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Health Reports

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How healthy are Canadians?

A SPECIAL ISSUE

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Health Statistics Division

Health Reports

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- -	amount too small to be expressed
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Health Reports - Special Issue

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Canadians are extremely interested in health. Personal health status, the health of family and friends, and the ability of the health care system to respond to one's needs are all important aspects of this interest. Compared with most countries of the world, we have much about which we can feel proud. But we have by no means achieved all that is possible in health status or the quality of the health care system.

Statistics Canada and the Canadian Institute for Health Information (CIHI) are reporting jointly on the health of the population and the performance of the health care system in order to provide information and background so Canadians and decision-makers in the health system can better judge the factors and complex decisions that contribute to improvements in health. This report focuses on the health status of Canadians and the factors that determine or affect our health. Its companion report, to be published in late April 2000, 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.

Health and health care are enormously complex. Added to this complexity is the growing recognition that the determinants of health—genetics, the physical environment, the socioeconomic environment, early childhood experiences, etc.—influence overall population health status and, in some cases, the effectiveness of health care. The health status of the population changes slowly. Improvements in prevention, nutrition and physical activity or reductions in smoking are reflected in the population's health only years later.

Health status is not evenly distributed. With each step up the socioeconomic 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.

About this report

This report and the companion report to be released by the Canadian Institute for Health Information are the first in a series that will provide up-to-date information on the health of Canadians in all regions of the country: on how differences in health status are related to the various determinants of health, and on how the health care system affects health. The data to support this process are drawn from many sources. Statistics Canada generates much of the information on health status and the non-medical determinants of health. The Canadian Institute for Health Information compiles much of the information on resources and performance of the health care system.

Health is perceived by individuals in many different ways. 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. It may be physical, mental or social.

The measures of the health of Canadians presented in this report are based primarily on a new source, namely the 1998/99 cycle of the National Population Health Survey, and on new analyses available since the preparation of *Toward a Healthy Future: Report on the Health of Canadians, Second Report on the Health of Canadians* and its companion statistical report by the Federal, Provincial and Territorial Advisory Committee on Population Health in September 1999.

This report shows great progress through increased life expectancy, reduced infant mortality, and increased quality of life in middle age and the older years. Although Canadians with low levels of income and education may have equal access to medically necessary health services, they may not have equal access to good health. Depression among young women, and heavier drinking among young men, and increases in diabetes among men and in asthma and migraine headaches among women in middle age are causes of concern.

Generally, this special issue of *Health Reports* begins by looking at new information related to the *health status* of Canadians of all ages, and particularly among children, middle-aged adults and older adults. It then examines three important *determinants of health*: income inequality and mortality among the working-age population, personal health practices (especially among young people) and health care services. More specifically, the report looks at the following.

Life expectancy is widely used as one of the indicators of the health status of a population. Although life expectancy is continuing to increase in Canada, there are inequalities in life expectancy across Canada's 136 health regions. Differences in mortality rates for major causes of death, geographical location, and socioeconomic and demographic characteristics are examined for their association with high or low life expectancy.

Over the past century and even in the past two decades, infant mortality has declined dramatically in Canada. There remain, however, income-related disparities in both infant mortality and low birth weight. Most children in Canada are in good health, but there is a strong relationship of perceived health status with socioeconomic status as defined by the education level of parents.

Those in mid-life are generally enjoying improved health when compared with their counterparts of 20 years ago, despite increases in the prevalence of asthma, diabetes for men and migraine headaches for women. While the proportion of adults who report poorer health increases with age, there are changes in health, both improvements and declines, for adults of all ages. The association of these changes with illness and disability as well as socioeconomic factors and healthy behaviours is presented.

The decline in health with advancing age is not uniform. Factors such as mortality, institutionalization, and changes in functional status are examined for their association with the health of older adults. The analyses provide support for the theory of compression of morbidity; that is, a

shortening of the period between the onset of illness and the end of life, when overall life expectancy is increasing.

Depression is a burden on those who suffer from it and on those whose lives are affected by it. Differences between men and women in the prevalence and incidence of depression as well as in several factors that are predictive of future depressive episodes are troubling.

The relationship between health and socioeconomic status is complex. Indeed, when examining the distribution of income at varying geographic levels, the strong relationship between income inequality and mortality in the United States is not found to hold in Canada.

For teens and young adults, decisions about personal health practices, whether positive or negative, influence their current and future health. Young adults, both male and female, have demonstrated increases in moderate leisure-time physical activity. On the other hand, the higher rate of smoking of teenage girls compared with boys and recent increases in heavier drinking by teenage and young adult males are causes for concern.

In Canada, the universal medical care system has ensured equitable access to insured services, but not necessarily good health. Differences exist in utilization of such services, with more usage by those with lower socioeconomic status. In addition, significant inequities exist in access to uninsured health services (for example, for dental care or prescription drugs). The likelihood of going to hospital is related to socioeconomic status, to specific personal health practices and to certain chronic conditions.

Limitations of this report

This report is based on specific data and analyses related to health status and the determinants of health. It is not intended to provide a comprehensive overview of health status and all of the determinants of health, but rather to report on new information.

Sources and basic definitions are contained within the text of each article. The Annex contains information on the National Population Health Survey, a primary source for much of the data and analyses contained in this report.

About Statistics Canada

Statistics Canada is authorized under the Statistics Act to collect, compile, analyze, abstract, and publish statistics related to the health and well-being 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.

About the Canadian Institute for Health Information

Created in 1994 by Canada's health ministers, CIHI is the national, not-for-profit organization responsible for coordinating the development and maintenance of the country's health information system. To this end, CIHI provides accurate and timely information that is needed to establish sound health policies, manage the Canadian health system effectively and create public awareness of the factors affecting good health.

About Health Reports

Health Reports is a 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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Life expectancy

Highlights

- Life expectancy in Canada is excellent—among the highest in the world.
- Over 90% of Canada's 136 health regions, comprising about 99% of the total population, have life expectancy values within 2.8 years of the overall Canada value.
- The health regions with the lowest life expectancies tend to be in remote regions or northern parts of certain provinces and have significant Aboriginal populations. The lower life expectancies are not associated with any one specific cause; rather, the mortality rates in these regions are higher for most causes of death.
- Mortality patterns are similar for men and women in the low life expectancy health regions.
- Most health regions with higher life expectancy are in and west of Ontario. Mortality rates are generally at least 10% lower for all causes than the Canadian average.
- Consistent with other measures of the health of the population, there is an association with socioeconomic factors: life expectancy increases as the rate of unemployment decreases and the level of education increases.

Life expectancy is a widely used indicator of the health of a population, with a long time series of data being available. This article focuses on life expectancy as a starting point in the discussion of the health of Canadians, while the articles that follow delve into the quality of the population's health.

Analysis of mortality data for the populations of Canada's 136 health regions (see *Definitions* and *Maps*) reveals some disparities in life expectancy. Life expectancy is generally lower in remote regions or northern parts of certain provinces; many of these regions have significant proportions of Aboriginal peoples. Health regions with high life expectancy are generally found in southern urban areas in or west of Ontario.

This article examines life expectancy and focuses on health regions with the lowest and highest life expectancy in the country (see Appendix Table A). For regions with the lowest life expectancy, mortality rates for major causes of death are compared with the national average, noting important differences for Aboriginal and non-Aboriginal populations, as well as for men and women. Other factors that are associated with (but not necessarily the cause of) high and low life expectancy, such as rate of unemployment and level of education attained, are also explored.

Highs and lows in life expectancy

In 1996, life expectancy at birth for Canada as a whole was 78.6 years (see *Definitions*). Compared with other developed countries that are members of the Organisation for Economic Co-operation and Development (OECD), Canada ranks third in life expectancy, behind Switzerland and Japan.[2]

Of the 136 health regions in Canada, the vast majority (over 90%) of regions, constituting almost 99% of the total population, had life expectancy

Methods

Data source

This article is based on data from: Statistics Canada, Health Statistics Division, Vital Statistics 1995 to 1997; Statistics Canada, 1996 Census (special tabulations); and Statistics Canada, Demography Division, adjusted 1996 Census population calculated for census subdivisions.

Analytical techniques

Calculation of life expectancy: The program used to calculate life expectancy for this report was based on Chiang's method for abridged life tables.[1] Abridged life tables use five-year age groupings of both population and mortality rate inputs (as opposed to single-year age breakdown). Since there is more variability in the number of events by age in smaller geographic areas and/or areas with small populations, abridged life tables are more suitable for the adaptation to a sub-provincial (health region) level. Chiang's method was chosen because it was relatively straightforward to adapt to the health region level methodology and included a standard error calculation (in this case, addressing the variability of the number of deaths in a given health region from one year to the next).

To determine data ranges shown on the life expectancy maps, a formula called the Jenks' optimization, which is available in MapInfo (a mapping software), was used to identify natural breakpoints in the data values, and was calculated separately for males, females, and both sexes combined. Jenks' method minimizes the sum of the variance within each of the ranges. This option is good at revealing underlying groupings and patterns in the data. While five natural breakpoints were originally calculated, the three middle ranges were collapsed to draw particular attention to those regions with low and high life expectancy.

Mortality data: The mortality data used in the calculation of life expectancy were the 1995, 1996 and 1997 data years linked to health region geography (see note on health region boundaries and data linkage). The same three years of mortality data linked to health region were averaged to create an artificial single year that was then age-standardized using the direct method to produce rates for selected causes of death referred to in this analysis.

Population data: To calculate life expectancy and to produce mortality rates for specific causes of death in the analysis, 1996 Census population counts were used, adjusted for net undercoverage and including population estimates for incompletely enumerated Indian reserves. These data were provided by Demography Division at the census subdivision (CSD) level and subsequently linked to health regions by Health Statistics Division.

Health region boundaries and data linkage: Health region level data were produced through a geo-coding process using correspondence files developed with input from each provincial health ministry, BCStats, and Alberta Treasury. The link between enumeration areas and health regions was first created to provide the best resolution to census geography, and a census subdivision link to health regions was derived from this file (see *Definitions*).

The enumeration area (EA) level correspondence was used to geo-code 1996 mortality data because these records are already linked to EA codes (assigned via postal code of usual residence). The 1995 and 1997 mortality data were geo-coded to health region using the CSD level correspondence (CSD codes are assigned using place name of usual residence). This latter approach is as effective as the EA link for most health regions across Canada, although it is slightly less accurate in the western provinces, where health regions do not always match CSD boundaries. In the few cases where there are boundary differences, only relatively small populations are affected. In terms of health region population counts, CSD level data were used in order to include the post-censal adjustments for 1996 Census under-coverage.

Limitations

In regions where population size is small, there is a greater chance of fluctuations in mortality between years. As such, both mortality rates and life expectancy (which is based on mortality) in these regions can exhibit high variability. Results from these regions should be viewed with caution. Regions with life expectancy values that have an error range equal to or higher than +/- 1.6 years are noted with caution on the accompanying maps. Mortality rates in Région du Nunavik, which has one of the smallest population sizes of all health regions, are noted in the text as requiring cautionary viewing.

values within 2.8 years of the overall Canada value. However, regional disparities were revealed when comparing those regions falling well below (three or more years) and above (at least one year) the Canadian average.

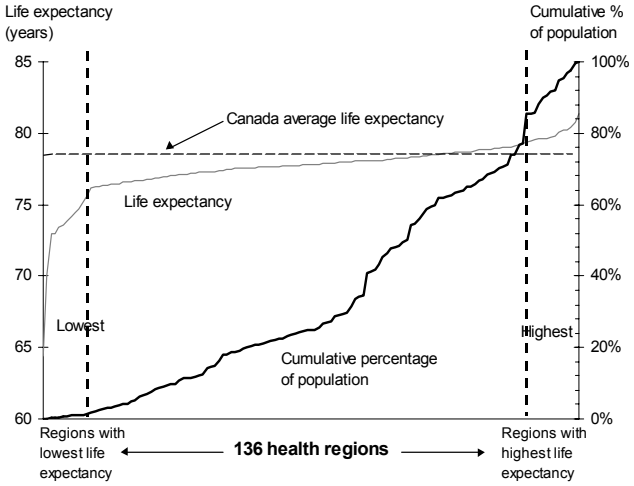
To determine the range of life expectancy values referred to as "low" and "high" in this report, natural breakpoints (using Jenks' optimization; see *Methods*) were used to classify and group the lowest and highest values of the data series.

Low life expectancy health regions represent only a small fraction of the population (less than 1.5%), but they were identified because they have life expectancy values that are at least three years lower than the overall Canada value, along with mortality rates that are cause for concern (Chart 1). On the other hand, while there are only a small number of regions with high life expectancy, they represent a relatively large proportion of the total population (over 14.5%). They are discussed within the context of their socioeconomic characteristics, since their mortality rates are generally lower.

In 12 health regions, people are not expected to live for more than 75.7 years; these results are roughly equivalent to both the life expectancy for Mexico in 1996[2] and for Canadians 25 years ago.[3] These health regions are located in remote or northern parts of the country, and tend to have significant proportions of Aboriginal peoples. On the other hand, in 13 health regions, people are expected to live at least 79.5 years. These health regions are mostly southern urban communities with populations between 46,000 and 850,000, located in and west of Ontario.

These regional disparities also occur when one compares life expectancy for men and women. For Canada as a whole in 1996, life expectancy at birth was 75.7 years for men and 81.4 years for women.[4] However, in health regions with low life expectancy for men or women, males are not expected to live for more than 73.0 years and females, not more than 78.0 years—values similar to those of males and females 15 years ago. In contrast, in health regions with high life expectancy for men or women, males are expected to live for more than 76.5 years and females, more than 82.3 years.

Chart 1
Life expectancy at birth and cumulative percentage of population health regions, 1996



Data sources: *Canadian Vital Statistics Data Base; Demography Division*

Health regions with lowest life expectancy: mortality rates

The 12 health regions with the lowest life expectancy (less than 75.7 years at birth, males and females combined) are: the Yukon Territory, Nunavut, and some of the northern regions of Québec, Ontario, Manitoba and Saskatchewan (Table 1). Aboriginal peoples make up 20% of the population in at least nine of these health regions. In fact, almost half (48%) of the total population (280,166) of these nine regions is Aboriginal. The patterns of mortality rates for both sexes combined are similar to the rates for males and females separately. Further elaboration of male or female mortality rates are made where notable differences were found.

Mortality rates in these 12 regions are higher than the Canadian rate for most causes of death, and particularly for selected chronic diseases, infant mortality, unintentional injury and suicide. However, there are noteworthy differences between regions with predominantly Inuit populations and those with predominantly non-Inuit Aboriginal populations.

Table 1
Health regions with low life expectancy at birth, by Aboriginal share of population and leading causes of death, 1996

		Diseases of the circulatory system			Cancer				
	Infant mortality	Total	Cerebro-vascular disease	Ischaemic heart disease	Total	Lung cancer	Diseases of respiratory system	Unintentional injury	Suicide
More than 20% Aboriginal									
Health Labrador Corporation, Newfoundland	XXX	X	XX	X	X	XX	XXX	XXX	XX
Région des Terres-Cries-de-la-Baie-James, Québec	XXX		X			XX	XXX	XXX	
Northwestern PHU, Ontario	XX	X	X	X	X	X		XXX	XXX
Norman, Manitoba		X	XX		X	X	XXX	XXX	XX
Burntwood/Churchill, Manitoba	XX	XX	XX	X		X	XX	XXX	
Northern HSB, Saskatchewan	XX	X		X	X	X	XX	XXX	XXX
Yukon	X	X			X	XX	X	XXX	XX
Nunavut	XXX				XX	XXX	XXX	XXX	XXX
Région du Nunavik, Québec†	XXX	XX	XXX		X	XXX	XXX	XXX	XXX
Less than 20% Aboriginal									
Timiskaming PHU, Ontario		X	X	X	X	X	X	XX	
Peace RHA, Alberta	XX	X		X	X		X	XXX	XX
Northern Lights RHA, Alberta		XX	XX	XX	X	XX	XX	XXX	X

Data sources: *Canadian Vital Statistics Data Base; Demography Division*
Note: *Mortality rates (except infant mortality) age-standardized to 1991 Canadian population*
X Mortality rate 1.1 to 1.4 times higher than national rate
XX Mortality rate 1.5 to 1.9 times higher than national rate
XXX Mortality rate at least 2.0 times higher than national rate
† High variability due to small population and small number of deaths

Comparison of mortality rates among Aboriginal-populated low life expectancy health regions

Of the nine health regions with low life expectancy and more than 20% Aboriginal population, two regions—Région du Nunavik and Nunavut—have predominantly Inuit populations. In the remaining seven regions, the Aboriginal populations are predominantly non-Inuit. While the rates of death due to most causes are often higher than the average Canadian rates in the seven regions with non-Inuit Aboriginal populations, the rates are frequently highest in the two regions with Inuit populations. (The mortality rates for Région du Nunavik should be interpreted with caution because of the small population and small number of deaths.)

Death due to disease

Circulatory disease, cancer and respiratory disease are major causes of death in Canada. Mortality due to circulatory disease was 1.1 to 1.5 times the Canadian rate in six of the health regions with non-Inuit Aboriginal populations, while it was 1.7 times the Canadian rate in Région du Nunavik. Similarly, mortality due to cancer was 1.1 to 1.3 times the Canadian rate in five of the regions with non-Inuit Aboriginal populations, while it was 1.4 and 1.8 times the Canadian rate in Région du Nunavik and Nunavut, respectively. The rates of death due to lung cancer, while higher than the Canadian rate in all of the regions with non-Inuit Aboriginal populations, were also highest in the regions with Inuit populations. Likewise, mortality due to

respiratory disease was 1.3 to 2.5 times the Canadian rate in six of the regions with non-Inuit Aboriginal populations, while it was over 3.5 times the Canadian rate in Région du Nunavik and Nunavut.

Other causes of death

High infant mortality contributes to low life expectancy at birth. In health regions with low life expectancy and more than 20% non-Inuit Aboriginal population, the infant mortality rates were 1.3 to 2.8 times the Canadian rate. The infant mortality rates in Région du Nunavik and Nunavut were over 3.1 times the Canadian rate.

Unintentional injuries are a main cause of death among Aboriginal peoples. For Aboriginal infants, the rate of death due to injury is almost four times the Canadian rate; for preschoolers, it is five times higher; and among teenagers, it is three times higher.[5] These patterns are reflected in rates of death due to injury in health regions with low life expectancy and more than 20% Aboriginal population. In all nine Aboriginal-populated health regions with low life expectancy at birth, the unintentional injury death rates were over two times the Canadian rate.

