population in depression. Longer-term immigrants reported slightly higher rates of alcohol dependence than recent immigrants (0 to 14 years), and but rates of alcohol dependence were significantly lower than the Canadian-born for all immigrants except those who had been in Canada 30 years or longer.

Chart 1
Depression and alcohol dependence, by length of residence in Canada



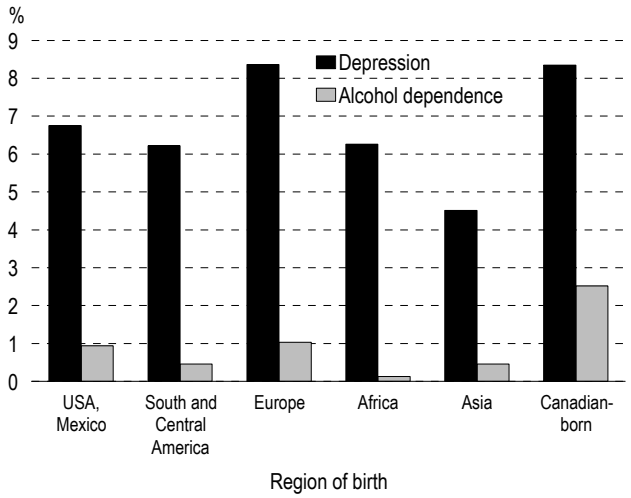
***Data source**: Canadian Community Health Survey, cycle 1.1, 2000/01*
***Note:** Rates are adjusted by age and sex to the Canadian-born group.*

Fewest problems with depression and alcohol for Asian and African immigrants

Immigrants from Asia reported far fewer depressive experiences in the previous 12 months than immigrants from any other region (Chart 2). Rates for immigrants from Africa, South and Central America and the Caribbean were also significantly lower than the Canadian-born average. Immigrants reported lower rates of alcohol dependence than the Canadian-born population, regardless of their region of birth. African immigrants reported the lowest rates of alcohol dependence.

Region of birth was associated with length of residence in Canada, since the places of origin of immigrants have changed through time. Asia was the birthplace of about 56% of the immigrants who had been in Canada for less than 10 years, whereas Europe was the birthplace for the majority of immigrants (77%) who had been in Canada for more than 30 years. Similarly, most European immigrants (59%) had been in Canada for more than 30 years.

Chart 2
Depression and alcohol dependence, by region of birth



***Data source**: Canadian Community Health Survey, cycle 1.1, 2000/01*
***Notes:** Oceania was omitted because the cell sizes were too small for accurate estimates.*
Rates are adjusted by age and sex to the Canadian-born group

Patterns of depression and alcohol dependence unaffected by demographic and socio-economic characteristics

Canada's immigrant population is highly variable, in terms of not only length of residence and region of birth, but also other factors associated with mental health. Social characteristics that have been demonstrated to influence mental health include age, sex, marital status, income, and education.[16] The lower rates of depression and alcohol dependence reported by immigrants might therefore reflect differences among immigrants in terms of these other social factors. To examine this possibility, multivariate logistic regression was performed to take account of length of residence in Canada, age, sex, marital status, income, and education. Table 1 presents the odds ratios for length of residence in Canada, which reveal

Table 1
Odds ratios of a depressive episode and alcohol dependence, by length of residence in Canada, with adjustment for age, sex, marital status, income, and education, age 15 to 75, Canada, 2000/01

	Depression		Alcohol dependence	
Length of residence	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Canadian-born (reference)	1.00		1.00	
0-4 years	0.33*	0.26, 0.41	0.05*	0.02, 0.12
5-9 years	0.45*	0.37, 0.54	0.27*	0.17, 0.41
10-14 years	0.90	0.78, 1.03	0.15*	0.09, 0.26
15-19 years	0.55*	0.43, 0.69	0.42*	0.25, 0.70
20-29 years	0.90	0.79, 1.03	0.33*	0.21, 0.52
30+ years	1.15	1.02, 1.28	0.74	0.50, 1.09

***Data source:** Canadian Community Health Survey, cycle 1.1, 2000/01*
***Note:** Variables included in the model but not presented are age, age squared, sex, marital status (married, previously married, never married), income, and education. Odds ratios for all variables are presented in Appendix Table B.*
** p < 0.01.*

how different cohorts of immigrants compare to the Canadian-born population when other factors are considered.

Compared with the Canadian-born population, the odds that immigrants experienced a depressive episode in the previous year were lower for recent cohorts but not for longer-term ones, with the exception of immigrants who arrived 15-19 years ago. For alcohol dependence, the all immigrants had significantly lower odds except immigrants who had resided in Canada for at least 30 years. These long-term immigrants reported alcohol dependence similar to the Canadian-born population once all other factors had been taken into consideration. The pattern shown in Chart 1, whereby more-recent immigrants had the lowest rates of depression and alcohol dependence, this advantage being less pronounced with increasing length of residence in Canada, was still evident. For the most recent immigrants (arrival up to 4 years previously) and those who had been in Canada for 5 to 9 years, the odds of having experienced a depressive episode were less than half the odds for the Canadian-born population. The immigrant advantage was more pronounced for alcohol dependence. Except for immigrants who had been in Canada for over 30 years, the odds of alcohol dependence for all cohorts were substantially lower than for the Canadian-born population. The risk of alcohol dependence for recent immigrants (0 to 4 years) was 95% lower than for the Canadian-born population. The odds increased with length of residence in Canada, but even immigrants who had been here for 20 to 29 years had a risk a third that of people born in Canada.

Immigrant advantage unaffected by language barriers

Immigrants who cannot speak either English or French may experience isolation in Canadian society that could cause higher rates of depression and alcohol dependence. To examine this possibility, a variable assessing whether a respondent could converse in either or neither of the official languages was added to the model shown in Table 1. Just over 7% of immigrants and less than 1% of the Canadian-born population reported speaking neither English nor French. The results (Appendix table C) reveal that inability to speak either official language did not increase the risk of depression or alcohol dependence among immigrants. In fact, when social characteristics are taken into consideration, respondents who could not speak either English or French reported the same rates of depression and alcohol dependence as those who could.

Immigrant advantage unaffected by employment status

Employment status is another factor that might account for some of the differences between immigrants and the Canadian-born population. Inclusion of employment status in the model shown in Table 1 did not change the risk of depression or alcohol dependence for immigrants relative to the Canadian-born population (Appendix table D). Although immigrants were less likely to have held a job during the week before the interview (Appendix Table A), and although being employed is associated with a lower risk of depression (Appendix table D), the odds of depression remained about the same as when employment status was not included for each cohort

Definitions

Major depressive episodes were assessed for the previous 12 months. *Depression* is characterized by a depressed mood or lack of interest in most things (or both), along with other symptoms, that lasts at least 2 weeks. Symptoms include appetite or sleep disturbance, decreased energy, difficulty concentrating, feelings of worthlessness, or suicidal thoughts, or any combination of these. Prevalence of depression is the percentage of the population that is estimated to have experienced a depressive episode at some time in the year before the survey interview. From this information, the probability of a depressive episode occurring was estimated. For this analysis, respondents were considered to have had a depressive episode if they had a probability of 0.90 or more (five or more symptoms).[17]

Alcohol dependence was also assessed for the previous 12 months. A respondent was classified as having experienced alcohol dependence if the estimated probability of dependence was 0.85 or more, which means that the respondent reported at least three of the following symptoms of alcohol dependence: being drunk or hungover while at work or school or while caring for children, engaging in risk-taking behaviour while drunk or hungover, having psychological problems related to alcohol use, experiencing a persistent desire for alcohol, drinking too much or for too long, or experiencing increased tolerance.[17]

Immigrants were defined as anyone who was born outside of Canada and was not born a Canadian citizen. This category includes landed immigrants, refugees, non-permanent residents, and naturalized Canadian citizens.

The *Canadian-born population* refers to people who are Canadian citizens by birth. Although most were born in Canada, a small number were born outside Canada to Canadian parents.

(defined by length of residence in Canada). Holding a job was not associated with alcohol dependence.

Immigrant advantage unaffected by sense of belonging

Immigrants reported a significantly lower sense of belonging to the local community than the Canadian-born population (Appendix table A). Perhaps immigrants with a lower sense of belonging to the local community experience a greater risk of mental health problems. When sense of belonging was added to the model shown in Table 1, it was determined that this factor was associated with lower risk of both depression and alcohol dependence (Appendix table E). However, the addition of sense of belonging to the model did not alter the lower risk for depression and alcohol dependence enjoyed by immigrants.

Concluding remarks

Overall, immigrants had lower rates of depression and alcohol dependence than the Canadian-born population. Among immigrants, time since arrival in Canada was associated with these two aspects of mental health. The gap between immigrants and the Canadian-born population was larger for more recent immigrants than for cohorts who had arrived earlier, and recent immigrants reported lower rates of depression and alcohol dependence than longer-term immigrants. Immigrants living in Canada for over 10 to 14 years and 20 years have the same rates of depression as the Canadian-born.

To take the diversity of immigrants into consideration, a number of factors were examined that are associated with mental health and on which immigrants might be expected to differ. Variation in mental health does exist among immigrants but this variation follows unexpected patterns. Immigrants reporting the fewest mental health problems were not from countries economically or culturally similar to Canada. Thus, the findings do not support the notion that recent immigrants who face a cultural adjustment process and non-European immigrants are more likely to suffer mental health problems. In fact, immigrants from Asia and Africa reported fewer problems than did European immigrants.