Suicide is also a major cause of death among Aboriginal peoples and people living in northern

Table 2
Health regions with low male life expectancy at birth, by Aboriginal share of population and leading causes of death, 1996

		Diseases of the circulatory system			Cancer				
	Infant mortality	Total	Cerebro-vascular disease	Ischaemic heart disease	Total	Lung cancer	Diseases of respiratory system	Unintentional injury	Suicide
More than 20% Aboriginal									
Health Labrador Corporation, Newfoundland	XXX	X	XX	X	X	X	XXX	XXX	XX
Northwestern PHU, Ontario	XX	X		X	X	X		XXX	XXX
Norman, Manitoba		X	XX				XX	XXX	XX
Burntwood/Churchill, Manitoba	XXX	X	XX				X	XXX	
Northern HSB, Saskatchewan	X	X					XX	XXX	XXX
Yukon	XX	X					XX	XXX	XXX
Nunavut	XXX				X		XX	XXX	XXX
Région du Nunavik, Québec†	XXX	XX	XXX		X	XX	XXX	XXX	XXX
Less than 20% Aboriginal									
Region 4, New Brunswick	XX		X		X	XX		XXX	XXX
Région de la Côte-Nord, Québec	XX				X	XX		XXX	XXX
Timiskaming PHU, Ontario		X	XX			X		XX	
Peace RHA, Alberta	XX	X		X	X	X	XX	XXX	XXX
Northern Lights RHA, Alberta		XX	XX	XXX	X	X	XX	XXX	X

Data sources: *Canadian Vital Statistics Data Base; Demography Division*
Note: *Mortality rates (except infant mortality) age-standardized to 1991 Canadian population*
X Mortality rate 1.1 to 1.4 times higher than national rate
XX Mortality rate 1.5 to 1.9 times higher than national rate
XXX Mortality rate at least 2.0 times higher than national rate
† High variability due to small population and small number of deaths

and remote communities. All but two of the health regions with low life expectancy and more than 20% Aboriginal population had suicide rates that were 1.5 to 2.9 times the Canadian rate.

Comparison of mortality rates: men and women

The profiles of health regions with the lowest life expectancy at birth for men or women (Tables 2 and 3) are similar to the profile of health regions with the lowest life expectancy overall (Table 1). All but one (Region 4 in New Brunswick, which has one of the lowest life expectancy rates for men at birth) are in the northern parts of some provinces or in the more remote areas of Canada. The population of 8 of the 13 health regions with low life expectancy for men is at least 20% Aboriginal, as is the population of 9 of the 10 health regions with low life expectancy for women. In many instances, the health regions with low life expectancy for men are also regions with low life expectancy for women. For the most part, causes of death are similar for men and women in these regions. Specific similarities and differences are summarized for regions with predominantly Inuit population (Région du Nunavik and Nunavut), regions with at least 20% non-Inuit Aboriginal population, and regions with less than 20% Aboriginal population.

Région du Nunavik and Nunavut

Mortality due to cancer and respiratory disease was higher than the Canadian rate for both men and women in Région du Nunavik and Nunavut. Death due to cancer was about 1.5 times the Canadian rate

Table 3
Health regions with low female life expectancy at birth, by Aboriginal share of population and leading causes of death, 1996

		Diseases of the circulatory system			Cancer				
	Infant mortality	Total	Cerebro-vascular disease	Ischaemic heart disease	Total	Lung cancer	Diseases of respiratory system	Unintentional injury	Suicide
More than 20% Aboriginal									
Health Labrador Corporation, Newfoundland	XXX	X	XX	XX	X	X	XXX	XXX	- -
Région des Terres-Cries-de-la-Baie-James, Québec	XXX	XX	XX	XX	X		XXX	XXX	- -
Northwestern PHU, Ontario	X		X	X				XXX	XXX
Norman, Manitoba		X	XX	X	X	XX	XXX	XX	
Burntwood/Churchill, Manitoba	X	XX	X		X	X	XXX	XXX	
Northern HSB, Saskatchewan	XXX	X			X	XX	XX	XXX	XX
Northwestern RHA, Alberta	X		XX					XXX	- -
Nunavut	XXX				XX	XXX	XXX	XXX	XXX
Région du Nunavik, Québec†	XXX	XXX		XXX	X	XXX	XXX	XXX	XXX
Less than 20% Aboriginal									
Northern Lights RHA, Alberta	X	X	XX	X	X	XXX	XX	XX	- -

Data sources: *Canadian Vital Statistics Data Base; Demography Division*
Note: *Mortality rates (except infant mortality) age-standardized to 1991 Canadian population*
X Mortality rate 1.1 to 1.4 times higher than national rate
XX Mortality rate 1.5 to 1.9 times higher than national rate
XXX Mortality rate at least 2.0 times higher than national rate
† High variability due to small population and small number of deaths
- - Amount too small to be expressed

among men in both health regions, and almost twice the Canadian rate among women in Nunavut (1.3 times among women in Région du Nunavik). Mortality due to lung cancer was particularly high among women: 2.5 times the Canadian rate in Région du Nunavik and 4.7 times the Canadian rate in Nunavut. Women in these health regions were also about seven times more likely to die of respiratory disease than Canadian women as a whole, while the rates for men in Nunavut and Région du Nunavik were 1.5 times and 3.5 times higher, respectively, than the rate for all Canadian men.

In Région du Nunavik, mortality due to circulatory disease was 1.5 times the Canadian rate among men, and almost twice the Canadian rate among women. In particular, death due to stroke was high among men, while death due to ischaemic heart disease was high among women. In Nunavut, mortality due to circulatory disease was below the Canadian rate among men, and on par with the Canadian rate among women.

Unlike most health regions with low life expectancy, death due to suicide is high among women as well as men in Région du Nunavik and Nunavut. Furthermore, the highest suicide rates among Canadian men are found in these two regions.

Male and female infant mortality were also high in these regions, more than twice the Canadian rate. Female infant mortality was higher than male infant mortality in Nunavut, but the opposite was the case in Région du Nunavik.

Low life expectancy health regions with non-Inuit Aboriginal population

In health regions with low life expectancy for men or women and more than 20% non-Inuit Aboriginal population, mortality due to circulatory disease and respiratory disease was (for the most part) higher than the Canadian rate for both men and women, and higher among women than among men. Mortality due to respiratory disease in most of these regions was especially high: 1.3 to 2.2 times the Canadian rate among men, and 1.8 to 2.9 times the Canadian rate among women. Mortality due to circulatory disease in most of these regions was also high: 1.1 to 1.4 times the Canadian rate among men, and 1.2 to 1.8 times the Canadian rate among women. Five of the seven health regions had rates of death due to cancer among women that were slightly higher than the Canadian average, but this pattern was not reflected among men.

Mortality due to unintentional injury was many times the Canadian rate among both men and women in these health regions. However, death due to suicide was, with a few exceptions, higher than the Canadian rate only among men.

Male and female infant mortality was higher than the Canadian rate in all the health regions except Norman, Manitoba.

Low life expectancy health regions with less than 20% Aboriginal population

With one exception, regions with low life expectancy among men and less than 20% Aboriginal population had overall cancer mortality rates that were higher than the corresponding Canadian average. Mortality due to lung cancer was especially high—1.3 to 1.9 times the Canadian rate. In most of these regions, mortality due to circulatory disease among men was roughly equal to the Canadian rate, but several regions had high rates of death due to stroke or ischaemic heart disease.

As in regions with more than 20% Aboriginal population, mortality due to unintentional injury and suicide was high among men in regions with less than 20% Aboriginal population.

In the one health region with low life expectancy among women and less than 20% Aboriginal population, Northern Lights Regional Health Authority in Alberta, mortality for women was higher than the Canadian rate for all causes of death except suicide.

Factors associated with high and low life expectancy

Health regions where either men or women or both are expected to live longer have several common characteristics. These include, in addition to lower mortality rates for all causes of death, such factors as lower rates of unemployment and higher levels of educational attainment.

High life expectancy health regions generally have large populations and small geographic areas, while health regions with lower life expectancy tend to have small populations and cover large geographic areas. Greater variability in the mortality rates among the low life expectancy regions is expected

Table 4
Socioeconomic characteristics of health regions with high life expectancy, 1996

	Unemployment rate	Youth unemployment rate (ages 15-24)	High school graduates (ages 25-29)	Postsecondary graduates (ages 25-54)	Below low-income cut-off† (total)	Below low-income cut-off† (younger than 18)	Housing affordability‡
Region 1, New Brunswick (F)	X	√	√	X	√	√	√
Region 6, New Brunswick (F)	X	X	X	X	X	X	√
Ottawa-Carleton PHU, Ontario (T,M)	√	=	√	√	=	=	=
Peel PHU, Ontario (T,M)	√	√	√	√	√	√	X
York PHU, Ontario (T,M,F)	√	√	√	√	√	√	X
Halton PHU, Ontario (T,M,F)	√	√	√	√	√	√	√
Wellington-Dufferin-Guelph PHU, Ontario (M)	√	√	√	√	√	√	√
Central, Manitoba (M)	√	√	X	X	√	√	√
South Eastman, Manitoba (T,M,F)	√	√	X	X	√	√	√
Weyburn SA, Saskatchewan (F)	√	√	X	X	√	√	√
Swift Current SA, Saskatchewan (T,M,F)	√	√	X	X	√	√	√
Rosetown SA, Saskatchewan (T,M)	√	√	X	X	√	√	√
Headwaters HA, Alberta (M)	√	√	X	√	√	√	√
Calgary RHA, Alberta (M)	√	√	√	√	=	=	√
South Okanagan Similkameen, British Columbia (T,M,F)	=	=	X	√	√	√	=
South Fraser Valley, British Columbia (T,M)	√	√	X	=	√	√	X
Vancouver, British Columbia (F)	=	√	√	√	X	X	X
Burnaby, British Columbia (T,M,F)	√	√	√	√	X	X	X
North Shore, British Columbia (T,M,F)	√	√	√	√	√	√	X
Richmond, British Columbia (T,M,F)	√	√	√	√	X	X	X
Victoria, British Columbia (T,M)	√	√	√	√	√	√	X

Data source: *1996 Census of Canada*
Note: *T, M and F indicate high life expectancy for total, male and/or female population, respectively, in health region.*
√more than 1 percentage point better than national rate
X more than than 1 percentage point worse than national rate
= within 1 percentage point of national rate
† Percentage of population or of children younger than 18 in families spending 54.7% or more of their income on basic necessities in 1995; a low percentage indicates fewer people in straitened circumstances.
‡ Percentage of owners or renters spending 30% or more of total household income on major payments or gross rent; a low percentage indicates a large proportion of owners or renters who can afford their dwelling.

because of their small population size, and conversely, less variability in the high life expectancy regions with larger population size.

Mortality rates in high life expectancy regions

Chronic disease (circulatory, cancer and respiratory) mortality rates in most of the high life expectancy health regions were lower than the average Canada rates by at least 10%, and similarly lower for infant mortality, unintentional injury deaths and suicides. These mortality results held for males, females and both sexes combined. While there was some variation in how much mortality rates in each of these regions differed from the respective average Canada rates, no clear patterns emerged in the relationship between specific causes of death and high life expectancy.

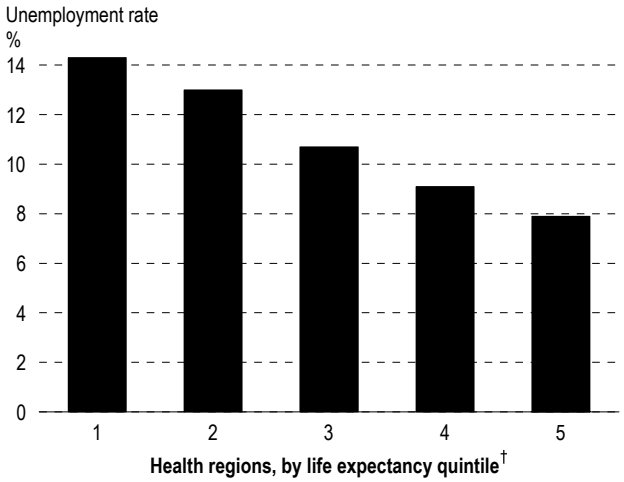
Rate of unemployment

Life expectancy at birth increases as the rate of unemployment decreases (Chart 2). The health regions with high life expectancy at birth all had overall unemployment rates in 1996 that were either equal to or much lower than the Canadian rate of 10.1% (Table 4). This was also true of youth unemployment. On the other hand, the unemployment rate was 1 to 10 percentage points higher than the Canadian rate in all but one of the health regions with low life expectancy and more than 20% Aboriginal population (Table 5).

Level of education

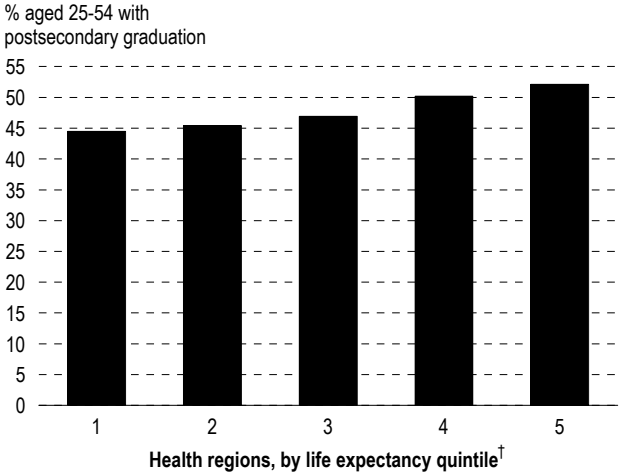
Life expectancy at birth also increases as the proportion of the population aged 25 to 54 with a postsecondary degree increases (Chart 3). Of the 13 health regions with high life expectancy at birth, 9 had a proportion of postsecondary graduates that was higher than the proportion for Canada as a whole (Table 4). By contrast, all the health regions with low life expectancy and more than 20% Aboriginal population had a lower proportion of high school graduates aged 25 to 29 and, with the exception of two regions, a much lower proportion of postsecondary graduates than Canada as a whole (Table 5).

Chart 2
Unemployment rate, by quintile of life expectancy at birth, health regions, 1996



Data sources: *1996 Census of Canada; Demography Division*
† Population represented by each quintile: Quintile 1 - 2,017,040; Quintile 2 - 4,002,060; Quintile 3 - 3,995,338; Quintile 4 - 8,770,043; Quintile 5 - 10,062,334

Chart 3
Percentage of population aged 25 to 54 with postsecondary graduation, by quintile of life expectancy at birth, health regions, 1996



Data sources: *1996 Census of Canada; Demography Division*
† Population represented by each quintile: Quintile 1 - 2,017,040; Quintile 2 - 4,002,060; Quintile 3 - 3,995,338; Quintile 4 - 8,770,043; Quintile 5 - 10,062,334

Other socioeconomic factors

There is no consistent pattern of association between higher life expectancy at birth and the overall level of income or cost of housing in health regions. While some health regions with high life expectancy at birth had fewer persons with incomes

Table 5
Socioeconomic characteristics of health regions with low life expectancy, 1996

	Unemployment rate	Youth unemployment rate (ages 15-24)	High school graduates (ages 25-29)	Postsecondary graduates (ages 25-54)	Below low-income cut-off† (total)	Below low-income cut-off† (younger than 18)	Housing affordability‡
Health Labrador Corporation, Newfoundland (T,M,F)	X	X	X	√	√§	√§	√§
Region 4, New Brunswick (M)	X	X	X	X	X	X	√
Région de la Côte-Nord, Québec (M)	X	X	X	X	√	√	√
Région des Terres-Cries-de-la-Baie-James, Québec (T,F)	X	X	X	X	..	..	..
Northwestern PHU, Ontario (T,M,F)	X	X	X	X	√§	√§	√§
Timiskaming PHU, Ontario (T,M)	X	X	X	X	√	=	√
Norman, Manitoba (T,M,F)	X	X	X	X	√§	√§	√§
Burntwood/Churchill, Manitoba (T,M,F)	X	X	X	X	√§	√§	√§
Northern Health Services Branch, Saskatchewan (T,M,F)	X	X	X	X	X§	X§	√§
Peace RHA, Alberta (T,M)	√	X	X	X	√	√	√
Northern Lights RHA, Alberta (T,M,F)	√	=	X	√	√	√	√
Northwestern RHA, Alberta (F)	√	X	X	X	√§	√§	√
Yukon (T,M)	X	=	X	√	..	..	√§
Nunavut (T,M,F)	X	X	X	X	..	..	√§
Région du Nunavik, Québec (T,M,F)	X	X	X	X	√§	√§	√§

Data source: *1996 Census of Canada*
Note: *T, M and F indicate low life expectancy for total, male and/or female population, respectively, in health region.*
√more than 1 percentage point better than national rate
X more than than 1 percentage point worse than national rate
= within 1 percentage point of national rate
† Percentage of population or of children younger than 18 in families spending 54.7% or more of their income on basic necessities in 1995; a low percentage indicates fewer people in straitened circumstances.
‡ Percentage of owners or renters spending 30% or more of total household income on major payments or gross rent; a low percentage indicates a large proportion of owners or renters who can afford their dwelling.
§ Non-reserve population
·· Figures not available

below the low-income cut-off than the average for Canada as a whole, or more affordable housing than in Canada as a whole, this was not true for all health regions with high life expectancy at birth (Table 4).

Concluding remarks

Life expectancy at birth is considerably lower in remote northern health regions than in the rest of Canada. The population of many of these regions includes a significant proportion of Aboriginal people. Several health regions with low life expectancy, however, have a population that is less than 20% Aboriginal.

While mortality due to major chronic disease is higher in the health regions with a large proportion of Aboriginal people, there are important variations. In these regions, mortality due to major chronic disease is higher among women than among men. Furthermore, the rates are generally higher in the two regions with predominantly Inuit population, compared with regions with predominantly non-Inuit Aboriginal population.

The higher rates of mortality due to circulatory disease, cancer and respiratory disease in health regions with a large proportion of Aboriginal people are cause for concern. The high rate of death due

Definitions

Life expectancy at birth is the number of years a person would be expected to live from the day he or she is born, based on mortality statistics at the time of birth (using five-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.

Leading causes of death include diseases of the circulatory system, cerebrovascular disease, ischaemic heart disease, cancer, lung cancer, and diseases of the respiratory system. *Diseases of the circulatory system* are all diseases of the heart and blood vessels. These include *cerebrovascular disease* (any disease affecting an artery within and supplying blood to the brain, such as stroke) and *ischaemic heart disease* (narrowing or obstruction of the arteries to the heart, resulting in reduced blood supply to the heart). *Cancer* refers to all forms of cancer, including *lung cancer*. *Diseases of the respiratory system* refers to diseases of the breathing passages and lungs, such as pneumonia and bronchitis.

Infant mortality rates measure the number of deaths of infants aged less than one year for every 1,000 live births.

Aboriginal peoples include First Nations people, Métis and Inuit.

Health regions are defined by provincial governments as the administrative areas of responsibility for regional health boards or areas of interest to health care authorities.

An e*numeration area (EA)* is the geographic area canvassed by one census representative and is the smallest standard geographic area for which census data are reported.

Census subdivision (CSD) is a general term applying to municipalities (as determined by provincial legislation) or their equivalent (for example, Indian reserves and unorganized territories).

to lung cancer and respiratory disease among Inuit women is particularly alarming. It is likely that this high mortality is associated with smoking. In 1997, the rate of smoking among adults in the Aboriginal population was double the rate for Canada as a whole.[4]

The high rate of infant mortality in health regions with a large proportion of Aboriginal people is consistent with other findings. Infant mortality is twice as high among First Nations people as in the Canadian population as a whole.[4] The rate of mortality is especially high for First Nations infants in the postneonatal period. The main causes of death in that period are sudden infant death syndrome, congenital anomalies and respiratory conditions such as bronchitis and pneumonia.

The risk of death due to suicide is high among men in almost all regions with low male life expectancy. In a few health regions, notably Région du Nunavik and Nunavut, mortality due to suicide is high among women as well as men. While most of the regions with high rates of suicide among men are in the north, one is in the south of Canada (Region 4 in New Brunswick). It, like other regions with low life expectancy, is characterized by rates of unemployment that are higher than the average in Canada and levels of education that are lower than the average in Canada.

The association between low life expectancy and higher rates of unemployment and lower levels of education indicates that non-medical factors may play a role. A similar association among lower level of income, lower level of education, poorer health and chronic illness has been observed among adults in Canada as a whole. ●

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References

1 Chiang CL. *The Life Table and Its Applications.* Malabar, Florida: Robert E. Krieger Publishing Company, 1984.

2 Organisation for Economic Co-operation and Development. *OECD Health Data 99* (CD-ROM).

3 Statistics Canada. *Health Statistics at a Glance* (Statistics Canada, Catalogue 82F0075XCB) Ottawa: Minister of Industry, 1999.

4 Federal, Provincial and Territorial Advisory Committee on Population Health. *Toward a Healthy Future: Second Report on the Health of Canadians* (Catalogue H39-468/1999E) Ottawa: Minister of Public Works and Government Services, 1999.

5 MacMillan H, Walsh C, Jamieson E, et al. *Children's Health. First Nations and Inuit Regional Health Survey.* Ottawa: First Nations and Inuit Regional Health Survey National Steering Committee, 1999.

Appendix

Table A
Life expectancy at birth, by health region, 1996

Map code	Health region	Both sexes		Males		Females	
		Life expectancy (years)	95% confidence interval	Life expectancy (years)	95% confidence interval	Life expectancy (years)	95% confidence interval
Newfoundland							
1001	Health and Community Services St. John's Region	77.6	77.2 - 78.0	74.2	73.6 - 74.8	80.8	80.2 - 81.4
1002	Health and Community Services Eastern Region	76.8	76.3 - 77.2	73.9	73.3 - 74.5	80.0	79.3 - 80.6
1003	Health and Community Services Central Region	77.6	77.1 - 78.0	75.4	74.7 - 76.0	80.0	79.3 - 80.7
1004	Health and Community Services Western Region	77.3	76.7 - 77.8	75.0	74.3 - 75.7	79.7	78.9 - 80.5
1005	Grenfell Regional Health Services Board	77.6	76.3 - 79.0	75.9	74.0 - 77.7	79.7	77.8 - 81.7
1006	Health Labrador Corporation	73.4	72.0 - 74.8	69.9	68.1 - 71.8	77.9	75.7 - 80.0
Prince Edward Island							
1101	Prince Edward Island	78.0	77.5 - 78.4	74.5	73.9 - 75.1	81.5	80.9 - 82.1
Nova Scotia							
1201	Western	78.3	77.9 - 78.6	75.5	75.1 - 76.0	81.1	80.6 - 81.5
1202	Central	78.1	77.8 - 78.4	75.2	74.8 - 75.6	80.8	80.4 - 81.2
1203	Northern	77.7	77.3 - 78.1	74.9	74.3 - 75.4	80.6	80.0 - 81.1
1204	Eastern	76.8	76.4 - 77.1	73.7	73.2 - 74.2	79.9	79.4 - 80.4
New Brunswick							
1301	Region 1	78.8	78.4 - 79.2	75.3	74.8 - 75.9	82.3	81.8 - 82.8
1302	Region 2	77.5	77.2 - 77.9	74.7	74.1 - 75.2	80.3	79.7 - 80.8
1303	Region 3	77.9	77.5 - 78.3	74.9	74.4 - 75.5	80.9	80.3 - 81.4
1304	Region 4	76.5	75.7 - 77.2	72.9	71.8 - 74.0	80.1	79.2 - 81.1
1305	Region 5	77.9	76.9 - 78.8	74.1	72.8 - 75.4	81.6	80.4 - 82.8
1306	Region 6	78.9	78.3 - 79.5	75.7	74.9 - 76.5	82.5	81.7 - 83.2
1307	Region 7	77.2	76.5 - 78.0	73.6	72.5 - 74.6	81.3	80.3 - 82.3
Québec							
2401	Région du Bas-Saint-Laurent	78.1	77.7 - 78.4	74.7	74.2 - 75.2	81.5	81.1 - 82.0
2402	Région du Saguenay - Lac-Saint-Jean	76.7	76.4 - 77.0	73.3	72.8 - 73.7	80.2	79.8 - 80.7
2403	Région de Québec	78.1	77.9 - 78.3	74.4	74.1 - 74.6	81.5	81.2 - 81.8
2404	Région de la Mauricie-Bois-Francs	77.4	77.2 - 77.7	73.8	73.4 - 74.1	81.1	80.7 - 81.4
2405	Région de l'Estrie	77.9	77.6 - 78.2	74.5	74.1 - 75.0	81.2	80.7 - 81.6
2406	Région de Montréal-Centre	78.1	78.0 - 78.2	74.8	74.6 - 74.9	81.0	80.8 - 81.1
2407	Région de l'Outaouais	77.1	76.8 - 77.4	74.1	73.7 - 74.5	80.1	79.7 - 80.6
2408	Région de l'Abitibi-Témiscamingue	76.3	75.8 - 76.7	73.1	72.5 - 73.7	79.8	79.2 - 80.4
2409	Région de la Côte-Nord	76.3	75.7 - 76.8	72.6	71.8 - 73.4	80.6	79.8 - 81.3
2410	Région du Nord-du-Québec	76.4	74.7 - 78.1	73.9	71.7 - 76.0	80.0	77.3 - 82.6
2411	Région de la Gaspésie-Îles-de-la-Madeleine	76.7	76.2 - 77.2	73.1	72.3 - 73.8	80.8	80.1 - 81.5
2412	Région de la Chaudière-Appalaches	78.2	77.9 - 78.4	74.6	74.3 - 75.0	81.8	81.5 - 82.2
2413	Région de Laval	78.8	78.5 - 79.1	75.9	75.5 - 76.3	81.4	81.1 - 81.8
2414	Région de Lanaudière	77.4	77.1 - 77.7	74.4	74.0 - 74.8	80.5	80.1 - 80.9
2415	Région de Laurentides	77.3	77.0 - 77.5	74.5	74.1 - 74.8	80.3	79.9 - 80.6
2416	Région de la Montérégie	78.3	78.2 - 78.4	75.4	75.2 - 75.6	81.1	80.9 - 81.3
2417	Région du Nunavik	64.4	62.1 - 66.6	68.8	66.6 - 70.9	71.5	69.3 - 73.7
2418	Région des Terres-Cries-de-la-Baie-James	74.7	72.7 - 76.7	72.8	70.0 - 75.6	76.7	73.9 - 79.5
Ontario							
3526	Algoma Public Health Unit	76.9	76.4 - 77.4	74.1	73.5 - 74.7	79.8	79.2 - 80.4
3527	Brant Public Health Unit	77.9	77.5 - 78.3	75.1	74.5 - 75.7	80.6	80.0 - 81.2
3530	Durham Public Health Unit	78.5	78.2 - 78.7	76.1	75.7 - 76.4	80.7	80.4 - 81.0
3531	Elgin-St Thomas Public Health Unit	77.0	76.4 - 77.5	74.1	73.3 - 74.8	79.8	79.0 - 80.6
3533	Bruce-Grey-Owen Sound Public Health Unit	77.5	77.1 - 77.9	75.1	74.5 - 75.7	80.0	79.4 - 80.5
3534	Haldimand-Norfolk Public Health Unit	77.7	77.2 - 78.2	75.1	74.4 - 75.8	80.3	79.6 - 81.0

Map code	Health region	Both sexes		Males		Females	
		Life expectancy (years)	95% confidence interval	Life expectancy (years)	95% confidence interval	Life expectancy (years)	95% confidence interval
3535	Haliburton, Kawartha, Pine Ridge Public Health Unit	78.5	78.1 - 78.9	76.0	75.5 - 76.6	81.0	80.5 - 81.5
3536	Halton Public Health Unit	80.3	80.0 - 80.5	77.8	77.4 - 78.2	82.5	82.1 - 82.9
3537	Hamilton-Wentworth Public Health Unit	78.0	77.8 - 78.2	75.3	75.0 - 75.7	80.6	80.2 - 80.9
3538	Hastings and Prince Edward Public Health Unit	77.3	76.9 - 77.7	74.3	73.7 - 74.9	80.3	79.7 - 80.8
3539	Huron Public Health Unit	78.6	78.0 - 79.2	75.6	74.7 - 76.5	81.7	80.8 - 82.5
3540	Kent-Chatham Public Health Unit	76.4	76.0 - 76.9	73.5	72.8 - 74.2	79.3	78.6 - 80.0
3541	Kingston, Frontenac, Lennox and Addington Public Health Unit	77.8	77.4 - 78.2	74.8	74.3 - 75.4	80.7	80.2 - 81.2
3542	Lambton Public Health Unit	78.6	78.2 - 79.1	75.7	75.1 - 76.3	81.5	80.9 - 82.1
3543	Leeds, Grenville, Lanark Public Health Unit	77.2	76.8 - 77.5	74.2	73.6 - 74.7	80.2	79.6 - 80.7
3544	Middlesex-London Public Health Unit	78.4	78.2 - 78.7	75.4	75.0 - 75.7	81.4	81.0 - 81.7
3545	Muskoka-Parry Sound Public Health Unit	77.3	76.8 - 77.9	74.1	73.2 - 74.9	80.9	80.1 - 81.7
3546	Niagara Public Health Unit	78.4	78.1 - 78.6	75.7	75.4 - 76.1	80.9	80.5 - 81.2
3547	North Bay Public Health Unit	76.3	75.8 - 76.8	73.5	72.8 - 74.2	79.2	78.5 - 79.9
3549	Northwestern Public Health Unit	73.8	73.2 - 74.5	70.3	69.3 - 71.2	77.8	76.9 - 78.6
3551	Ottawa Carleton Public Health Unit	79.6	79.4 - 79.8	77.1	76.8 - 77.4	81.8	81.5 - 82.0
3552	Oxford Public Health Unit	78.0	77.5 - 78.5	75.6	74.9 - 76.2	80.2	79.5 - 81.0
3553	Peel Public Health Unit	80.1	79.9 - 80.3	77.8	77.5 - 78.1	82.1	81.9 - 82.4
3554	Perth Public Health Unit	79.0	78.5 - 79.6	76.0	75.2 - 76.8	82.0	81.2 - 82.8
3555	Peterborough Public Health Unit	78.5	78.0 - 78.9	76.0	75.3 - 76.6	80.9	80.3 - 81.5
3556	Porcupine Public Health Unit	76.2	75.7 - 76.7	73.2	72.5 - 73.9	79.4	78.7 - 80.2
3557	Renfrew Public Health Unit	78.1	77.6 - 78.5	75.1	74.4 - 75.8	81.0	80.4 - 81.7
3558	Eastern Ontario Public Health Unit	77.3	76.9 - 77.7	74.5	74.0 - 75.0	80.1	79.6 - 80.6
3560	Simcoe Public Health Unit	78.1	77.9 - 78.4	75.4	75.0 - 75.8	80.9	80.5 - 81.2
3561	Sudbury Public Health Unit	76.6	76.3 - 77.0	73.9	73.4 - 74.4	79.5	78.9 - 80.0
3562	Thunder Bay Public Health Unit	76.9	76.5 - 77.3	74.4	73.8 - 75.0	79.4	78.9 - 80.0
3563	Timiskaming Public Health Unit	75.7	74.9 - 76.5	72.8	71.7 - 74.0	78.7	77.6 - 79.8
3565	Waterloo Public Health Unit	78.9	78.6 - 79.1	75.9	75.5 - 76.2	81.7	81.3 - 82.0
3566	Wellington-Dufferin-Guelph Public Health Unit	79.0	78.7 - 79.4	76.6	76.2 - 77.1	81.3	80.9 - 81.8
3568	Windsor-Essex Public Health Unit	77.9	77.6 - 78.2	75.0	74.6 - 75.3	80.7	80.3 - 81.1
3570	York Public Health Unit	80.8	80.5 - 81.0	78.8	78.5 - 79.1	82.6	82.3 - 82.9
3595	City of Toronto Public Health Unit	79.3	79.2 - 79.4	76.3	76.2 - 76.5	82.1	82.0 - 82.3
Manitoba							
4610	Winnipeg	78.1	77.8 - 78.3	75.3	75.0 - 75.6	80.5	80.2 - 80.8
4615	Brandon	78.7	78.0 - 79.5	76.4	75.2 - 77.5	80.9	79.9 - 81.9
4620	North Eastman	77.5	76.6 - 78.4	74.7	73.4 - 76.0	80.8	79.5 - 82.1
4625	South Eastman	79.5	78.8 - 80.2	76.5	75.5 - 77.6	82.8	81.8 - 83.9
4630	Interlake	77.5	76.9 - 78.1	75.1	74.2 - 76.0	80.2	79.3 - 81.1
4640	Central	78.9	78.3 - 79.4	76.6	75.9 - 77.4	81.1	80.4 - 81.9
4650	Marquette	77.8	76.9 - 78.7	74.1	72.7 - 75.5	81.9	80.8 - 83.0
4655	South Westman	77.8	77.0 - 78.7	75.2	74.0 - 76.5	80.5	79.4 - 81.7
4660	Parkland	76.6	75.8 - 77.5	73.8	72.6 - 75.0	79.8	78.6 - 80.9
4670	Norman	74.4	73.3 - 75.5	71.7	70.1 - 73.2	77.5	76.0 - 79.1
4680	Burntwood/Churchill†	73.0	71.9 - 74.1	70.4	68.9 - 71.9	75.6	73.9 - 77.2
Saskatchewan							
4701	Weyburn (A) Service Area	79.2	78.5 - 79.8	76.0	75.0 - 76.9	82.7	81.8 - 83.6
4702	Moose Jaw (B) Service Area	78.7	78.0 - 79.4	75.9	74.9 - 76.9	81.6	80.6 - 82.6
4703	Swift Current (C) Service Area	79.8	79.1 - 80.6	76.8	75.7 - 77.9	83.0	82.1 - 84.0
4704	Regina (D) Service Area	78.1	77.7 - 78.5	74.8	74.3 - 75.3	81.3	80.8 - 81.8
4705	Yorkton (E) Service Area	78.3	77.7 - 79.0	75.6	74.7 - 76.5	81.3	80.4 - 82.2
4706	Saskatoon (F) Service Area	78.9	78.6 - 79.3	76.0	75.6 - 76.5	81.8	81.3 - 82.3
4707	Rosetown (G) Service Area	79.5	78.8 - 80.3	77.2	76.2 - 78.3	81.9	80.9 - 83.0
4708	Melfort (H) Service Area	78.1	77.3 - 78.9	75.1	73.9 - 76.3	81.4	80.3 - 82.5
4709	Prince Albert (I) Service Area	77.7	77.1 - 78.4	75.4	74.5 - 76.3	80.2	79.3 - 81.1
4710	North Battleford (J) Service Area	77.0	76.3 - 77.7	73.5	72.5 - 74.5	81.0	80.1 - 82.0
4711	Northern Health Services Branch (K) Service Area	73.0	71.7 - 74.3	70.6	68.9 - 72.3	76.1	74.1 - 78.0
Alberta							
4801	Chinook Regional Health Authority	78.0	77.5 - 78.4	75.0	74.3 - 75.6	81.1	80.5 - 81.7
4802	Palliser Health Authority	78.6	78.0 - 79.2	75.9	75.1 - 76.7	81.4	80.7 - 82.2

Map code	Health region	Both sexes		Males		Females	
		Life expectancy (years)	95% confidence interval	Life expectancy (years)	95% confidence interval	Life expectancy (years)	95% confidence interval
4803	Headwaters Health Authority	79.3	78.7 - 80.0	76.9	75.9 - 77.8	81.9	80.9 - 82.8
4804	Calgary Regional Health Authority	79.2	79.0 - 79.4	76.7	76.4 - 77.0	81.6	81.3 - 81.8
4805	Health Authority #5	77.6	76.8 - 78.4	75.2	74.1 - 76.4	80.0	78.9 - 81.1
4806	David Thompson Regional Health Authority	78.3	77.9 - 78.7	75.9	75.3 - 76.5	80.8	80.2 - 81.4
4807	East Central Health Authority	77.9	77.4 - 78.4	74.7	74.0 - 75.4	81.5	80.8 - 82.2
4808	WestView Regional Health Authority	77.8	77.1 - 78.4	74.8	73.9 - 75.6	81.2	80.3 - 82.1
4809	Crossroads Regional Health Authority	77.6	76.7 - 78.6	75.2	73.9 - 76.4	80.3	78.9 - 81.6
4810	Capital Health Authority	79.1	78.8 - 79.3	76.3	76.0 - 76.6	81.6	81.3 - 81.9
4811	Aspen Regional Health Authority	77.7	77.1 - 78.3	75.2	74.5 - 76.0	80.7	79.8 - 81.5
4812	Lakeland Regional Health Authority	77.7	77.1 - 78.2	75.0	74.3 - 75.7	80.7	80.0 - 81.5
4813	Mistahia Regional Health Authority	77.7	77.0 - 78.4	74.9	74.0 - 75.8	80.9	80.0 - 81.9
4814	Peace Regional Health Authority	73.6	72.2 - 74.9	69.7	67.9 - 71.5	78.5	76.5 - 80.4
4815	Keeweetinok Lakes Regional Health Authority	77.1	75.6 - 78.6	74.8	72.8 - 76.9	80.0	77.7 - 82.2
4816	Northern Lights Regional Health Authority	74.2	72.9 - 75.5	71.4	69.8 - 73.0	78.0	75.5 - 80.4
4817	Northwestern Regional Health Authority	77.2	75.1 - 79.2	76.2	73.3 - 79.1	78.2	75.3 - 81.0
British Columbia							
5901	East Kootenay	78.7	78.1 - 79.3	76.1	75.2 - 77.0	81.4	80.6 - 82.3
5902	West Kootenay-Boundary	77.6	77.0 - 78.2	74.8	73.9 - 75.6	80.8	80.0 - 81.6
5903	North Okanagan	78.8	78.3 - 79.3	76.4	75.6 - 77.1	81.4	80.7 - 82.0
5904	South Okanagan Similkameen	80.2	79.9 - 80.6	77.4	76.9 - 77.9	83.2	82.7 - 83.6
5905	Thompson	77.0	76.5 - 77.5	74.2	73.5 - 74.8	80.0	79.4 - 80.7
5906	Fraser Valley	78.7	78.3 - 79.0	76.1	75.6 - 76.6	81.3	80.8 - 81.7
5907	South Fraser Valley	79.6	79.4 - 79.8	77.2	76.8 - 77.5	82.0	81.7 - 82.3
5908	Simon Fraser	78.7	78.4 - 79.0	76.1	75.6 - 76.5	81.2	80.7 - 81.6
5909	Coast Garibaldi	78.2	77.6 - 78.9	75.6	74.7 - 76.5	81.1	80.2 - 82.0
5910	Central Vancouver Island	78.3	77.9 - 78.6	75.4	74.9 - 75.9	81.3	80.8 - 81.7
5911	Upper Island/Central Coast	77.7	77.2 - 78.2	75.5	74.8 - 76.2	80.1	79.4 - 80.8
5912	Cariboo	76.4	75.7 - 77.1	73.5	72.6 - 74.5	79.7	78.8 - 80.7
5913	North West	77.5	76.8 - 78.2	75.5	74.6 - 76.4	79.9	78.9 - 80.8
5914	Peace Liard	77.2	76.4 - 77.9	75.0	74.0 - 76.1	79.7	78.6 - 80.8
5915	Northern Interior	76.6	76.0 - 77.2	73.9	73.1 - 74.6	79.8	79.0 - 80.6
5916	Vancouver	78.5	78.3 - 78.8	74.6	74.3 - 75.0	82.5	82.2 - 82.9
5917	Burnaby	79.7	79.3 - 80.0	76.6	76.1 - 77.1	82.6	82.1 - 83.1
5918	North Shore	80.4	80.1 - 80.8	78.2	77.7 - 78.7	82.5	82.0 - 82.9
5919	Richmond	81.4	81.0 - 81.8	78.5	77.9 - 79.1	84.0	83.4 - 84.6
5920	Capital	79.7	79.5 - 80.0	77.2	76.8 - 77.6	82.0	81.7 - 82.4
Yukon Territory							
6001	Yukon Territory	75.3	74.1 - 76.4	72.3	70.8 - 73.7	79.4	77.6 - 81.3
Northwest Territories							
6101	Northwest Territories	76.7	75.4 - 77.9	74.6	72.9 - 76.2	79.2	77.3 - 81.0
Nunavut							
6201	Nunavut	70.1	68.3 - 71.8	67.8	65.8 - 69.8	71.2	68.7 - 73.7