This pattern may reflect a selection effect, whereby the immigrants from non-European countries represent the most educated and wealthiest segment of their society. Regional differences may also reflect cultural or religious differences. For example, it may be that a higher proportion of immigrants from Africa and Asia than from other regions follow a religion that prohibits alcohol, such as Islam. If so, lower rates of alcohol dependence would be expected, at least to the extent to which people adhere to such religious prohibitions.

The lower rates of depression and alcohol dependence among immigrants held even when demographic and socio-economic factors were taken into consideration. Thus, the healthy immigrant effect does not merely reflect differences in income and education. Furthermore, these patterns held when ability to conduct a conversation in one of the official languages, employment status, and sense of belonging to the local community were considered.

There may be some cultural differences in willingness to report symptoms of depression or alcohol dependence that could account, at least in part, for the lower rates reported by immigrants. Likewise, despite the fact that respondents who could not understand English or French were interviewed in their own language, the possibility of misunderstanding or misinterpretation of the questions might also have affected the responses. However, given the magnitude of the differences between immigrants and the Canadian-born population, it is unlikely that these factors alone could account for the results observed.

These results are consistent with previous findings on physical health, which have shown that immigrants in Canada are in better physical health than the Canadian-born population. This analysis found a similar healthy immigrant effect for mental health, and, on the whole, immigrants reported fewer mental health problems than the Canadian-born population. The findings are inconsistent with some predictions from the mental health literature suggesting that immigrants represent a vulnerable population at risk for higher rates of depression and alcohol dependence.[18] This discrepancy may relate to the fact that the mental health literature has typically focused on specific subsets of individuals (such as refugees) who are more likely to have elevated rates of depression. Although it is clear that there are vulnerable sub-groups among immigrants, it appears that most immigrants, particularly recent immigrants, exhibit fewer mental health problems than the Canadian-born population. Whether this pattern reflects greater resiliency or a difference in how immigrants approach stress and adversity in their lives is a question that could be addressed in future research.

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Appendix

Table A
Distribution of selected characteristics, by immigration status, household population aged 15 to 75, Canada, 2000/01

	All respondents		Canadian-born population		Immigrants	
	Sample size	%	Sample size	%	Sample size	%
Depression						
No depression	85,064	92.08	67,607	91.65	17,457	93.80
Depression	7,315	7.92	6,161	8.35	1,153	6.20
Alcohol dependence						
No alcohol dependence	90,421	97.88	71,912	97.48	18,509	99.45
Alcohol dependence	1,958	2.12	1,857	2.52	101	0.55
Immigration status						
Canadian-born	73,769	79.85				
Immigrant	18,610	20.15				
Length of residence in Canada						
0-4 years					2,498	13.42
5-9 years					2,598	13.96
10-14 years					2,687	14.44
15-19 years					1,482	7.97
20-29 years					3,454	18.56
30+ years					5,891	31.66
Age group						
15-24	14,757	15.97	13,052	17.69	1,705	9.16
25-44	39,076	42.30	31,223	42.33	7,853	42.20
45-64	29,574	32.01	22,770	30.87	6,804	36.56
65+	8,972	9.71	6,724	9.11	2,248	12.08
Region of birth						
USA, Mexico					952	5.12
South America, Central America, Caribbean					2,273	12.22
Europe					7,749	41.64
Africa					1,139	6.12
Asia					6,314	33.93
Oceania					181	0.97
Sex						
Male	44,403	48.07	35,248	47.78	9,154	49.19
Female	47,977	51.93	38,521	52.22	9,456	50.81
Marital status						
Married†	58,422	63.24	45,351	61.48	13,071	70.23
Previously married	10,409	11.27	8,267	11.21	2,142	11.51
Never married	23,548	25.49	20,150	27.32	3,398	18.26
Education						
Less than secondary graduation	21,455	23.23	17,855	24.20	3,600	19.35
Secondary graduation	18,054	19.54	14,402	19.52	3,652	19.62
Some post-secondary	8,024	8.69	6,715	9.10	1,309	7.03
Post-secondary graduation	44,846	48.55	34,796	47.17	10,049	54.00
Household income						
Lowest	3,511	3.80	2,623	3.56	888	4.77
Lower-middle	6,526	7.06	4,846	6.57	1,680	9.03
Middle	19,467	21.07	14,813	20.08	4,654	25.01
Upper-middle	33,509	36.27	27,212	36.89	6,297	33.83
Highest	29,365	31.79	24,274	32.90	5,092	27.36
Work status (previous week)						
Worked at job or business/had a job but was absent	63,653	68.90	51,491	69.80	12,161	65.35
Did not hold a job/unable to work	28,726	31.10	22,278	30.20	6,449	34.65
Sense of belonging to local community	92,379	Mean = 2.58	73,769	Mean = 2.59	18,610	Mean = 2.55
Official language proficiency - conversation						
English and/or French spoken	90,643	98.12	73,364	99.45	17,279	92.85
Neither English nor French spoken	1,736	1.88	405	0.55	1,331	7.15
TOTAL	92,379		73,769		18,610	

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Note: *Weighted with normalized weight that sums to sample size.*
† Includes common-law and living with partner.

Definitions:

Depression (dependent variable): The Canadian Community Health Survey (CCHS) uses the same measure of depression as the National Population Health Survey (NPHS). Major depressive disorder in the past 12 months is assessed with the short form of the Composite International Diagnostic Interview (CIDI). These questions cover a cluster of symptoms for a depressive disorder, which are listed in the DSM-III-R (the psychiatric diagnostic manual of the American Psychiatric Association).[19] The results are transformed into probability estimates of a diagnosis, which are used as the basis for creating a dummy variable for probable cases. A probability of 90% or more (five or more symptoms) is coded as a probable depressive episode.

Alcohol dependence (dependent variable): The CCHS uses the same measure of alcohol dependence (in the past year) as the NPHS. As for depression, it is determined from the short form of the CIDI, which is based on the DSM-III-R.[19] A probability of 85% or more (three or more symptoms) is coded as a probable episode of alcohol dependence.

Immigrants: Anyone who was born outside of Canada. This category includes landed immigrants, refugees, non-permanent residents, and naturalized Canadian citizens.

Canadian-born: People who are Canadian citizens by birth. Although most were born in Canada, a small number were born outside Canada to Canadian parents.

Length of residence: For immigrants, years of residence in Canada, defined by the number of years since residence in Canada was first established. Assumes continuous residence in Canada between year first established and the present. Operationalized as dummy variables as follows: 0-4, 5-9, 10-14, 15-19, 20-29, 30+. The reference group in regression analyses is the Canadian-born population.

Region of birth: Canada, other North America, South America, Central America, Caribbean, Europe, Africa, Asia, Oceania (Oceania is omitted from presentation because of small numbers).

Controls:

Marital status: Married/common-law, widowed/separated/divorced, single, never married.

Household income: Household income before taxes, adjusted for family size. Lowest: 1-4 people - less than $10,000; 5 or more people, less than $15,000. Lower-middle: 1 or 2 people, $10,000 to $14,999; 3 or 4 people, $10,000 to $19,999; 5 or more people, $15,000 to $29,999. Middle: 1 or 2 people, $15,000 to $29,999; 3 or 4 people, $20,000 to $39,999; 5 or more people, $30,000 to $59,999. Upper-middle: 1 or 2 people, $30,000 to $59,999; 3 or 4 people, $40,000 to $79,999; 5 or more people, $60,000 to $79,999. Highest: 1 or 2 people, $60,000 or more, 3 or more people, $80,000 or more.

Education: Highest education acquired. Less than secondary graduation, secondary graduation (no post-secondary), some post-secondary, post-secondary graduation.

Sex: Male, female.

Age: Categorical variable (15-24, 25-44, 45-64, 65+) used for age- and gender-adjusted prevalences of depression and alcohol dependence; continuous variable used in logistic regression with squared term.

Employment status: Working status in the week prior to interview. Worked or held a job in the week before interview/had a job but was absent; did not hold a job/unable to work.

Language of conversation: Languages in which respondent can hold a conversation.

Sense of belonging: Response to the question "How would you describe your sense of belonging to your local community?" Responses coded in reverse, such that 1 = very weak, 2 = somewhat weak, 3 = somewhat strong, 4 = very strong.

Table B

Full model for Table 1: Odds ratios for a depressive episode and alcohol dependence, by selected characteristics, household population aged 15 to 75, Canada, 2000/01

	Depression		Alcohol dependence	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Length of residence in Canada				
Canadian-born (reference)	1.00		1.00	
0-4 years	0.33*	0.26, 0.41	0.05*	0.02, 0.12
5-9 years	0.45*	0.37, 0.54	0.27*	0.17, 0.41
10-14 years	0.90	0.78, 1.03	0.15*	0.09, 0.26
15-19 years	0.55*	0.43, 0.69	0.42*	0.25, 0.70
20-29 years	0.90	0.79, 1.03	0.33*	0.21, 0.52
30+ years	1.15	1.02, 1.28	0.74	0.50, 1.09
Age	1.10*	1.09, 1.11	1.09*	1.06, 1.12
Age^2	1.00*	1.00, 1.00	1.00*	1.00, 1.00
Sex				
Female (reference)	1.00		1.00	
Male	0.53*	0.50, 0.55	2.92*	2.63, 3.23
Marital status				
Married (reference)†	1.00		1.00	
Previously married	2.21*	2.06, 2.38	3.30*	2.78, 3.93
Never married	1.66*	1.55, 1.77	2.91*	2.55, 3.31
Household income				
Lowest	2.29*	2.05, 2.55	1.79*	1.47, 2.18
Lower-middle	1.93*	1.76, 2.12	1.48*	1.24, 1.76
Middle	1.47*	1.37, 1.58	1.01	0.88, 1.15
Upper-middle	1.21*	1.14, 1.30	0.88	0.78, 1.00
Highest (reference)	1.00		1.00	
Education				
Less than secondary graduation	1.25*	1.17, 1.34	1.17	1.02, 1.34
Secondary graduation	1.08	1.01, 1.16	1.32*	1.16, 1.50
Some post-secondary	1.21*	1.11, 1.31	1.97*	1.71, 2.26
Post-secondary graduation (reference)	1.00			
-2 log L	48,365		16,045	