Data sources: *Canadian Vital Statistics Data Base; Demography Division*

† *Due to the small population of Churchill, Manitoba (map code 4690), this health region has been grouped with Burntwood (map code 4680).*

Note: *This information is available in electronic format on the Talon Web Site at this address: http://www.statcan.ca/english/ads/82-003-XPB/letab.htm*

Maps

Map code	Health region
	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	Prince Edward Island
	Nova Scotia
1201	Western
1202	Central
1203	Northern
1204	Eastern
	New Brunswick
1301	Region 1
1302	Region 2
1303	Region 3
1304	Region 4
1305	Region 5
1306	Region 6
1307	Region 7
	Québec
2401	Région du Bas-Saint-Laurent
2402	Région du Saguenay-Lac-Saint-Jean
2403	Région de Québec
2404	Région de la Mauricie-Bois-Francs
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 de 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-Wentworth 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 Carleton 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	City of 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
4690	Churchill
	Saskatchewan
4701	Weyburn (A) Service Area
4702	Moose Jaw (B) Service Area
4703	Swift Current (C) Service Area
4704	Regina (D) Service Area
4705	Yorkton (E) Service Area
4706	Saskatoon (F) Service Area
4707	Rosetown (G) Service Area
4708	Melfort (H) Service Area
4709	Prince Albert (I) Service Area
4710	North Battleford (J) Service Area
4711	Northern Health Services Branch (K) Service Area
	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

LIFE EXPECTANCY AT BIRTH
by health region, 1996
(males and females)

ESPÉRANCE DE VIE À LA NAISSANCE
par région socio-sanitaire, 1996
(hommes et femmes)

Life expectancy – Espérance de vie

- 75.7 years or less – 75.7 ans ou moins
- 75.8 to 79.4 years – 75.8 à 79.4 ans
- 79.5 years or more – 79.5 ans ou plus
- High variability – Grande variabilité
- 2418 Health region – Région socio-sanitaire

1 : 15,300,000

1 : 7,200,000 B

1 : 2,200,000 A

Source: Health Statistics Division. Produced by Geography Division, Statistics Canada, 1999.
Division des statistiques sur la santé. Préparé par la Division de la géographie, Statistique Canada, 1999.

LIFE EXPECTANCY AT BIRTH
by health region, 1996
(males)

ESPÉRANCE DE VIE À LA NAISSANCE
par région socio-sanitaire, 1996
(hommes)

Life expectancy – Espérance de vie

- 73.0 years or less – 73.0 ans ou moins
- 73.1 to 76.4 years – 73.1 à 76.4 ans
- 76.5 years or more – 76.5 ans ou plus
- High variability – Grande variabilité
- 2418 Health region – Région socio-sanitaire

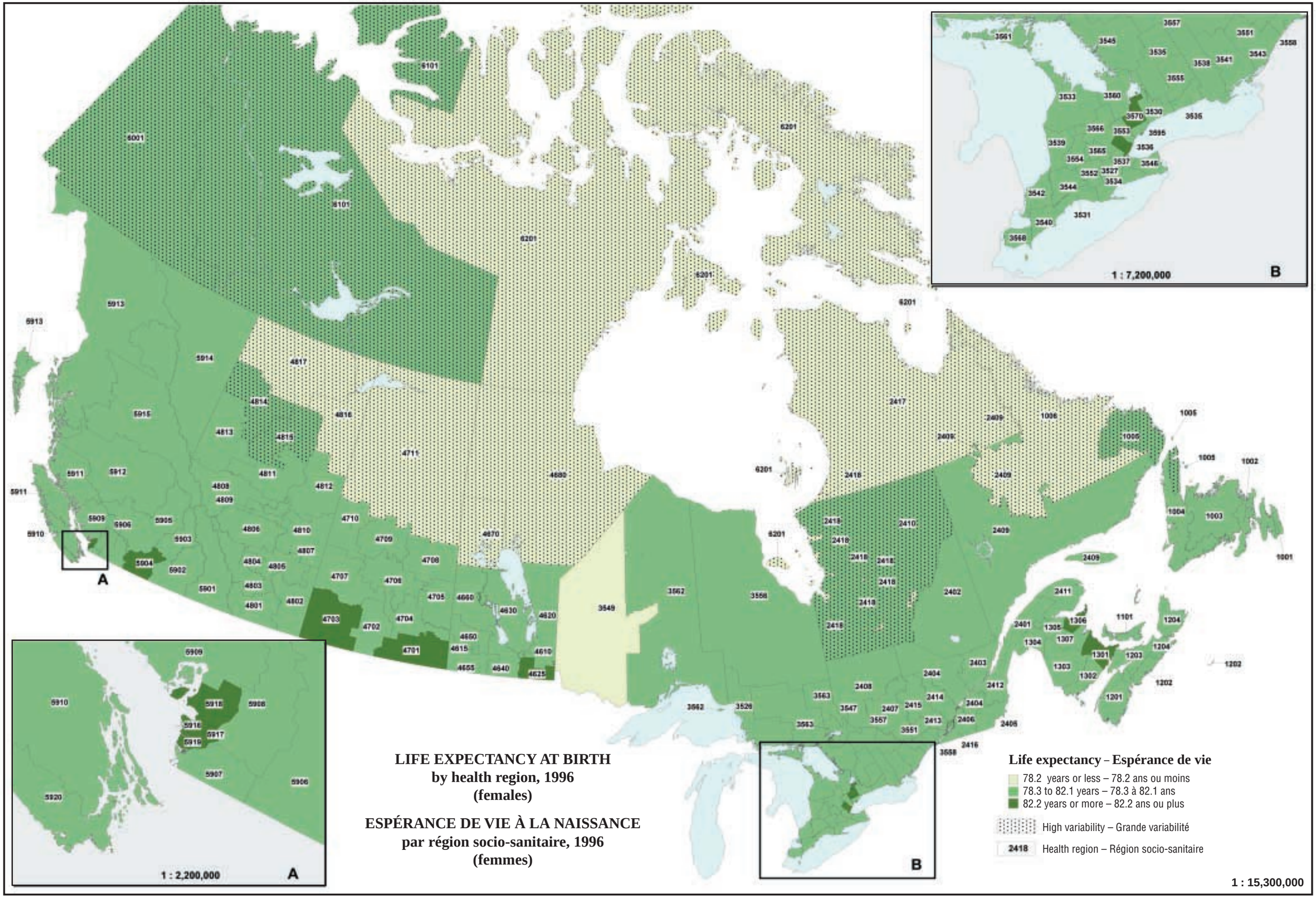
1 : 15,300,000

1 : 7,200,000 B

1 : 2,200,000 A

B

Source: Health Statistics Division. Produced by the Geography Division, Statistics Canada, 1999.
Division des statistiques sur la santé. Préparé par la Division de la géographie, Statistique Canada, 1999.



Source: Health Statistics Division. Produced by the Geography Division, Statistics Canada, 1999.
Division des statistiques sur la santé. Préparé par la Division de la géographie, Statistique Canada, 1999.

Health status of children

Highlights

- The 20th century has seen a dramatic decline in infant mortality in Canada and an accompanying decline in regional disparities in infant mortality.
- Income-related differences in infant mortality have diminished substantially; however, by 1996, rates in the poorest neighbourhoods were still two-thirds higher than those in the richest neighbourhoods.
- Infant mortality in Canada's poorest neighbourhoods is now significantly lower than the national rate for the United States. However, it is less impressive than what has been attained in parts of Europe, such as France and Sweden. The infant mortality rate in Canada's richest neighbourhoods is currently only about as low as the national rate for Sweden.
- In recent years in Canada, income-related disparities in infant mortality have ceased to diminish, although regional disparities have continued to decline.
- Since 1971, Canada has seen dramatic reductions in child mortality due to most external causes of death (accidents, poisoning and violence). Nevertheless, there has been an increase in suicides among children.
- Most children in Canada are in very good health. However, socioeconomic differences are evident from an early age. The children of parents with a low level of education are more likely to have poorer perceived health and are less likely to enjoy unbroken good health.

Over the past three decades, the rates of infant and child mortality have declined substantially in Canada. These trends represent undisputed progress in efforts to secure the health of Canadian children. The gains made in preventing the principal causes of death among infants (under 1 year of age) as well as children (aged 1 to 14) have been impressive. The greatest gains in reducing infant mortality have been made in the poorest neighbourhoods and most disadvantaged regions. However, there are still important disparities in the health of infants and other children.

This article explores both changes and disparities in the health status of children (see *Methods* and *Definitions*). It reviews trends in infant mortality, low birth weight and child mortality, and examines the declines in principal causes of infant and child mortality. It also explores disparities in measures of health for infants and children according to socioeconomic status (levels of income and education) and region. Finally, it notes recent developments of concern, such as increases in the proportion of low birth weight births to teenage mothers and increases in rates of suicide among children.

The health of infants (measured by infant mortality and low birthweight) is considered separately from the health of other children (measured by child mortality and morbidity), because the patterns for these age groups are different.

Declining infant mortality in Canada

This century has seen a dramatic decline in infant mortality in Canada. In 1901, the infant mortality rate in Canada was 134 per 1,000, meaning that about 1 in 7 newborns died before their first birthday.[1] By 1997, the infant mortality rate in Canada had fallen to 5.5 per 1,000, meaning that only 1 in 182 newborns failed to survive their first year.[2]

The decline in infant mortality in Canada as a whole has been accompanied by a decline in regional disparities in infant mortality. This can be measured by the absolute difference between the rate for Canada as a whole and the rate for the region with the lowest infant mortality. The difference has fallen from 10 per 1,000 in 1951, to 6 in 1956, to less than 3 in 1966, and to less than 1 in 1981. By 1996, the

Methods

Data sources

The following Statistics Canada data sources were used for this article: live birth and death registration data from the Canadian Vital Statistics Data Base and its derivatives, the Canadian Births Data Base and the Canadian Mortality Data Base; population estimates by age, sex and province; census data on low income by census tract and age; historic life tables for 1901; abridged life tables for 1996; and the National Longitudinal Survey of Children and Youth (NLSCY).

Analytical techniques

Descriptive analyses of the birth and death data show rates, rate differences, rate ratios, and excess events, which are generally done by year (or three-year averages), region and neighbourhood income quintile. International comparisons are also shown for infant mortality.

Morbidity measures from the NLSCY were analyzed through six health variables: 1996/97 perceived health, 1994/95-1996/97 changes in perceived health (improvements or declines), 1996/97 serious injuries, 1994/95-1996/97 repeated serious injuries, and 1996/97 activity limitations. For each of these morbidity measures, a basic logistic regression model was tested and, then, specific explanatory variables were added. The basic model included age and sex of the child, presence of two parents and parent's level of education. Absence of chronic conditions was added to the perceived health model as a specific variable to take into account the health condition of the child. Development of chronic conditions during the 1994/95-1996/97 period and disappearance of chronic conditions during the same period were added as specific variables to the model for 1994/95-1996/97 changes in perceived health.

For the morbidity analyses, education of the parent was selected as the measure of socioeconomic status instead of income because it is, in general, determined before the birth of a child and is therefore not affected by the child's health. Interpretation of results where income was used as the measure would have been more difficult, since it is possible that parents of very sick children may choose to reduce their income (for example, by changing from a dual-earner to single-earner family) in order to provide care to their children.

Limitations

Vital statistics birth and death data are believed to be quite complete and accurate with respect to birth weight, age of mother, live birth parity, date of death, and major causes of death. In recent years, the marital status of mother has been missing for about 5% of births. Census tract coded from street address and postal code is highly precise in urban areas, but much less precise in rural areas, so the analyses were restricted to residents of census metropolitan areas.

Causal inferences based on cross-sectional data are always hazardous, and income of adults is known to be both a determinant and effect of their ill-health. But for low birth weight and infant mortality outcomes, working with results by income quintiles defined on the basis of neighbourhood income is less problematic, since the neighbourhood of residence of the parents is nearly always determined prior to the birth of the child.

The fact that most children are in very good health makes it difficult to analyze the rare event of morbidity among the population aged 0 to 11. A longer period of observation may be necessary to improve the statistical power to detect associations.

This analysis did not make use of specialized software to take into account the complex sample design of the NLSCY. Instead, normalized weights were used, and an adjustment for the design effect was made. Furthermore, a conservative threshold risk level of 0.01 (instead of the usual 0.05) was considered significant.

difference was only 0.5 per 1,000—about a twentieth of what it had been 45 years earlier.

Looked at in another way, in 1951, there would have been about 3,700 fewer infant deaths if infant mortality in all regions of Canada had been as low as the rate in British Columbia (the lowest regional rate at that time). In 1996, there would have been about 180 fewer infant deaths if infant mortality in all regions of Canada had been as low as the rate in Québec (the lowest regional rate at that time).

Fewer infant deaths due to perinatal conditions, congenital anomalies and external causes

In 1971, the principal causes of death among infants in Canada, as grouped by chapters of the *International*

Definitions

Infant mortality refers to deaths of infants under 1 year of age. *Infant mortality rates* are the number of deaths of infants under 1 year of age for every 1,000 live births.

Excess infant deaths are defined as the number of infant deaths observed, less the number of infant deaths expected if the rate in the region with the lowest rate, or in the richest neighbourhood income quintile, had been experienced by Canada as a whole.

Causes of death among infants were grouped according to chapters of the *International Classification of Diseases*.[3,4] *Perinatal conditions* occur during the period just before or just after birth. *Congenital anomalies* are defects present at birth. *Ill-defined conditions* include sudden infant death syndrome (SIDS). *External causes* include all accidents, poisoning and violence.

Low birth weight (LBW) is defined as a birth weight of less than 2,500 grams (about 5.5 pounds). LBW may result from premature birth or restricted growth within the uterus, or a combination of both problems. The *low birth weight rate* is the number of low birth weight infants per 100 live births.

Excess LBW births are defined as the number of LBW births observed, less the number of LBW births expected if the rate in the region with the lowest rate, or in the richest neighbourhood income quintile, had been experienced by Canada as a whole.

Live birth parity is the number of infants born alive to a mother, including the current birth.

Marital status of the mother was based on her legal marital status as shown on the birth registration. *Unmarried* includes never married, separated, divorced and widowed.

Child mortality refers to deaths of children aged 1 to 14. *Child mortality rates* are the number of deaths per million children aged 1 to 14. Rates were calculated for each three-year period as 1,000,000 x the sum of the deaths divided by 3 x the mid-year population of the central year of each period.

Causes of death among children aged 1 to 14 were grouped according to chapters of the *International Classification of Diseases*.[3,4] *External causes* include all accidents, poisoning and violence. *Neoplasms* refer to cancer and other tumours. *Congenital anomalies* are defects present at birth. *Nervous system diseases* include diseases of the brain, spinal cord and sense organs. *Circulatory system diseases* include diseases of the heart, stroke and arterial diseases.

Subcategories of external causes of death among children aged 1 to 14 were grouped based on List A of the *International Classification of Diseases*, 8th Revision[3] and the corresponding NCHS List A based on the 9th Revision.[5]

Neighbourhood income was measured by the percentage of the population with income below the Statistics Canada low-income cut-offs within census tracts in urban Canada. The measure is divided into fifths or *quintiles* of the population within each census metropolitan area (CMA). Quintile 1 (Q1), the richest neighbourhoods, comprises census tracts with the lowest percentage of the population with income below the Statistics Canada low-income cut-offs. Quintile 5 (Q5), the poorest neighbourhoods, comprises census tracts with the highest percentage of the population with income below the Statistics Canada low-income cut-offs.

The five *regions* were defined as: Atlantic (Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick), Québec, Ontario, Prairies (Manitoba, Saskatchewan, Alberta) and British Columbia. The Yukon and Northwest Territories were included in the total for Canada, but not in the regional comparisons. For regional analyses of birth weight data, Newfoundland was excluded prior to 1991 because of a lack of data on birth weight and maternal characteristics.

For morbidity analyses, parent's educational attainment was grouped into five levels: (1) less than a high school diploma; (2) high school diploma, but no other education; (3) high school diploma and some postsecondary education without a diploma; (4) diploma from a college, nursing school or any other postsecondary institution excluding university; and (5) university graduation.

Classification of Diseases,[3] were perinatal conditions, congenital anomalies, ill-defined conditions, and external causes. From 1971 to 1996, death rates declined markedly for each of the principal causes of death among infants except for ill-defined conditions, which first rose sharply and then declined.

The greatest progress has been made in preventing death due to perinatal conditions, congenital anomalies and external causes. When the average annual mortality rate for the years 1995 to 1997 is compared with the average annual rate for the years 1970 to 1972, there were fewer than one-third as many deaths due to perinatal conditions and congenital anomalies, and only one-tenth as many deaths due to external causes. Perinatal and congenital conditions together accounted for about two-thirds of infant deaths from 1995 to 1997, followed by "all other" causes and ill-defined conditions. External causes accounted for less than 2% of infant deaths from 1995 to 1997.

How does Canada compare internationally?

Other industrialized countries have also seen a decline in their infant mortality rates (Table 1). In 1970, the rates ranged from a low of 11 per 1,000 in Sweden to a high of 20 per 1,000 in the United States. By 1996, the rates had fallen to a low of 4 in Sweden and a high of 8 in the United States. Canada's rate declined from 19 per 1,000 in 1970 to less than 6 per 1,000 in 1996.