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Notes: *† Includes common-law and living with partner.*
** $p < 0.01$.*

Table C

Full model for Table 1: Odds ratios for a depressive episode and alcohol dependence, by selected characteristics and knowledge of official language, household population aged 15 to 75, Canada, 2000/01

	Depression		Alcohol dependence	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Length of residence in Canada				
Canadian-born (reference)	1.00		1.00	
0-4 years	0.34*	0.27, 0.42	0.05*	0.02, 0.12
5-9 years	0.46*	0.38, 0.56	0.27*	0.18, 0.42
10-14 years	0.92	0.80, 1.06	0.15*	0.09, 0.27
15-19 years	0.56*	0.44, 0.70	0.42*	0.25, 0.71
20-29 years	0.91	0.80, 1.04	0.33*	0.21, 0.52
30+ years	1.15	1.03, 1.29	0.74	0.50, 1.09
Age	1.10*	1.09, 1.11	1.09*	1.06, 1.12
Age^2	1.00*	1.00, 1.00	1.00*	1.00, 1.00
Sex				
Female (reference)	1.00		1.00	
Male	0.53*	0.50, 0.55	2.92*	2.63, 3.23
Marital status				
Married (reference)†	1.00		1.00	
Previously married	2.21*	2.06, 2.37	3.30*	2.77, 3.93
Never married	1.65*	1.55, 1.77	2.90*	2.55, 3.30
Household income				
Lowest	2.29*	2.05, 2.56	1.80*	1.47, 2.19
Lower-middle	1.93*	1.76, 2.12	1.48*	1.24, 1.76
Middle	1.47*	1.37, 1.58	1.01	0.88, 1.15
Upper-middle	1.22*	1.14, 1.30	0.88	0.79, 0.99
Highest (reference)	1.00		1.00	
Education				
Less than secondary graduation	1.26*	1.18, 1.35	1.17	1.02, 1.34
Secondary graduation	1.09	1.02, 1.16	1.32*	1.16, 1.50
Some post-secondary	1.21*	1.11, 1.32	1.97*	1.71, 2.26
Post-secondary graduation (reference)	1.00			
Conversation in English or French				
Can converse in English or French (reference)	1.00		1.00	
Cannot converse in English or French	0.77	0.61, 0.96	0.56	0.29, 1.10
-2 log L	48,359		16,042	

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Notes: *† Includes common-law and living with partner.*
** $p < 0.01$.*

Table D

Full model for Table 1: Odds ratios for a depressive episode and alcohol dependence, by selected characteristics and employment status, household population aged 15 to 75, Canada, 2000/01

	Depression		Alcohol dependence	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Length of residence in Canada				
Canadian-born (reference)	1.00		1.00	
0-4 years	0.31*	0.25, 0.38	0.05*	0.02, 0.12
5-9 years	0.44*	0.36, 0.53	0.27*	0.17, 0.41
10-14 years	0.89	0.77, 1.02	0.15*	0.09, 0.26
15-19 years	0.54*	0.43, 0.69	0.42*	0.25, 0.70
20-29 years	0.91	0.80, 1.04	0.33*	0.21, 0.52
30+ years	1.15	1.03, 1.29	0.74	0.50, 1.09
Age	1.12*	1.11, 1.13	1.09*	1.06, 1.12
Age^2	1.00*	1.00, 1.00	1.00*	1.00, 1.00
Sex				
Female (reference)	1.00		1.00	
Male	0.54*	0.52, 0.57	2.92*	2.63, 3.23
Marital status				
Married (reference)†	1.00		1.00	
Previously married	2.27*	2.11, 2.43	3.30*	2.78, 3.93
Never married	1.68*	1.57, 1.80	2.91*	2.55, 3.31
Household income				
Lowest	1.93*	1.72, 2.17	1.80*	1.47, 2.20
Lower-middle	1.68*	1.53, 1.85	1.48*	1.24, 1.77
Midde	1.38*	1.29, 1.49	1.01	0.88, 1.15
Upper-middle	1.19*	1.11, 1.27	0.88	0.79, 0.99
Highest (reference)	1.00		1.00	
Education				
Less than secondary graduation	1.19*	1.11, 1.27	1.17	1.02, 1.35
Secondary graduation	1.07	1.00, 1.14	1.32*	1.16, 1.50
Some post-secondary	1.18*	1.08, 1.28	1.97*	1.72, 2.26
Post-secondary graduation (reference)	1.00		1.00	
Employment status (week before interview)				
Held a job	0.69*	0.65, 0.73	1.01	0.90, 1.13
Did not hold job (reference)	1.00			
-2 log L	48,217		16,045	