In the period from 1970 to 1975, which followed the introduction of universal medical care in Canada, Canada recorded the greatest decrease in infant mortality of all five countries in each of the five-year periods from 1970 to 1995. In recent years, however, the rate of improvement has slowed in Canada compared with the United States, the United Kingdom, France and Sweden. Canada recorded the smallest decrease in infant mortality of the five countries in the 1990-to-1995 period.

Table 1
Infant mortality rates, selected countries, 1970 to 1996

	Canada	United States	United Kingdom	France	Sweden
	Infant deaths per 1,000 live births				
1970	18.8	20.0	18.5	18.2	11.0
1975	13.6	16.1	16.0	13.8	8.6
1980	10.4	12.6	12.1	10.0	6.9
1985	7.9	10.6	9.4	8.3	6.8
1990	6.8	9.2	7.9	7.3	6.0
1995	6.1	8.0	6.0	4.9	4.1
1996	5.6	7.8	6.1	4.9	4.0

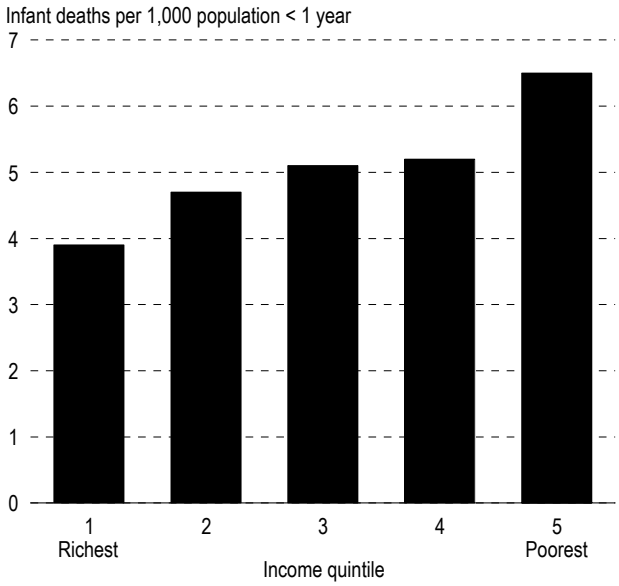
***Data source**: Reference 6*

Persistent income-related disparities in infant mortality

Since 1971, the gains made against infant mortality in Canada have been greatest in the poorest urban neighbourhoods. However, infant mortality rates in Canada are still highest in the poorest urban neighbourhoods, and lowest in the richest urban neighbourhoods (Chart 1). In 1996, the infant mortality rate in Canada's poorest neighbourhoods (6.5 per 1,000) was two-thirds higher than that of the richest neighbourhoods (3.9 per 1,000). If the rate for all Canada had been as low as that of the richest neighbourhoods, there would have been about 500 fewer infant deaths in 1996.

The difference between the infant mortality rate for Canada as a whole and the rate for the richest

Chart 1
Infant mortality, by neighbourhood income quintile, urban Canada, 1996



***Data source:** References 7 and 8 and preliminary tabulations from the 1996 mortality by income study (see Table 2)*

urban neighbourhoods fell sharply from 1971 to 1986, and declined further from 1986 to 1991. But progress in reducing this disparity in Canada has slowed in recent years (Table 2). From 1991 to 1996, there was little change in those rate differences.

From 1971 to 1996, income-related disparities in infant mortality rates did not decline as much as regional disparities. In 1971, 1986, and 1991, income-related disparities were at least twice as large as regional disparities. However, from 1991 to 1996, income-related differences in infant mortality remained constant at 1.3 per 1,000, while regional differences diminished to 0.5 per 1,000, so that income-related disparities are now three times as large as regional disparities.

Infant mortality rates of rich and poor neighbourhoods in Canada may be compared with national infant mortality rates of other industrialized countries. Infant mortality rates for Canada's richest neighbourhoods were very close to the Swedish national rates in 1971, 1986 and again in 1996, while the rates for Canada's poorest neighbourhoods resembled the national rates for the United States in both 1971 and 1986 (compare Tables 1 and 2). However, by 1991 and again in 1996, the rates for Canada's poorest neighbourhoods were considerably lower than the corresponding national rates for the United States.

Trends in low birth weight

Low birth weight (LBW) is a major risk factor for perinatal and infant mortality, as well as childhood disability and other health problems.[9,10] The percentage of LBW births in Canada rose from 7.2% in 1961 to 7.8% in 1966, and then fell to 5.6% in 1986. It remained at 5.6% in 1991, and then rose back to 5.8% in 1996 and 1997.

The initial rise in LBW rates from 1961 to 1966 has been linked to the practice of severely limiting maternal weight gain during pregnancy—a practice recommended by physicians at the time, but since modified to prevent adverse effects on birth weights. Studies suggest that the recent increase in LBW rates may partly be associated with an increasing proportion of multiple births (which are usually born smaller and earlier), and an increase in the reporting of very small and premature babies as live births rather than stillbirths.[11,12]

Regional and income-related disparities

The difference between the percentage of LBW births in Canada as a whole and the percentage in the region with the lowest rate fell from 0.9 in 1961 to 0.5 in 1971, then rose to 0.8 in 1981 and 1986, and thereafter, fell again to a low of 0.5 in 1997. Thus, regional disparities in LBW were about as large in 1997 as they had been in the early 1970s.

Table 2
Infant mortality rates, by neighbourhood income quintile, urban Canada, 1971, 1986, 1991 and 1996

	Rates by income quintile†						Q5 versus Q1		Total versus Q1		
	Total	Q1	Q2	Q3	Q4	Q5	Rate difference	Rate ratio	Rate difference	Rate ratio	Excess deaths‡
	Infant deaths per 1,000 population < 1 year										
1971	15.0	10.2	12.4	15.2	16.6	20.0	9.8	1.97	4.8	1.47	2,028
1986	7.5	5.8	5.7	7.7	8.0	10.5	4.8	1.82	1.7	1.29	666
1991	5.8	4.5	5.1	5.0	6.7	7.5	2.9	1.64	1.3	1.29	577
1996	5.2	3.9	4.7	5.1	5.2	6.5	2.6	1.67	1.3	1.33	513

Source: *References 7 and 8 and preliminary tabulations from the 1996 mortality by income study.*
Note: *For comparability with the 1971 baseline data (and because coding of births to census tract was still incomplete for 1996), infant mortality was calculated as number of infant deaths (< 1 year) divided by the corresponding census population aged < 1 year.*
† Quintile 1 defined as neighbourhoods with lowest percentage of population below Statistics Canada's low-income cut-offs; Quintile 5 defined as neighbourhoods with highest percentage of population below cut-offs.
‡ Excess deaths estimated for Canada as a whole, based on rate ratios for urban Canada applied to rates and births for all Canada.

Table 3
Low birth weight (LBW) rates, by neighbourhood income quintile, urban Canada, 1986, 1991 and 1996

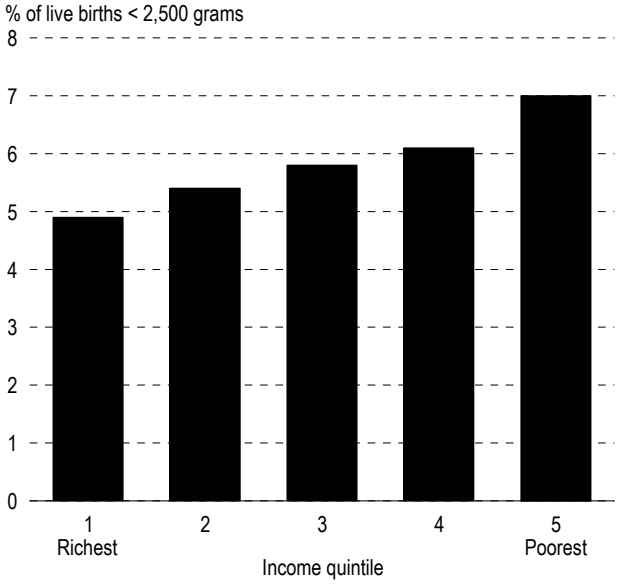
	Rates by income quintile†						Q5 versus Q1		Total versus Q1		
	Total	Q1	Q2	Q3	Q4	Q5	Rate difference	Rate ratio	Rate difference	Rate ratio	Excess LBW‡
	% of live births < 2,500 grams										
1986	5.7	4.9	4.9	5.6	6.1	6.9	2.0	1.41	0.8	1.16	2,359
1991	5.7	4.8	5.1	5.4	5.9	6.7	1.9	1.40	0.9	1.19	3,620
1996	5.8	4.9	5.4	5.8	6.1	7.0	2.1	1.44	0.9	1.20	3,004

Sources: *Reference 13 and preliminary tabulations of the births by income data*
Note: *For 1996 only, coding to census tract was incomplete for Newfoundland and Manitoba in these preliminary tabulations. At the urban Canada level, this should have minimal effect on the LBW rates by quintile.*
† Quintile 1 defined as neighbourhoods with lowest percentage of children younger than 18 below Statistics Canada's low income cut-offs; Quintile 5 defined as neighbourhoods with highest percentage of children younger than 18 below Statistics Canada's low-income cut-offs.
‡ Excess LBW estimated for Canada as a whole, based on rate ratios for urban Canada applied to rates and births for all Canada.

On the other hand, income-related disparities in LBW have increased somewhat in recent years. In 1986, the rates per quintile varied from a low of 4.9% in the richest urban neighbourhoods to a high of 6.9% in the poorest urban neighbourhoods (Table 3). By 1996, the rate in the richest urban neighbourhoods was again at 4.9%, while the rates had increased in all but one of the other quintiles. The disparity between the rate for the richest neighbourhoods and the rate for Canada as a whole increased from 0.8 in 1986 to 0.9 in 1996 (an increase of 13%). The average birth weight of babies born in Canada's poorest urban neighbourhoods is currently about 120 grams (one-quarter pound) less than that of babies born in the richest neighbourhoods.

Overall, there was little change in LBW by income quintile from 1986 to 1996, whereas there were continuing reductions in infant mortality by income quintile in the same period. Nevertheless, income-related disparities persist for both these measures of health in infancy. The lower the neighbourhood income, the higher the rates of LBW and infant mortality (Charts 1 and 2).

Chart 2
Low birth weight rates, by neighbourhood income quintile, urban Canada, 1996



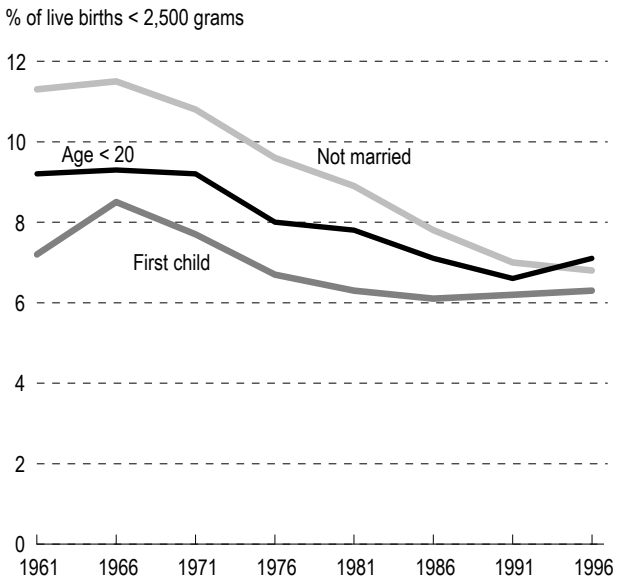
Data source: *Preliminary tabulations of births by income data*

Characteristics of mothers

From 1971 to 1991, there was a decline in the proportion of LBW births among unmarried mothers, mothers under the age of 20, and mothers giving birth to their first child (Chart 3). However, from 1991 to 1996, the rate of LBW births increased among teenage mothers from 6% to over 7%, so that it exceeded that of unmarried mothers who, historically, have had the highest rates of LBW births.

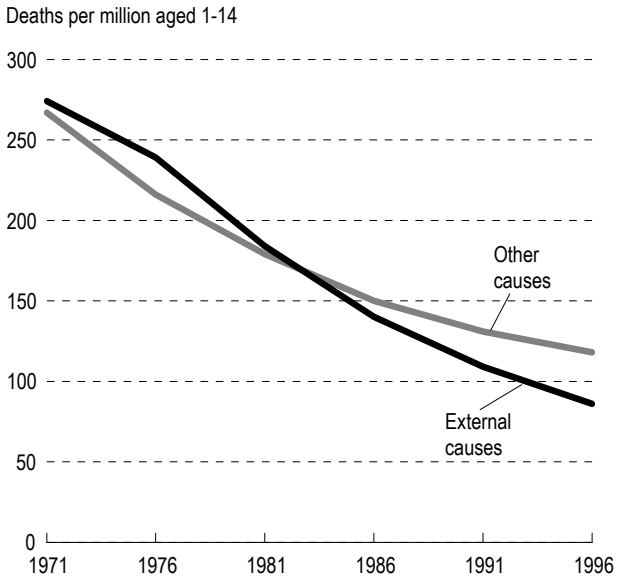
The decline in LBW rates for unmarried mothers was influenced by the fact that the majority of children in Québec are born to mothers who are not legally married, although they are usually living in a common-law relationship with the child's father.

Chart 3
Low birth weight rates, by maternal characteristics, Canada, 1961 to 1997



Data source: *References 2, 14, 15, and Canadian Births Data Base*

Chart 4
Mortality rates, children aged 1 to 14, Canada, 1970-1972 to 1995-1997



Data source: *Reference 21 and Canadian Mortality Data Base*

So unmarried motherhood has become the norm, and it no longer carries the high degree of excess risk often associated with marginal characteristics.

The increase in LBW rates for teenage mothers occurred at the same time as smoking prevalence rates among teenagers increased significantly, from 22.6% to 29.1%.[16] Simulations show that such an increase in smoking prevalence could account for half to two-thirds of the observed increase in LBW rates among teenage mothers from 1991 to 1996. That is because smoking a pack of cigarettes per day is known to lower average birth weights by about 150 to 200 grams (one-third pound).[17-19]

Decreasing child mortality in Canada

Mortality among children aged 1 to 14 is now exceptionally rare in Canada. For children who survived infancy in 1996, only 1 in 366 is expected to die before their 15th birthday.[20] By comparison, in 1901, the risk of dying among children aged 1 to 14 was 1 in 7.[1]

From 1971 to 1996, the average number of deaths per year among children aged 1 to 14 decreased from 541 per million to 204 per million (Chart 4). In absolute numbers, there were about 2,150 fewer deaths per year, on average, in this age group in the years 1995 to 1997 than in the years 1970 to 1972. (There were between 5 and 6 million children of that age in Canada throughout this period; the number of deaths and deaths per million per year are averaged over three-year intervals.)

Fewer deaths due to external causes

Throughout this period, the most common causes of death among children aged 1 to 14, as grouped by chapters of the *International Classification of Diseases*,[3,4] were external causes, followed distantly by neoplasms, congenital anomalies and nervous system diseases. Each of these major causes declined by at least 50% between 1971 and 1996, but external causes declined the most, from 274 per million to 86 per million—a decrease of 70% (Chart 4).

The extent of decline in mortality rates due to external causes has varied for different causes (Table 4). The mortality rates for child pedestrians hit by motor vehicles fell by almost 90%, from 76 per million in 1971 to just 9 per million in 1996. The rate of accidental drownings fell by 77%, from 48 per million in 1971 to 11 per million in 1996. Death

Table 4
External causes† of death, children aged 1 to 14, Canada, 1970-1972 to 1995-1997

	Average annual number of deaths from external causes	Mortality rate from external causes								
			Motor vehicle accident							
		Total	Occupant	Pedestrian	Drowning	Poisoning	Suicide‡	Homicide	Fire	Other
		Average annual deaths per million children aged 1-14								
1970-1972	1,666	274	52	76	48	5	3	6	31	53
1975-1977	1,338	239	58	45	39	4	5	8	26	55
1980-1982	952	184	50	30	29	2	5	7	24	36
1985-1987	717	140	44	20	18	1	5	8	16	29
1990-1992	587	109	35	14	14	2	6	7	11	20
1995-1997	483	86	26	9	11	1	8	7	7	18

Source: *Reference 21 and Canadian Mortality Data Base*
Notes: *Rates calculated for each three-year period as 1,000,000 x the sum of deaths divided by 3 x the mid-year population of the central year of each period. Cause groupings were from List A of the International Classification of Diseases, 8th Revision (World Health Organization, 1967) (used for mortality coding in Canada from 1969 to 1978) and the corresponding List A based on the 9th Revision (World Health Organization, 1975) (used for mortality coding in Canada from 1979 to 1999).*
† External causes include all accidents, poisoning and violence.
‡ As there were few, if any, suicides among children aged 1-9, the suicide death rates would be approximately three times as high if restricted to the 10-14 age group.

rates due to accidental fires also fell by 77%, from 31 per million in 1971 to 7 per million in 1996. Deaths to child passengers in motor vehicle crashes fell by 50%, from 52 per million in 1971 to 26 per million in 1996. Deaths due to poisoning, relatively less common than the preceding causes, fell from 5 per million in 1971 to 1 per million in 1996.

Increase in suicides among children

While deaths among children due to most external causes and diseases have declined considerably since 1971, the mortality rate due to suicide increased over 2.5 times, from 3 per million in 1971 to 8 per million in 1996. Since few, if any, suicide deaths occur among children aged 1 to 9, the suicide death rate would be approximately three times as high if the calculations were restricted to the 10-to-14 age group.

The mortality rate due to homicide also increased marginally, from 6 per million in 1971 to 7 per million in 1996.

Factors associated with poorer perceived health

The analysis of infant mortality rates and low birth weight rates in Canada indicates that income-related disparities persist in these measures of health. Is there any evidence of an association between socioeconomic status and measures of the health of children as they grow older?

The National Longitudinal Survey of Children and Youth (NLSCY), which follows a cohort of 23,000 children under age 12 at the beginning of the study, sheds some light on this question. Data are available from two waves of the NLSCY, conducted in 1994/95 and 1996/97.[22]

According to special tabulations from the NLSCY, the vast majority of children—88% in 1996/97—are in excellent or very good health as perceived by their parents. For those whose health is poorer (whose health is perceived to be good, fair or poor), several factors appear to be significant. One is chronic illness. Children with a chronic condition have over three times the odds (3.6) of poorer perceived health, and the disappearance of a chronic condition is the most important factor contributing to an improvement in perceived health.

Socioeconomic status (particularly the education level of the parents) is also a factor. Children of parents who did not graduate from high school have almost three times the odds (2.75) of poorer perceived health than children of parents with a university diploma. And among children whose perceived health changed, children of parents who

did not graduate from high school also had greater odds of perceiving a decline in health than children of parents with university graduation.

Factors associated with injuries and activity limitations

A further analysis was conducted on factors associated with injuries and activity limitations among children. There was no significant association between parent's level of education and children's injuries or activity limitations. However, girls, younger children (less than 10 years old) and children with two parents at home were less likely to have had repeated serious injuries (injuries reported in 1994/95 and 1996/97) and activity limitations.

Concluding remarks

The 20th century in Canada has been a time of tremendous progress against infant mortality. What was once a relatively common occurrence has become a rare event. Regional differences in infant mortality are now quite small in absolute terms, and only a small fraction of what they had been in the early 1950s. Income-related differences in infant mortality have also diminished substantially, although by 1996 they were still nearly three times as large as regional differences. Nevertheless, infant mortality in Canada's poorest neighbourhoods is now significantly lower than the national rate for the United States.

The single most important modifiable risk factor for low birth weight is maternal smoking.[23] Thus, future reductions in rates of low birth weight may depend, in large part, on the success or failure of programs and policies to prevent young women from becoming smokers and to encourage smokers to quit. Also, since smoking is most common among the least well-educated women, it is the children of such women who would have the most to gain.

Although Canada's progress against infant mortality looks good from a North American perspective, it is less impressive than what has been attained in parts of Europe, such as France and Sweden. The infant mortality rate in Canada's richest neighbourhoods is currently only about as low as the national rate for Sweden. International comparisons also indicate that during the 1990s the decline in infant mortality in Canada has not kept pace with that of France, Sweden or Britain. Thus, the evolution of infant mortality in Canada raises grounds for concern as well as reasons for a sense of accomplishment.

Similarly, the dramatic reductions in child mortality due to external causes of death attests to the overwhelming success of a host of regulatory, policy, educational, and product safety improvements over time. While it was not possible to apportion the mortality declines to specific interventions, it is likely that the reduction in child deaths in motor vehicle crashes, for example, was related to changes in the design and use of seatbelts, infant seats, air bags, improvements in tires and brakes, vehicle safety design and helmets for bicyclists, as well as increased school bussing, 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 child deaths due to drownings, fires and poisoning. At the same time, the increase in suicide deaths among children in Canada stands in sharp contrast to the gains that have been made in reducing childhood deaths due to fatal unintentional injuries.

In recent years in Canada, income-related disparities in infant mortality have ceased to diminish, although regional disparities have continued to decline. At the same time, income-related disparities in low birth weight have increased somewhat. This suggests that changes in the socioeconomic environment in recent years may have negatively affected prospects for improved health and survival of our youngest citizens.

Since most children are in very good health, a longer period of observation may be necessary to improve the statistical power of factors associated with illness and disability among children. However, perceived health status and changes in perceived health status show a strong relationship with socioeconomic status as defined by parents'

education level. Children of parents with a low level of education are more likely to have poorer perceived health and are less likely to enjoy unbroken good health. ●

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References

1 Bourbeau R, Légaré J, Émond V. New birth cohort life tables for Canada and Québec, 1801-1991. *Current Demographic Analysis, Demographic Document No. 3* (Statistics Canada, Catalogue 91F00115MPE) Ottawa: Statistics Canada, 1997.

2 Statistics Canada. *Births and Deaths, 1997* (Catalogue 84F0210) Ottawa: Statistics Canada, 1999.

3 World Health Organization. *International Classification of Diseases, Eighth Revision*. Geneva: World Health Organization, 1967 (Vol 1, List A: 440-4).

4 World Health Organization. *International Classification of Diseases, Ninth Revision*. Geneva: World Health Organization, 1975.

5 Statistics Canada. *Mortality-Summary List of Causes, 1997* (Statistics Canada, Catalogue 84F0209) Ottawa: Statistics Canada, 1999 (Appendix 5, List A: 179-88).

6 Duchesne D, Nault F, Gilmour H, et al. *Vital Statistics Compendium* (Statistics Canada, Catalogue 84-214-XPE) Ottawa: Minister of Industry, 1999.

7 Wilkins R, Adams O, Brancker A. Changes in mortality by income in urban Canada from 1971 to 1986. *Health Reports* (Statistics Canada, Catalogue 82-003) 1989; 1(2): 137-74.

8 Wilkins R. *Mortality by Neighbourhood Income in Urban Canada, 1986-1991*. Conference presentation to Canadian Society for Epidemiology and Biostatistics, St. John's, Newfoundland, August 1995.

9 McCormick MC. The contribution of low birth weight to infant mortality and childhood morbidity. *New England Journal of Medicine* 1985; 312(2): 82-90.

10 Overpeck MD, Moss AJ, Hoffman HJ, et al. A comparison of the childhood health status of normal birth weight and low birth weight infants. *Public Health Reports* 1989; 4(1): 58-70.

11 Joseph KS, Kramer MS. Determinants of preterm birth rates in Canada from 1981 through 1983 and from 1992 through 1994. *New England Journal of Medicine* 1998; 339(20): 1434-9.

12 Joseph KS, Kramer MS. Recent trends in infant mortality rates and proportions of low-birth-weight live births in Canada. *Canadian Medical Association Journal* 1997; 157(5): 535-41.

13 Wilkins R, Sherman GJ, Best PAF. Birth outcomes and infant mortality by income in urban Canada, 1986. *Health Reports* (Statistics Canada, Catalogue 82-003) 1991; 3(1): 7-31.

14 Ng E, Wilkins R. Maternal demographic characteristics and rates of low birth weight in Canada, 1961 to 1990 *Health Reports* (Statistics Canada, Catalogue 82-003) 1994; 6(2): 241-52.

15 Statistics Canada. *Births and Deaths, 1996* (Catalogue 84F0210) Ottawa: Health Statistics Division, Statistics Canada, 1999.

16 Gilmore J. *Report on smoking prevalence in Canada, 1985 to 1999* (Statistics Canada, Catalogue 82F0077XIE) Ottawa: Minister of Industry, 2000.

17 Kline J, Stein Z, Hutzler M. Cigarettes, alcohol and marijuana: varying associations with birth weight. *International Journal of Epidemiology* 1987; 16(1): 4-51.

18 Sachs BP. Sharing the cigarette: the effects of smoking in pregnancy. In Rosenberg MJ, ed., *Smoking and Reproductive Health*. Littleton, MA: PSG Publishing Co, 1987.

19 Eskenazi B, Prehn AW, Christianson RE. Passive and active maternal smoking as measured by serum cotinine: the effect on birthweight. *American Journal of Public Health* 1995; 85(3): 395-8.

20 Health Statistics Division. 1996 Abridged life tables. Unpublished tabulations. Ottawa: Statistics Canada, 1998.

21 Statistics Canada. *Annual Demographic Statistics 1998* (Catalogue 91-213) Ottawa: Minister of Industry, 1999.

22 Montigny G. The National Longitudinal Survey of Children and Youth (NLSCY). *Health Reports* (Statistics Canada, Catalogue 82-003) 1993; 5(3): 317-20.

23 Kramer MS. Determinants of low birthweight: Methodological assessment and meta-analysis. *Bulletin of the World Health Organization* 1987; 65: 663-737.

Health in mid-life

Highlights

- Most Canadians enjoy good health in the middle years, although, not surprisingly, health declines with age.
- The prevalence of several chronic conditions and activity limitations due to a health problem has declined for those aged 45 to 64 over the past 20 years. At the same time, the prevalence of asthma and migraine headaches has increased for women aged 45 to 64; diabetes and asthma have increased among men in the same age group.
- Lower levels of education and income are associated with an increased likelihood of a decline in health and with chronic illness.

Most Canadians enjoy good health during their middle years. However, as Canadians grow older, they are more likely to report poorer health. In the 1998/99 National Population Health Survey (NPHS), the percentage of respondents who rated their health as fair or poor increased significantly with age (Chart 1). While the percentage of adults who report poorer health increases with age, there are changes in health—improvements as well as declines—for adults in every age group. These changes are associated not only with illness and disability, but also with socioeconomic factors such as level of income and level of education.

This article examines factors associated with changes (declines or improvements) in self-perceived health among Canadians aged 25 to 64, using data from the 1994/95, 1996/97 and 1998/99 NPHS. Research indicates that self-perceived health is a predictor of health problems, the use of health services and longevity, particularly among the elderly.[1-8] Self-ratings of health have also been found to be consistent with more objective ratings made by physicians based on extensive medical and psychiatric evaluations.[9]

This article also explores 20-year trends in chronic conditions and activity limitations among Canadians aged 45 to 64, using data from the 1978/79 Canada Health Survey

(CHS) as well as the NPHS (see *Methods*, *Definitions* and *Appendix*). Adults aged 45 to 64 are twice as likely as those aged 25 to 44 to report poorer health (12% versus 6%). Furthermore, analyses of the factors associated with changes in self-perceived health in mid-life show that decline in self-perceived health is associated with chronic conditions and activity dependence.

Methods

Data sources

This article is based on data from the first three cycles of the National Population Health Survey (NPHS) (see *Annex*) and the 1978/79 Canada Health Survey.

The 1998/99 estimates of prevalence of chronic conditions are based on the 1998/99 NPHS cross-sectional general file. The 1994/95-to-1998/99 longitudinal file was used in the analyses of transitions in health status.

The 1978/79 estimates of prevalence of chronic conditions are based on the 1978/79 Canada Health Survey (CHS). The CHS, conducted by Statistics Canada and Health and Welfare Canada, took place from May 1978 through March 1979. The survey covered the non-institutionalized population, excluding residents of the Territories, Indian reserves and remote areas. The sample size was 12,218 households. An interviewer collected data on chronic conditions and activity limitations for the entire household from a suitable household member. The household response rate to this component was 86%. A subset of sampled individuals were asked to participate in the physical measures component. Part of this component involved measuring blood pressure.

Analytical techniques

This analysis examines four-year transitions in self-perceived health among individuals aged 25 to 64. Data from the longitudinal component of the NPHS for the 10 provinces were used to explore the determinants of declines and improvements in self-perceived health over the four-year period. Two groups were formed: respondents who reported excellent, very good or good health at baseline (1994/95) and respondents who reported fair or poor health at baseline. Multiple logistic regression was used to analyze the first group to determine factors associated with a decline in health versus those whose health status remained stable. The second group was used to determine factors associated with an improvement. When considering health and transitions in health status, it is important to be aware of the interplay of physical, social and environmental factors that may influence health. Therefore, socio-demographic variables, health behaviours, chronic conditions, measures related to psychological well-being, and social support variables were all entered into the multivariate models that were used to explore the determinants of transition. Unless otherwise specified, all determinants were measured at baseline in 1994/95.

Further analyses were conducted on the 45-to-64 age group to compare the prevalence rates of selected chronic conditions and activity limitation in 1978/79 with the rates from 1998/99. The rates for 1998/99 are based on estimates from the cross-sectional household component of the third cycle of the NPHS (1998/99). The 1978/79 Canada Health Survey was used to estimate the rates for 1978/79.

All analyses are based on weighted data. For estimates based on NPHS data, the weighted bootstrap procedure was used to estimate sampling error; that is, in the estimates of standard error of prevalence rates and in the calculation of the confidence intervals for the odds ratios in the logistic regression models.[10-12] This procedure fully accounts for the design effects of the NPHS. For prevalence rates based on data from the CHS, estimates of standard error were calculated with SUDAAN, which uses a Taylor series linearization method to adjust for the complex design of the CHS.[13]

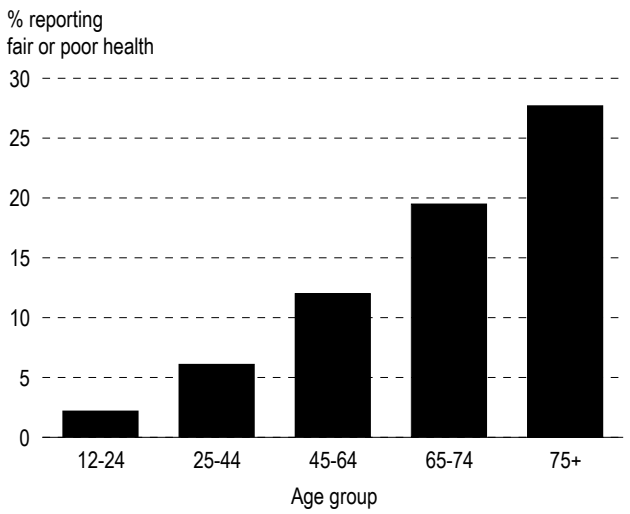
Results at the $p \leq 0.05$ level were considered significant.

Limitations

A number of studies have shown that the prevalence of chronic conditions may be affected by the use of proxy responses. While some studies have documented under-reporting of some chronic conditions by proxies, other studies have reported no under-reporting of chronic conditions by proxies.[14-19] Therefore, some changes in prevalence rates may be partially attributable to proxy response. The prevalence estimates of chronic conditions from the NPHS and the CHS were based on data collected for all members of selected households as reported by one knowledgeable member. However, the exact proxy response rate for the CHS cannot be determined, so it is not possible to assess the potential influence of proxy reporting.

The CHS asked all household members if they had high blood pressure. As well, some members of sampled households participated in the physical measures component of the CHS. All respondents who reported having high blood pressure were considered to have high blood pressure. Respondents who did not report high blood pressure but whose physical measure of blood pressure was high were also defined as having high blood pressure. By contrast, the NPHS data on blood pressure are based only on data reported by the respondent, which may result in a lower prevalence estimate.

Chart 1
Percentage of household population aged 12 or older reporting fair or poor health, Canada excluding territories, 1998/99



Data source: *1998/99 National Population Health Survey; cross-sectional sample, Health file*

Changes in self-perceived health

Using the NPHS longitudinal file, it was possible to examine transitions in health over the four-year period from 1994/95 to 1998/99 among Canadians aged 25 to 64.

During this time period, a small number of individuals in this age group died (just under 2%) and a negligible number were institutionalized. Not surprisingly, health status at baseline in 1994/95 was related to mortality. Of the individuals who reported fair or poor health in 1994/95, approximately 6% had died by 1998/99, six times the rate for individuals who reported excellent, very good, or good health at baseline (data not shown).

The vast majority (98%) of this population were still residing in households in 1998/99. Transitions in health status also occurred for a substantial proportion of these individuals (Table 1). Among the 1.3 million individuals aged 25 to 64 who reported fair or poor health in the 1994/95 survey, more than half (52%) reported an improvement to excellent, very good or good health in 1998/99. By contrast, of the 13.8 million individuals who reported excellent, very good or good health in 1994/95, 5% reported a decline to fair or poor health by 1998/99. This was one-third the rate of decline reported by those aged 65 or older (15%).

Factors associated with changes in self-perceived health

When considering changes in self-perceived health status, it is important to examine the interplay of physical, social and environmental factors that may influence this global measure of health.[20] These include age, income, education, health behaviours (such as smoking and exercise), chronic conditions and other health impairments (arthritis, heart disease and diabetes, for example), psychological well-being (such as depression and chronic stress) and social support (living arrangements and emotional support, for example). To investigate associations between these factors and changes in self-perceived health, multivariate regression analyses were conducted on

Table 1
Four-year transition rates in self-perceived health, household population aged 25 to 64, Canada excluding territories

Self-perceived health in 1994/95	Total		Self-perceived health in 1998/99				
			Total	Excellent, very good or good		Fair or poor	
	'000	%	%	'000	%	'000	%
Total	**15,120**	**100**	**100**	**13,740**	**91**	**1,390**	**9**
Excellent, very good or good	13,810	91	100	13,060	95†	760	5
Fair or poor	1,310	9	100	680	52	630	48‡

Data source*: National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
Note*: Based on 7,943 longitudinal respondents aged 25 to 64 in 1994/95 who were still residing in households in 1998/99.*
† Significantly higher than fair or poor in 1994/95
‡ Significantly higher than excellent, very good or good in 1994/95

Table 2
Adjusted odds ratios relating selected characteristics to changes in self-perceived health between 1994/95 and 1998/99, household population aged 25 to 64 in 1994/95, Canada excluding territories

	Decline		Improvement	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Sex				
Men	1.5	1.0, 2.1	1.4	0.8, 2.3
Women†	1.0	...	1.0	...
Age				
25-44†	1.0	...	1.0	...
45-64	1.5*	1.0, 2.2	0.7	0.4, 1.2
Education				
Less than secondary graduation‡	1.8*	1.2, 2.7	1.3	0.8, 2.1
Household income				
Lowest/Lower-middle	1.8*	1.1, 3.0	1.1	0.6, 1.9
Middle†	1.0	...	1.0	...
Upper-middle/Highest	0.8	0.5, 1.1	2.1*	1.2, 3.7
Social support				
Living alone‡	0.9	0.6, 1.3	1.0	0.6, 1.8
Low emotional support‡	1.1	0.7, 1.8	0.8	0.5, 1.3
Health behaviours				
Daily smoker‡	1.1	0.8, 1.6	0.7	0.4, 1.2
Infrequent exercise‡	1.4	0.9, 2.1	0.9	0.6, 1.6
Frequent drinker‡	0.6	0.3, 1.3	1.1	0.4, 3.4
Weight				
Underweight	1.2	0.6, 2.6	1.0	0.4, 2.9
Acceptable weight†	1.0	...	1.0	...
Excess weight	1.1	0.7, 1.6	0.9	0.5, 1.6
Activity dependent‡§	4.7*	2.8, 7.8	0.6	0.4, 1.1
Chronic and other health conditions§				
Arthritis or rheumatism‡	1.9*	1.2, 2.9	0.7	0.4, 1.2
Back problems‡	1.3	0.9, 1.9	0.6	0.4, 1.1
High blood pressure‡	1.4	0.8, 2.2	0.9	0.5, 1.6
Migraine headaches‡	1.3	0.9, 2.0	0.8	0.5, 1.5
Diabetes‡	4.4*	2.0, 10.0	0.8	0.4, 1.8
Heart disease‡	3.4*	1.9, 5.9	0.5	0.3, 1.1
Stomach or intestinal ulcers‡	1.7	0.9, 3.3	1.0	0.5, 2.0
Cancer‡	2.8	1.0, 7.9	--	--
Visual impairment‡	0.9	0.5, 1.7	--	--
Psychological well-being				
Low self-esteem‡	1.1	0.7, 1.8	0.3*	0.2, 0.5
High chronic stress‡	1.3	0.9, 2.0	1.1	0.6, 1.7
Major depressive episode‡§	2.2*	1.4, 3.4	0.8	0.4, 1.5

Data source: *National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
Notes: *The model for a decline in self-perceived health is based on 6,701 respondents aged 25 to 64 in 1994/95 , who then reported excellent, very good or good health and were still living in households in 1998/99; 357 of them reported fair or poor health in 1998/99; 440 records were removed from the analyses because of missing values. The model for an improvement in self-perceived health is based on 752 respondents aged 25 to 64, in 1994/95, who then reported fair or poor health and were still living in households in 1998/99; 379 of them reported excellent, very good or good health in 1998/99; 50 records were removed from the analyses because of missing values. Missing categories for the income and weight variables were included in the model to maximize sample size, but their odds ratios are not shown.*
† Reference category, for which the odds ratio is always 1.0
‡ Reference category is absence of the characteristic; for example, the reference category for "living alone" is "living with others."
§ For the model on decline in self-perceived health, the variables for activity dependence and chronic and other health conditions included conditions that existed in 1994/95 or in 1996/97. Likewise, major depressive episode included an episode in the year before 1994/95 or the year before 1996/97.
-- Sample size too small to include variable in model
** $p \leq 0.05$*

individuals aged 25 to 64 who were interviewed in both the 1994/95 and the 1998/99 NPHS. Those who lived in a household in 1994/95 but had either died or begun living in a health care institution by 1998/99 were excluded.