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Notes: *† Includes common-law and living with partner.*
** p < 0.01.*

Table E

Full model for Table 1: Odds ratios for a depressive episode and alcohol dependence, by selected characteristics and sense of belonging, household population aged 15 to 75, Canada, 2000/01

	Depression		Alcohol dependence	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Length of residence in Canada				
Canadian-born (reference)	1.00		1.00	
0-4 years	0.31*	0.25, 0.39	0.04*	0.02, 0.11
5-9 years	0.44*	0.37, 0.53	0.27*	0.18, 0.41
10-14 years	0.88	0.77, 1.01	0.15*	0.08, 0.26
15-19 years	0.55*	0.43, 0.69	0.42*	0.25, 0.70
20-29 years	0.89	0.78, 1.02	0.32*	0.20, 0.50
30+ years	1.15	1.03, 1.29	0.74	0.50, 1.09
Age	1.10*	1.08, 1.11	1.08*	1.05, 1.11
Age^2	1.00*	1.00, 1.00	1.00*	1.00, 1.00
Sex				
Female (reference)	1.00		1.00	
Male	0.53*	0.50, 0.55	2.92*	2.64, 3.24
Marital status				
Married (reference)†	1.00		1.00	
Previously married	2.14*	1.99, 2.30	3.15*	2.65, 3.76
Never married	1.61*	1.51, 1.73	2.80*	2.46, 3.18
Household income				
Lowest	2.22*	1.99, 2.48	1.72*	1.41, 2.10
Lower-middle	1.90*	1.73, 2.09	1.43*	1.20, 1.70
Middle	1.46*	1.36, 1.57	0.98	0.86, 1.12
Upper-middle	1.21*	1.13, 1.29	0.87	0.77, 0.97
Highest (reference)	1.00		1.00	
Education				
Less than secondary graduation	1.24*	1.16, 1.33	1.18	1.03, 1.35
Secondary graduation	1.07	1.00, 1.15	1.32*	1.16, 1.50
Some post-secondary	1.20*	1.11, 1.31	1.98*	1.73, 2.28
Post-secondary graduation (reference)	1.00			
Sense of belonging to local community	0.81*	0.79, 0.83	0.75*	0.72, 0.79
-2 log L	48,120		15,926	

Data source: *Canadian Community Health Survey, cycle 1.1, 2000/01*
Notes: *† Includes common-law and living with partner.*
** p < 0.01.*

Annex

Many analyses presented in this Health Reports Supplement are based on Statistics Canada's Canadian Community Health Survey (CCHS). Data collection for cycle 1.1 of the CCHS began in September 2000 and was conducted over 14 months. The CCHS covers the household population aged 12 or older in all provinces and territories, except persons living on Indian reserves, on Canadian Forces Bases, and in some remote areas.

Cycle 1.1 of CCHS was designed to collect information at the health region level.[1] For administrative purposes, each province is divided into health regions (HR); each territory is designated as a single HR. When cycle 1.1 of the CCHS was designed, there were 139 health regions in Canada. The CCHS combines data collection for the Burntwood and Churchill health regions in Manitoba because of Churchill's small population. There are two remote health regions for which the CCHS does not collect data: the Région du Nunavik and the Région des Terres-Cries-de-la-Baie-James, both in Québec.

The CCHS uses the area frame designed for the Labour Force Survey as its primary sampling frame. A multistage stratified cluster design was used to sample dwellings within the area frame. A list of the dwellings was prepared, and a sample of dwellings was selected from the list. The majority (83%) of the sampled households came from the area frame, and face-to-face interviews were held with respondents randomly selected from households in this frame. In some HRs, a random digit dialling (RDD) and/or list frame of telephone numbers was also used. Respondents in the telephone frames, who accounted for the remaining 17% of the targeted sample, were interviewed by telephone.

In approximately 82% of the households selected from the area frame, one person was randomly selected; two people were randomly chosen in the remaining households. For households selected from the telephone frames, one person was randomly chosen. The response rate was 84.7%. The responding sample size for cycle 1.1 was 131,535. A total of 6.3% of interviews were obtained by proxy.

References

1 Béland Y. Canadian Community Health Survey– Methodological overview. *Health Reports* (Statistics Canada, Catalogue 82-003) 2002; 13(3): 9-14.

Maps

Health Regions by Provinces and Territories

Newfoundland
1001 - Health and Community Services St. John's Region
1002 - Health and Community Services Eastern Region
1003 - Health and Community Services Central Region
1004 - Health and Community Services Western Region
1005 - Grenfell Regional Health Services Board
1006 - Health Labrador Corporation

Prince Edward Island
1101 - Urban Health Region
1102 - Rural Health Region

Nova Scotia
1201 - Zone 1
1202 - Zone 2
1203 - Zone 3
1204 - Zone 4
1205 - Zone 5
1206 - Zone 6

New Brunswick
1301 - Region 1
1302 - Region 2
1303 - Region 3
1304 - Region 4
1305 - Region 5
1306 - Region 6
1307 - Region 7

Quebec
2401 - Région du Bas-Saint-Laurent
2402 - Région du Saguenay - Lac-Saint-Jean
2403 - Région de Québec
2404 - Région de la Mauricie et Centre-du-Québec
2405 - Région de l'Estrie
2406 - Région de Montréal-Centre
2407 - Région de l'Outaouais
2408 - Région de l'Abitibi-Témiscamingue
2409 - Région de la Côte-Nord
2410 - Région du Nord-du-Québec
2411 - Région de la Gaspésie-Îles-de-la-Madeleine
2412 - Région de la Chaudière-Appalaches
2413 - Région de Laval
2414 - Région de Lanaudière
2415 - Région des Laurentides
2416 - Région de la Montérégie
2417 - Région du Nunavik
2418 - Région des Terres-Cries-de-la-Baie-James

Ontario
3526 - Algoma Public Health Unit
3527 - Brant Public Health Unit
3530 - Durham Public Health Unit
3531 - Elgin-St Thomas Public Health Unit
3533 - Bruce-Grey-Owen Sound Public Health Unit
3534 - Haldimand-Norfolk Public Health Unit
3535 - Haliburton-Kawartha-Pine Ridge Public Health Unit
3536 - Halton Public Health Unit
3537 - Hamilton Public Health Unit
3538 - Hastings and Prince Edward Public Health Unit
3539 - Huron Public Health Unit
3540 - Kent-Chatham Public Health Unit
3541 - Kingston-Frontenac-Lennox and Addington Public Health Unit
3542 - Lambton Public Health Unit
3543 - Leeds-Grenville-Lanark Public Health Unit
3544 - Middlesex-London Public Health Unit
3545 - Muskoka-Parry Sound Public Health Unit
3546 - Niagara Public Health Unit
3547 - North Bay Public Health Unit
3549 - Northwestern Public Health Unit
3551 - Ottawa Public Health Unit
3552 - Oxford Public Health Unit
3553 - Peel Public Health Unit
3554 - Perth Public Health Unit
3555 - Peterborough Public Health Unit
3556 - Porcupine Public Health Unit
3557 - Renfrew Public Health Unit
3558 - Eastern Ontario Public Health Unit
3560 - Simcoe Public Health Unit
3561 - Sudbury Public Health Unit
3562 - Thunder Bay Public Health Unit
3563 - Timiskaming Public Health Unit
3565 - Waterloo Public Health Unit
3566 - Wellington-Dufferin-Guelph Public Health Unit
3568 - Windsor-Essex Public Health Unit
3570 - York Public Health Unit
3595 - Toronto Public Health Unit

Manitoba
4610 - Winnipeg
4615 - Brandon
4620 - North Eastman
4625 - South Eastman
4630 - Interlake
4640 - Central
4650 - Marquette
4655 - South Westman
4660 - Parkland
4670 - Norman
4680 - Burntwood and Churchill

Saskatchewan
4701 - Weyburn Service Area
4702 - Moose Jaw Service Area
4703 - Swift Current Service Area
4704 - Regina Service Area
4705 - Yorkton Service Area
4706 - Saskatoon Service Area
4707 - Rosetown Service Area
4708 - Melfort Service Area
4709 - Prince Albert Service Area
4710 - North Battleford Service Area
4711 - Northern Health Services Branch

Alberta
4801 - Chinook Regional Health Authority
4802 - Palliser Health Authority
4803 - Headwaters Health Authority
4804 - Calgary Regional Health Authority
4805 - Health Authority #5
4806 - David Thompson Regional Health Authority
4807 - East Central Health Authority
4808 - WestView Regional Health Authority
4809 - Crossroads Regional Health Authority
4810 - Capital Health Authority
4811 - Aspen Regional Health Authority
4812 - Lakeland Regional Health Authority
4813 - Mistahia Regional Health Authority
4814 - Peace Regional Health Authority
4815 - Keeweetinok Lakes Regional Health Authority
4816 - Northern Lights Regional Health Authority
4817 - Northwestern Regional Health Authority

British Columbia
5901 - East Kootenay
5902 - West Kootenay-Boundary
5903 - North Okanagan
5904 - South Okanagan Similkameen
5905 - Thompson
5906 - Fraser Valley
5907 - South Fraser Valley
5908 - Simon Fraser
5909 - Coast Garibaldi
5910 - Central Vancouver Island
5911 - Upper Island/Central Coast
5912 - Cariboo
5913 - North West
5914 - Peace Liard
5915 - Northern Interior
5916 - Vancouver
5917 - Burnaby
5918 - North Shore
5919 - Richmond
5920 - Capital