Chronic conditions and disability

As one might expect, chronic conditions and disability were associated with a decline in self-perceived health. Individuals who reported certain chronic conditions in the 1994/95 or 1996/97 NPHS had increased odds of reporting a decline in self-perceived health by 1998/99 (Table 2). These conditions included arthritis or rheumatism, diabetes, and heart disease. Individuals with an activity dependence had almost five times the odds of reporting a decline.

For most people, the presence of a chronic condition or activity dependence is enduring and would tend to influence an individual's perception of an improvement in health. However, based on this analysis, chronic conditions and activity dependence at baseline were not negatively associated with an improvement in self-perceived health among people in mid-life who rated their health as poor or fair in cycle 1. This lack of association may be partly explained by successful treatment for the condition, which in turn leads to a more positive evaluation of one's perceived health. In other cases, individuals may be reporting an episodic illness or disability despite being asked about conditions that have lasted or are expected to last six months or more. Once they have recovered, these respondents will rate their health more positively. Another possibility is that the health of some people with a chronic illness will improve. These potential explanations, along with the lack of information on severity or duration of the chronic illness, would tend to confound the results on the association of chronic condition to improvement in self-perceived health, especially for individuals who have multiple, severe or long-lasting illnesses.

Psychological well-being

Various components of psychological well-being were associated with changes in self-perceived health among people in mid-life. Individuals who were classified as having experienced a major depressive episode in the year prior to the 1994/95 or the 1996/97 NPHS had more than twice the odds of reporting a decline in self-perceived health by 1998/99 (Table 2). Furthermore, individuals who were classified as having low self-esteem in 1994/95 had decreased odds of reporting an improvement in self-perceived health in 1998/99.

Although the association between self-esteem and depression is well-known,[22] this analysis indicates that these two dimensions of psychological well-being are differentially associated with transitions in self-perceived health. When examining the transition to poorer health, excluding self-esteem

Definitions

The *self-perceived health* indicator reflects respondents' global evaluation of their overall health. Individuals were asked to rate their general health on a five-point scale as excellent (1), very good, good, fair, or poor (5). Research has indicated that there is substantial stability in this single global rating of health across time.[9] Based on the NPHS longitudinal file, the correlation of this item is 0.55 between 1994/95 and 1996/97, 0.55 between 1996/97 and 1998/99, and 0.49 between 1994/95 and 1998/99. Consistent with the previous research findings, these correlations indicate substantial stability.

Both the National Population Health Survey (NPHS) and the Canada Health Survey (CHS) assessed *chronic conditions* with a checklist of conditions. In the NPHS, respondents were asked if they had "any long-term health conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." In the CHS, respondents were asked if they had any "long-term health problems." Because of differences in questionnaire wording, only seven conditions were relatively comparable, and therefore, selected for the analyses of prevalence rates over time: heart disease, hypertension, diabetes, arthritis or rheumatism, bronchitis or emphysema, asthma, and migraine headaches. The CHS also gathered additional information on blood pressure from physical measurements. This information was used in the analyses in this article, based on recent recommendations for the cut-offs of high-blood pressure (systolic BP greater than or equal to140 mm Hg; diastolic BP greater than or equal to 90 mm Hg).[21]

Activity limitation is defined in the NPHS as any long-term physical or mental condition or disability that has lasted or is expected to last six months or longer and that limits the kind or amount of activity an individual can do at home, at school, at work, or in other settings. In the CHS, respondents who reported a limitation that lasted for at least six months were considered to have an activity limitation for the purposes of the analyses in this article.

(See *Appendix* for definitions of socioeconomic, social support, health behaviour and psychological variables.)

from the model does not lessen the association between depression and a decline in health. Furthermore, if depression is removed from this model, self-esteem remains non-significant. Similarly, when the transition to better health is explored, excluding depression does not alter the negative association between low self-esteem and improvement in health. When self-esteem is removed from this second model, depression remains non-significant. This suggests that, despite the correlation between these two dimensions of psychological well-being, depression is predictive of a negative change in self-perceived health, while moderate or high self-esteem is predictive of an improvement in self-perceived health.

Socioeconomic factors

Socioeconomic factors were also associated with changes in self-perceived health (Table 2). Individuals who did not graduate from high school had increased odds of reporting a decline, compared with those with higher levels of education. Likewise, individuals in the lowest or lower-middle income category had increased odds of reporting a decline, compared with those in the middle-income category.

While lower income was associated with a decline in self-perceived health, higher income was associated with an improvement in self-perceived health. Individuals in the upper-middle or highest income category had more than twice the odds of reporting an improvement, compared with those in the middle-income category.

Health behaviours

When controlling for the other variables included in the multivariate model, no significant associations were found between changes in self-perceived health and smoking, physical exercise, body weight and alcohol consumption. The inability to detect significant associations between changes in self-perceived health and these health behaviours may be partly due to correlations with other factors included in the model (education and income, for example). Studies have found significant relationships between low socioeconomic status and smoking, being overweight and lower levels of leisure-time physical activity.[23,24]

Trends in chronic conditions and activity limitation

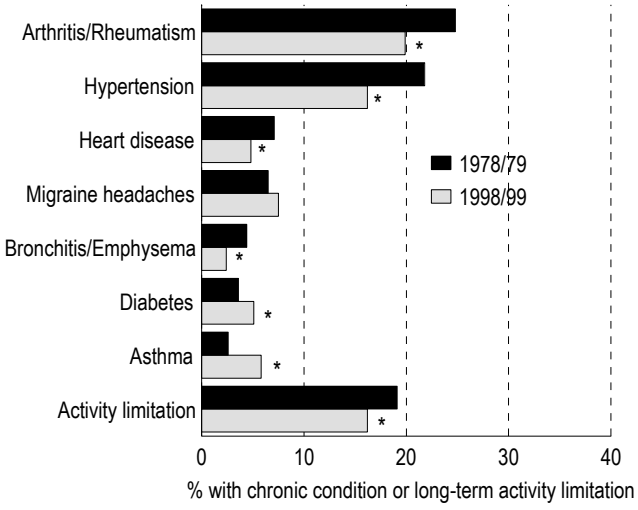
Individuals aged 45 to 64 are more likely to report fair or poor health, compared with those aged 25 to 44. Furthermore, individuals aged 45 to 64 have increased odds of reporting a decline in health, compared with those aged 25 to 44, based on data from adults who were interviewed in both the 1994/95 and the 1998/99 NPHS.

Chronic illness and disability are associated with decline in self-perceived health. Are chronic conditions and disability increasing or decreasing among Canadians aged 45 to 64 over time? Comparisons between the 1978/79 Canada Health Survey (CHS) and the first three cycles of the NPHS reveal several trends.

Prevalence of chronic conditions and activity limitation

Over the past 20 years, the prevalence of arthritis or rheumatism, high blood pressure, heart disease, and bronchitis or emphysema has decreased among Canadians aged 45 to 64 (Chart 2). The prevalence of activity limitation has also decreased. On the

Chart 2
Prevalence of chronic conditions or long-term activity limitation, household population aged 45 to 64, Canada excluding territories, 1978/79 and 1998/99



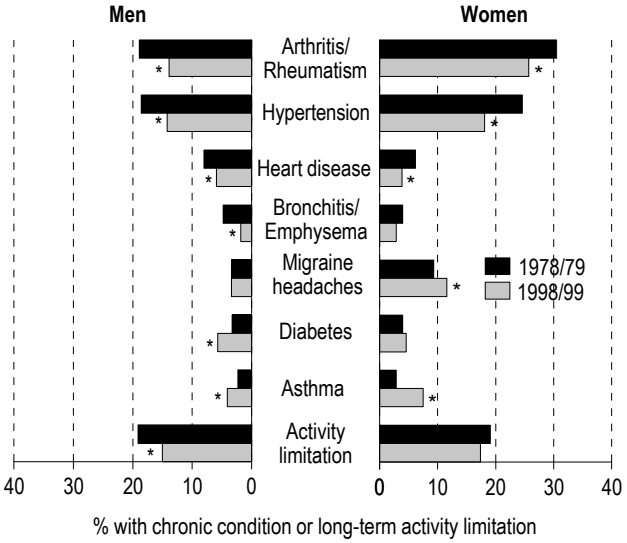
Data sources: *1978/79 Canada Health Survey; 1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from 1978/79, $p < 0.05$*

other hand, the prevalence of asthma and diabetes has increased. These trends are consistent with those in the United States (data not shown).

Differences between men and women

The direction of the trends in chronic conditions and activity limitation has been similar for men and women over the past 20 years, with some exceptions (Chart 3). The prevalence of diabetes has increased significantly among men, but not among women. The increase in the prevalence of asthma has been greater among women than among men, and bronchitis/emphysema has not declined significantly in prevalence among women as it has among men. Migraine headaches have become more prevalent among women, while the prevalence remained the same among men. Activity limitation became less prevalent among men, but there was no significant decrease in the prevalence among women.

Chart 3
Prevalence of chronic conditions or long-term activity limitation, by sex, household population aged 45 to 64, Canada excluding territories, 1978/79 and 1998/99



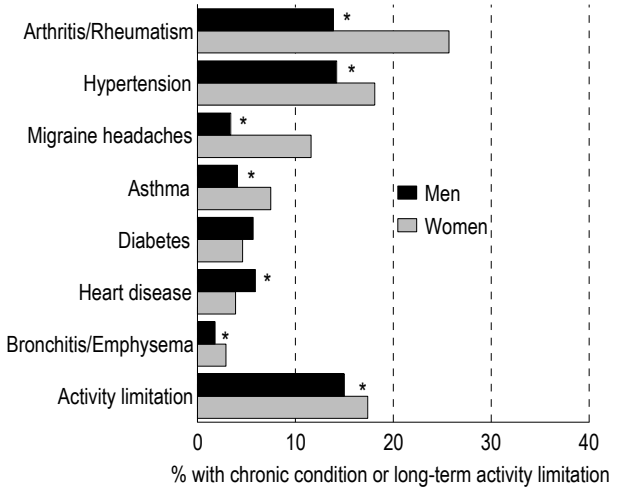
Data sources: *1978/79 Canada Health Survey; 1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from 1978/79, p < 0.05*

Table 3
Prevalence of chronic conditions or long-term activity limitation, by age group and region, household population aged 45 or older, Canada excluding territories, 1978/79 and 1998/99

	1978/79						1998/99					
	Canada	Atlantic	Québec	Ontario	Prairies	British Columbia	Canada	Atlantic	Québec	Ontario	Prairies	British Columbia
			%						%			
45-64												
Arthritis/Rheumatism	24.8	26.7	25.0	23.9	28.9*	20.3*	19.9	25.7*	14.8*	21.4	23.0*	18.3
Hypertension	21.8	25.0	21.0	22.8	20.7	19.4	16.2	19.4*	15.0	17.2	16.3	13.9
Heart disease	7.1	9.7	8.7	6.6	5.0*	5.6	4.8	6.1	4.6	6.1*	3.8	2.3*
Diabetes	3.6	3.5	4.7*	4.0	2.6	1.6*	5.1	5.9	4.1	5.7	5.8	4.4
Migraine headaches	6.5	5.6	6.2	6.0	6.7	9.0	7.5	7.1	6.7	7.5	8.0	8.9
Asthma	2.6	2.4	2.6	2.2	2.7	3.8	5.8	5.4	5.7	6.2	4.5*	6.6
Bronchitis/Emphysema	4.4	5.2	5.2	4.4	3.6	2.8	2.4	3.4*	2.1	2.3	2.5	2.6
Activity limitation	19.1	23.7	18.3	18.5	17.2	22.2	16.2	20.4*	13.2*	16.7	17.4	16.9
65+												
Arthritis/Rheumatism	42.7	44.2	37.8	43.3	44.7	46.4	41.5	44.5	34.3*	45.4*	44.1	38.8
Hypertension	39.2	43.8	37.5	39.8	38.7	37.4	35.6	41.0*	35.3	37.9	31.3*	31.4
Heart disease	18.2	21.6	16.6	19.6	15.5	18.0	17.4	19.7	14.6	18.8	16.1	19.0
Diabetes	6.5	8.4	5.1	8.1	6.6	3.3*	11.6	12.7	11.8	12.5	9.6	10.7
Migraine headaches	2.5	2.1	2.7	1.5	4.3	3.1	3.3	2.9	3.1	3.2	2.9	4.7
Asthma	3.9	3.7	3.4	4.6	3.4	4.1	5.7	7.5	4.5	6.0	6.8	4.9
Bronchitis/Emphysema	6.3	8.4	8.9	4.7	4.1	7.8	5.8	6.2	6.4	5.6	4.6	6.5
Activity limitation	35.4	40.0	33.2	32.5	36.4	43.0	29.1	32.3	22.9*	31.4	30.4	29.8

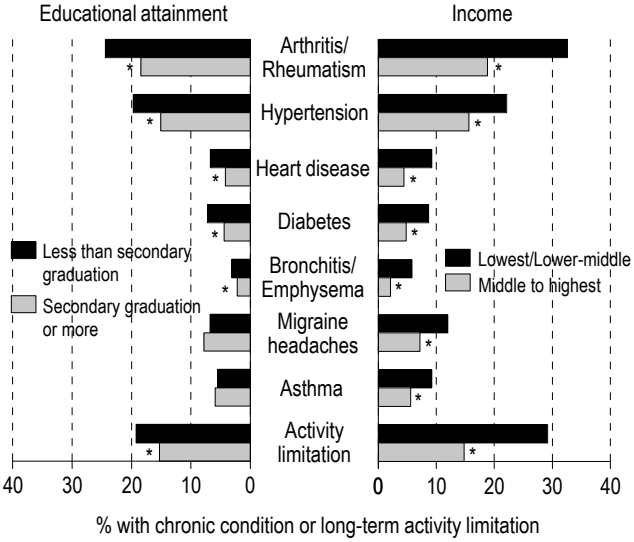
Data sources: *1978/79 Canada Health Survey; 1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from national average, p < 0.05*

Chart 4
Prevalence of chronic conditions or long-term activity limitation, by sex, household population aged 45 to 64, Canada excluding territories, 1998/99



Data source: *1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from women, p < 0.05*

Chart 5
Prevalence of chronic conditions or long-term activity limitation, by educational attainment and household income, household population aged 45 to 64, Canada excluding territories, 1998/99



Data source: *1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from less than secondary graduation or from lowest/ lower-middle, p < 0.05*

In 1998/99, arthritis or rheumatism, high blood pressure, migraine headaches, asthma, and bronchitis or emphysema were more prevalent among women, while heart disease was more prevalent among men (Chart 4). Activity limitation was more prevalent among women than among men.

Regional differences

There are regional differences in the prevalence of chronic conditions and activity limitation among Canadians aged 45 to 64 (Table 3). In 1998/99, the prevalence of arthritis or rheumatism, high blood pressure, bronchitis or emphysema, and long-term activity limitation was highest in the Atlantic region, and the prevalence of heart disease was higher in Ontario than in Canada as a whole. The differences in prevalence of these chronic conditions among regions were less pronounced in 1978/79. In 1998/99, the lowest prevalence of heart disease was in British Columbia, while the lowest prevalence of arthritis or rheumatism and long-term activity limitation was in Québec. The lowest prevalence of asthma was in the Prairies.

Socioeconomic differences

A decline in self-perceived health among individuals aged 25 to 64 was associated with lower levels of education and income. Chronic conditions and activity limitation are also more prevalent among individuals aged 45 to 64 with less education or less income. In 1998/99, arthritis or rheumatism, high blood pressure, heart disease, diabetes, bronchitis or emphysema, and activity limitation were more prevalent among those who had not graduated from high school (Chart 5). These conditions, as well as asthma and migraine headaches, were also more prevalent among those with a low or lower-middle income, compared with those with a middle to high income.

Concluding remarks

Most Canadians enjoy good health in their middle years. Moreover, the prevalence of several chronic conditions, as well as activity limitation due to illness, has declined over the past 20 years. These trends suggest that efforts in disease prevention and health

promotion, along with improvements in treatment of disease,[25,26] have contributed to improved health among recent cohorts aged 45 to 64, many of whom are "baby boomers."

Nevertheless, as Canadians grow older, they are more likely to perceive a decline in their health. When compared with younger adults aged 25 to 44, Canadians aged 45 to 64 have increased odds of reporting a decline in self-perceived health. Such declines in self-perceived health are associated with various factors, including the presence of certain chronic conditions.

While the prevalence of many chronic conditions has declined among Canadians aged 45 to 64 over the past 20 years, the prevalence of some chronic conditions, such as diabetes and asthma, has increased. Similar increases have been observed in the United States.[27,28] In Canada, there are important differences between men and women. The prevalence of diabetes and asthma has increased among men, while the prevalence of asthma and migraine headaches has increased among women.

The increase in diabetes among men is cause for particular concern, since diabetes is a high risk factor for heart disease, stroke, blindness, kidney diseases, disability and mortality. In the United States, the increase in the prevalence of diabetes has been partially attributed to an improvement in the sensitivity of methods to detect the condition, as well as increasing weight and sedentary lifestyle in the population.[27,29,30]

The increased prevalence of migraine headaches among women is also cause for concern. Stress has been identified as a risk factor for migraine headaches,[31] and more Canadian women report work-related stress than men, perhaps because they bear a disproportionate share of unpaid housework compared with men.[32] In addition, women who report migraine headaches have increased odds of experiencing a major depressive episode.

Between 1978/79 and 1998/99, the prevalence of asthma increased among men and women, and the prevalence of bronchitis and emphysema did not decrease among women as it did among men.

Finally, it is noteworthy that lower levels of education and income were associated with a decline in health and with chronic illness. Such socioeconomic disparities have been observed in other measures of health considered in this report. For example, life expectancy is higher in regions with lower levels of unemployment and higher levels of education, and infant mortality rates are highest in the poorest urban neighbourhoods. ●

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References

1 Mossey JM, Shapiro E. Self-rated health: a predictor of mortality among the elderly. *American Journal of Public Health* 1982; 72: 800-8.

2 Idler EL, Kasl S. Health perceptions and survival: do global evaluations of health status really predict mortality? *Journal of Gerontology* 1991; 46: S55

3 Pijls LTJ, Feskens EJM, Kromhout D. Self-rated health, mortality, and chronic diseases in elderly men: the Zutphen Study, 1985-1990. *American Journal of Epidemiology* 1993; 138: 840-8.

4 Blaum CS, Liang J, Liu X. The relationship of chronic diseases and health status to the health services utilization of older Americans. *Journal of the American Geriatrics Society* 1994; 42: 1087-93.

5 Evashwick C, Rowe G, Diehr P, et al. Factors explaining the use of health care services by the elderly. *Health Services Research* 1984; 19: 357-82.

6 Harris T, Kovar MG, Suzman R, et al. Longitudinal study of physical ability in the oldest-old. *American Journal of Public Health* 1989; 79(6): 698-702.

7 Mor V, Wilcox V, Rakowski W, et al. Functional transitions among the elderly: patterns, predictors, and related hospital use. *American Journal of Public Health* 1994; 84(8): 1274-80.

8 Branch LG, Leighton KU, Transitional probabilities to dependency, institutionalization and death among the elderly over a decade. *Journal of Aging and Death* 1989; 1(3): 370-408.