Yukon Territory
6001 - Yukon Territory

Northwest Territories
6101 - Northwest Territories

Nunavut
6201 - Nunavut

Health Regions by Peer Groups

Peer Group A
2406 - Région de Montréal-Centre
3595 - Toronto Public Health Unit
5916 - Vancouver
5917 - Burnaby
5919 - Richmond

Peer Group B
3551 - Ottawa Public Health Unit
3553 - Peel Public Health Unit
3570 - York Public Health Unit
4804 - Calgary Regional Health Authority
4810 - Capital Health Authority
5907 - South Fraser Valley
5908 - Simon Fraser
5918 - North Shore

Peer Group C
2417 - Région du Nunavik
2418 - Région des Terres-Cries-de-la-Baie-James
4680 - Burntwood and Churchill
4711 - Northern Health Services Branch
6201 - Nunavut

Peer Group D
1004 - Health and Community Services Western Region
1002 - Health and Community Services Eastern Region
1003 - Health and Community Services Central Region
1005 - Grenfell Regional Health Services Board
1205 - Zone 5
1305 - Region 5
1306 - Region 6
1307 - Region 7
2411 - Région de la Gaspésie-Îles-de-la-Madeleine

Peer Group E
1102 - Rural Health Region
1201 - Zone 1
1202 - Zone 2
3545 - Muskoka-Parry Sound Public Health Unit
3563 - Timiskaming Public Health Unit
4650 - Marquette
4655 - South Westman
4660 - Parkland
4702 - Moose Jaw Service Area
4705 – Yorkton Service Area
4708 – Melfort Service Area
4709 - Prince Albert Service Area
4710 - North Battleford Service Area

Peer Group F
1006 - Health Labrador Corporation
2410 - Région du Nord-du-Québec
4670 - Norman
4813 - Mistahia Regional Health Authority
4815 - Keeweetinok Lakes Regional Health Authority
4816 - Northern Lights Regional Health Authority
4817 - Northwestern Regional Health Authority
5912 - Cariboo
5913 - North West
5914 - Peace Liard
5915 - Northern Interior
6001 - Yukon Territory
6101 - Northwest Territories

Peer Group G
3539 - Huron Public Health Unit
3549 - Northwestern Public Health Unit
3554 - Perth Public Health Unit
3557 - Renfrew Public Health Unit
4620 - North Eastman
4625 - South Eastman
4630 - Interlake
4640 - Central
4701 - Weyburn Service Area
4703 - Swift Current Service Area
4707 - Rosetown Service Area
4801 - Chinook Regional Health Authority
4802 - Palliser Health Authority
4805 - Health Authority #5
4806 - David Thompson Regional Health Authority
4807 - East Central Health Authority
4809 - Crossroads Regional Health Authority
4811 - Aspen Regional Health Authority
4812 - Lakeland Regional Health Authority
4814 - Peace Regional Health Authority
5901 - East Kootenay

Peer Group H
1001 - Health and Community Services St. John's Region
1203 - Zone 3
1204 - Zone 4
1302 - Region 2
1304 - Region 4
2401 - Région du Bas-Saint-Laurent
2402 - Région du Saguenay - Lac-Saint-Jean
2403 - Région de Québec
2404 - Région de la Mauricie et Centre-du-Québec
2405 - Région de l'Estrie
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2415 - Région des Laurentides
2416 - Région de la Montérégie
3526 - Algoma Public Health Unit
3537 - Hamilton Public Health Unit
3547 - North Bay Public Health Unit
3556 - Porcupine Public Health Unit
3561 - Sudbury Public Health Unit
4610 - Winnipeg

Peer Group I
1101 - Urban Health Region
1206 - Zone 6
1301 - Region 1
1303 - Region 3
2413 - Région de Laval
2414 - Région de Lanaudière
3527 - Brant Public Health Unit
3531 - Elgin-St Thomas Public Health Unit
3533 - Bruce-Grey-Owen Sound Public Health Unit
3534 - Haldimand-Norfolk Public Health Unit
3535 - Haliburton-Kawartha-Pine Ridge Public Health Unit
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4704 - Regina Service Area
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5904 - South Okanagan Similkameen
5905 - Thompson
5906 - Fraser Valley
5910 - Central Vancouver Island
5920 - Capital

Peer Group J
3530 - Durham Public Health Unit
3536 - Halton Public Health Unit
3560 - Simcoe Public Health Unit
3566 - Wellington-Dufferin-Guelph Public Health Unit
4803 - Headwaters Health Authority
4808 - WestView Regional Health Authority
5909 - Coast Garibaldi
5911 - Upper Island/Central Coast