9 Maddox GL, Douglass EB. Self-assessment of health: a longitudinal study of elderly subjects *Journal of Health and Social Behavior* 1973; 14: 87-93.

10 Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18(2): 209-17.

11 Rust KF, Rao JNK. Variance estimation for complex surveys in using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 283-310.

12 Yeo D, Mantel H, Liu TP. Bootstrap variance estimation for the National Population Health Survey. *American Statistical Association: Proceedings of the Survey Research Methods Section*. Baltimore: August 1999.

13 Shah BV, Barnwell BG, Bieler GS. *SUDAAN User's Manual*. Release 7.5. Research Triangle Park, North Carolina: Research Triangle Institute, 1997.

14 Corder LS, Woodbury MA, Manton KG. Proxy response patterns among the aged: effects on estimates of health status and medical care utilization from the 1982-1984 long-term care surveys. *Journal of Clinical Epidemiology* 1996; 49(2): 173-82.

15 Koons DA. Quality control and measurement of nonsampling error in the Health Interview Survey. *Health and Vital Statistics* 1973; 2(54): 1-24.

16 Mathiowetz NA, Groves RM. The effects of respondent rules on health survey reports. *American Journal of Public Health* 1985; 75(6): 639-44.

17 Kovar MG, Wright RA. An experiment with alternate respondent rules in the National Health Interview Survey. *American Statistical Association: Proceedings of the Social Statistics Section* 1973: 311-16.

18 Lawrence RH. The structure of physical health status. Comparing proxies and self-respondents. *Journal of Aging and Health* 1995; 7(1): 79-98.

19 Miller RE, Massagli MP, Clarridge BR. Quality of proxy vs. self-reports: evidence from a health survey with repeated measures. *American Statistical Association: Proceedings of the Section on Survey Research Methods*. Washington, DC: American Statistical Association, 1986: 546-51.

20 Evans RG, Stoddart GL. *Producing Health, Consuming Health Care* (CHEPA working paper series #90-6). Hamilton: McMaster University, 1990.

21 Joffres MR, Hamet P, Rabkin SW, et al. Prevalence, control and awareness of high blood pressure among Canadian adults. *Canadian Medical Association Journal* 1992; 146(11): 1997-2005.

22 Beaudet M. Depression. *Health Reports* (Statistics Canada, Catalogue 82-003) 1996; 7(4): 11-24.

23 Federal, Provincial and Territorial Advisory Committee on Population Health. *Statistical Report on the Health of Canadians* (Catalogue H39-467/1999E). Ottawa: Minister of Public Works and Government Services, 1999.

24 Ford ES, Merritt RK, Heath GW, et al. Physical activity behaviors in lower and higher socioeconomic status populations. *American Journal of Epidemiology* 1991; 133(2): 1246-56.

25 Allaire SH, LaValley MP, Evans SR, et al. Evidence for decline in disability and improved health among persons aged 55 to 70 years: the Framingham Heart Study. *American Journal of Public Health* 1999; 89(11): 1687-93.

26 Mosterd A, D'Agostino RB, Silbershatz H, et al. Trends in the prevalence of hypertension, antihypertensive therapy, and left ventricular hypertrophy from 1950 to 1989. *New England Journal of Medicine* 1999; 340(16): 1221-7.

27 Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, improved fasting glucose, and impaired glucose tolerance in US adults. *Diabetes Care* 1998; 21(4): 518-24.

28 Goldring JM, James DS, Anderson HA. Chronic lung disease. In: Brownson RC, Remington PL, Davis JR, eds. *Chronic Disease Epidemiology and Control*. Washington, DC: American Public Health Association, 1998.

29 American Diabetes Association. *Diabetes 1996: Vital Statistics*. Alexandra, Virginia: American Diabetes Association, 1996.

30 Trends in the prevalence and incidence of self- reported diabetes mellitus–United States, 1980-1994. *Mortality and Morbidity Weekly Reports* 1997; 46(43): 1014-8.

31 Prevalence of chronic migraine headaches–United States, 1980-1989. *Mortality and Morbidity Weekly Reports* 1991; 40(20): 337-8.

32 Federal, Provincial and Territorial Advisory Committee on Population Health. *Toward a Healthy Future: Second Report on the Health of Canadians*. Ottawa: Minister of Public Works and Government Services, 1999.

33 National Health and Welfare. *Canadian Guidelines for Healthy Weights*. Report of an Expert Group convened by the Health Promotion Directorate, Health Services and Promotion Branch. Ottawa: Minister of National Health and Welfare, 1988.

34 Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. *Archives of General Psychiatry* 1994; 51: 8-19.

35 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, Third rev. ed. Washington, DC: American Psychiatric Association, 1987.

Appendix

Socioeconomic, social support, health behaviour and psychological variables

The *education* variable was based on the highest level of education attained and was classified into two groups: less than secondary school graduation and secondary school graduation or more.

In the analyses based on National Population Health Survey (NPHS) data, *income* was defined based on the number of people in the household and total household income from all sources in the 12 months before the survey. The following income groups were used:

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

In the analysis based on Canada Health Survey data, income was defined based on a derived economic family income quintile variable.

Social support variables included living arrangements and emotional support. *Living arrangement* categories were defined as living alone or living with at least one other person. Four "yes"/"no" questions were used to measure *emotional support*. Respondents were asked if they had someone they could confide in, count on, who could give them advice, and who could make them feel loved. If the answer to any of these questions was "no," the respondent was classified as having low emotional support.

Health behaviour variables included smoking status, alcohol consumption, frequency of exercise, and body weight. *Smoking status* was defined as less than daily or daily smoking. To measure *alcohol consumption*, respondents were asked the number of drinks they had on each day in the week before the survey. Respondents were classified as frequent drinkers if they had consumed 15 or more drinks over the week (an average of over two drinks per day). Frequency of exercise was based on the number of times in the previous three months that respondents had participated in a leisure-time physical activity lasting more than 15 minutes. Respondents who averaged less than four times per month were classified as having *infrequent exercise*.

The *Canadian Guidelines for Healthy Weights* use body mass index (BMI) to determine an acceptable range of healthy weights and to identify conditions of excess weight and underweight.[33] BMI is calculated by dividing weight in kilograms by height in metres squared. Four *weight categories* were identified based on BMI: underweight (BMI less than 20), acceptable weight (BMI 20 to 24.9), some excess weight (BMI 25 to 27), and overweight (BMI greater than 27). These guidelines are recommended for everyone aged 20 to 64 excluding pregnant women. In accordance with these guidelines, for this analysis, individuals whose BMI was 25 or higher at baseline in 1994/95 were classified as having *excess weight* and those with a BMI of less than 20 were classified as *underweight*.

Activity dependence refers to the need for help (for health reasons) with basic activities of daily living such as personal care (washing, dressing or eating) or moving about inside the house. Activity dependence also includes the need for help with instrumental activities of daily living (IADL) such as preparing meals, shopping for groceries or other necessities, or doing normal everyday housework.

Vision was classified into the following categories: no problem, problem corrected by lenses, uncorrected problem seeing close, uncorrected problem seeing distance, uncorrected problem seeing close and distance, and no sight. Respondents were classified as having a visual impairment if they had an uncorrected problem (that is, the last four categories).

Psychological well-being was assessed with three variables: chronic stress, self-esteem and depression. To measure *chronic stress*, NPHS respondents were asked whether the following statements were true or false:

- You are trying to take on too many things at once.
- There is too much pressure on you to be like other people.
- Too much is expected of you by others.
- You don't have enough money to buy the things you need.
- Your partner doesn't understand you.
- Your partner doesn't show enough affection.
- Your partner is not committed enough to your relationship.
- You find it is very difficult to find someone compatible with you.
- One of your children seems very unhappy.
- A child's behaviour is a source of serious concern to you.
- Your work around the home is not appreciated.
- Your friends are a bad influence.
- You would like to move but you cannot.
- Your neighbourhood or community is too noisy or too polluted.
- You have a parent, a child or partner who is in very bad health and may die.
- Someone in your family has an alcohol or drug problem.
- People are too critical of you or what you do.

A score of 1 was assigned to each "true" response. Adjustments were made if certain items were not applicable to a respondent (for

example, respondents without a partner) so that total scores were all based on the same denominator. Respondents whose total scores fell in the upper quartile of the distribution for the 18-or-older population (scores greater than or equal to 5) were categorized as having high chronic stress.

Self-esteem measures the "positiveness" with which individuals regard themselves. On a five-point scale from "strongly disagree" (score 0) to "strongly agree" (score 4), NPHS respondents replied to six statements:

You feel that you have a number of good qualities.

You feel that you are a person of worth at least equal to others.

You are able to do things as well as most other people.

You take a positive attitude toward yourself.

On the whole, you are satisfied with yourself.

All in all, you are inclined to feel you're a failure (scoring reversed).

Respondents whose total scores fell in the lower quartile of the distribution for the 18-or-older population (scores less than or equal to 17) were categorized as having low self-esteem.

Using the methodology of Kessler et al.,[34] the National Population Health Survey defines a *major depressive episode* (MDE) with 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*.[35] Responses to these questions were scored and transformed into a probability estimate of a diagnosis of MDE. If the estimate was 0.9 or more, that is, 90% certainty of a positive diagnosis, then the respondent was considered to have experienced an MDE in the 12 months before the survey.

Health among older adults

Highlights

- Our improving life expectancy in Canada does not necessarily mean more years in poor health. Older adults can expect an improved quality as well as an extended quantity of life compared with 20 years ago.
- Aging does not necessarily result in a continuous decline in health. Close to half of older Canadians who reported fair or poor health in 1994/95 reported an improvement in their health in 1998/99.
- The rate of institutionalization for Canadians aged 65 or older declined from 16% in 1981 to 14% in 1996, even with increases in life expectancy.
- The rate of activity limitation among adults aged 65 to 74 who live at home has declined since 1978; among adults aged 75 or older who live at home, the rate has not changed since 1978.
- The socioeconomic trends observed in younger age groups continue among older adults, although less so. Seniors who did not graduate from high school have increased odds of dying; those with low incomes have increased odds of institutionalization.

Canadians who turn 65 in the year 2000 can expect to celebrate quite a few more birthdays than they did a century ago. In 1900, a 65-year-old man would have been expected to live an additional 11.0 years, to age 76; a 65-year-old woman, an additional 12.0 years. By the beginning of the 1980s, life expectancy for Canadians 65 years of age had increased to 14.6 additional years for men and 19.0 more years for women.[1] By 1996, there were even further advances, with men expecting to live an additional 16.1 years and women, an additional 20.0 years beyond the age of 65.

While longer life expectancy among older adults is welcome, the quality of life for this age group is equally important. Older adults are more likely than younger Canadians to suffer from chronic conditions, to have activity limitations, and to be dependent on others for assistance in the activities of daily living. However, the resulting decline in health is not experienced at the same pace or in the same way by all older Canadians. Indeed, many older adults remain in good health into very old age. An important question is what enables older adults to remain in good health and retain their independence as they grow older.

Methods

Data sources

The following data sources were used in the analyses for this article: the National Population Health Survey (NPHS) (see *Annex),* the Canada Health Survey, the Health Promotion Survey, and the Census of Population.

The 1998/99 estimates of prevalence of chronic conditions are based on the 1998/99 NPHS cross-sectional General file. The NPHS cross-sectional Health files from all three cycles of the NPHS (1994/95, 1996/97 and 1998/99) were used to produce the trends in activity limitation. The 1994/95-to-1998/99 longitudinal file was used in the analyses of transitions in health status.

The 1978/79 estimates of prevalence of chronic conditions are based on the 1978/79 Canada Health Survey (CHS). The CHS, conducted by Statistics Canada Health and Welfare Canada, took place from May 1978 through March 1979. The survey covered the non-institutionalized population, excluding residents of the Territories, Indian reserves and remote areas. The sample size was 12,218 households. An interviewer collected data on chronic conditions and activity limitations for the entire household from a suitable household member. The household response rate to this component was 86%. A subset of sampled individuals were asked to participate in the physical measures component. Part of this component involved measuring blood pressure.

Results for the 1985 and 1990 Health Promotion Survey (HPS) were used in the production of trends for activity limitation. This survey was conducted by Statistics Canada for Health and Welfare Canada to collect information on the knowledge, attitudes and behaviours of Canadians about health issues. Both survey designs used random digit dialling (RDD) sampling techniques; that is, telephone numbers were randomly generated by the computer, and each number was then dialled. If the telephone number generated was the number for a household, a list was made of all household members, and one member 15 years of age or older was selected at random to complete the Health Promotion Survey. The overall response rate for the 10 provinces for the 1985 HPS was 81% with a total of 10,649 responding records; the response rate for the 1990 HPS was 78% with a total of 13,792 responding records.

Data from the 1981, 1986, 1991 and 1996 Census of Population were used to explore trends in the percentage of the population residing in health care institutions.

Analytical techniques

This analysis examines transitions in health for individuals aged 65 or older. Data from the longitudinal component of the NPHS for the 10 provinces were used to estimate changes over a four-year period (1994/95 to 1998/99). The indicators selected for the analyses include changes in functional status, changes in self-perceived health, institutionalization and mortality (see *Definitions*). Multiple logistic regression was used to explore the determinants of functional decline, functional improvement, declines and improvement in self-perceived health, institutionalization, and mortality over this four-year period. When considering health and transitions in health status, it is important to be aware of the interplay of physical, social and environmental factors that may influence health. Therefore, socio-demographic variables, health behaviours, chronic conditions, measures related to psychological well-being, and social support variables were all entered into the multivariate models that were used to explore the determinants of transition (see *Appendix*). Not all variables were used in each model. Decisions were made based on the appropriateness of the variable for the specific outcome under consideration. In some cases, small sample counts prohibited the use of a variable in a particular transition model. Unless otherwise specified, all determinants were measured at baseline in 1994/95.

Further analyses were conducted to compare the prevalence rates of various health indicators over time. Comparisons of prevalence rates of chronic conditions are made between 1978/79 (based on estimates from the Canada Health Survey) and 1998/99 (based on estimates from the cross-sectional household component of the third cycle of the NPHS). Comparisons are made of prevalence rates of activity limitation over six time periods: 1978/79 (based on estimates from the Canada Health Survey), 1985 (based on the Health Promotion Survey), 1990 (based on the Health Promotion Survey) and 1994/95, 1996/97 and 1998/99 (based on the cross-sectional estimates from the first three cycles of the NPHS). Finally, using data from the Census of Population, estimates of the proportions of individuals residing in health care institutions are compared for 1981, 1986, 1991 and 1996.

All analyses based on survey data have been weighted to represent the appropriate target population. For estimates based on NPHS data, the weighted bootstrap procedure was used to estimate sampling error; that is, in the estimates of standard error of prevalence rates and in the calculation of the confidence intervals for the odds ratios in the logistic regression models.[2-4] This procedure fully accounts for the design effects of the NPHS. For prevalence rates based on data from the CHS, estimates of standard errors were calculated with SUDAAN, which uses a Taylor series linearization method to adjust for the complex design of the CHS.[5] Standard errors for rates derived from the Health Promotion Survey (1985 and 1990) were estimated from approximate sampling variability tables. Standard errors from these tables are based on the formulae for simple random sampling with the incorporation of a conservative estimate of a design effect to account for the complex sampling design of these surveys.

Results at the $p \leq 0.05$ level were considered significant.

This article examines trends in several measures of health status among older adults (aged 65 or older): institutionalization, activity limitation, and chronic conditions. The analyses are based on data from the Canadian Census of Population, the 1978/79 Canada Health Survey (CHS), the 1985 and 1990 Health Promotion Survey (HPS), and the 1994/95, 1996/97 and 1998/99 National Population Health Survey (NPHS) (see *Methods, Definitions* and *Limitations*).

Using data from the NPHS longitudinal file, the article also identifies factors that are associated with decline or improvement in health status among older adults. The indicators selected for analysis include mortality, institutionalization, changes in functional status and changes in self-perceived health.

Trends in health status among older adults

The examination of three aspects of health status—institutionalization, activity limitation and chronic conditions—over the past 20 years reveals certain trends. In general, the proportion of seniors aged 75 or older residing in health care institutions has declined. The prevalence of activity limitation decreased for the 65-to-74 age group and remained stable for individuals aged 75 or older, while the prevalence of most chronic conditions among adults aged 65 or older residing in private households did not change significantly.

Institutionalization

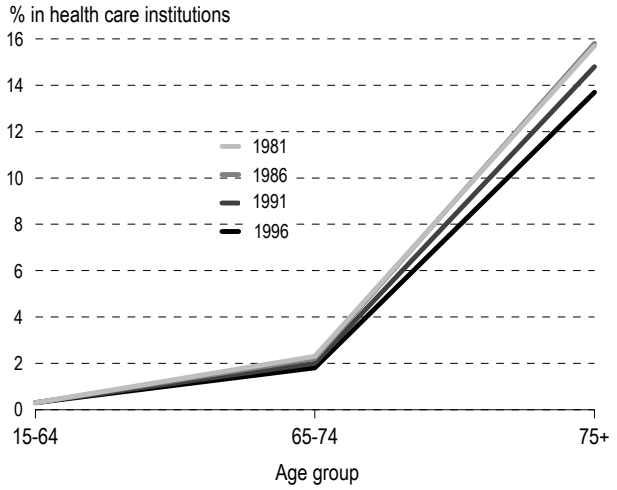
The rate of institutionalization is higher for Canadians aged 65 or older than for younger age groups. However, according to the census, from 1986 to 1996 there was a decline in institutionalization among adults aged 75 or older (Chart 1). In 1981 and 1986, almost 16% of Canadians aged 75 or older resided in health care institutions. By 1996, the rate had dropped to about 14%.

Activity limitation

For adults aged 65 to 74, the rates of activity limitation reported in the 1996/97 NPHS and the 1998/99 NPHS are significantly lower than the rates reported in the 1978/79 CHS and the 1985 HPS (Chart 2). During this 20-year period, there were no significant changes in the rates of activity limitation among adults aged 75 or older.

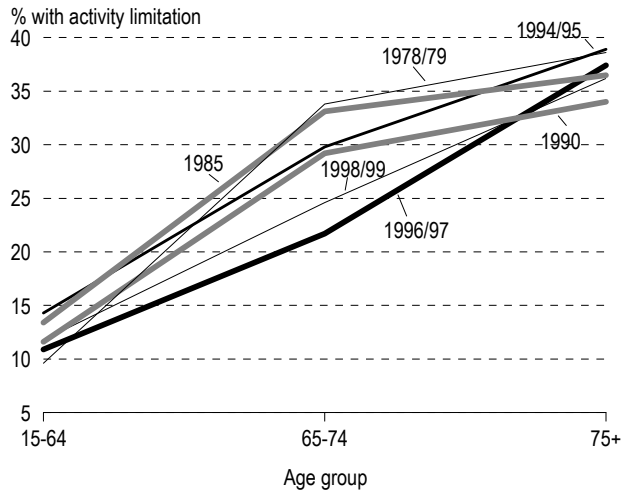
There are two factors that may account for the rate of activity limitation not having fallen among the 75-or-older group over the past 20 years. Life expectancy for seniors has increased since 1980,

Chart 1
Percentage of population aged 15 or older living in health care institutions, Canada, 1981, 1986, 1991 and 1996



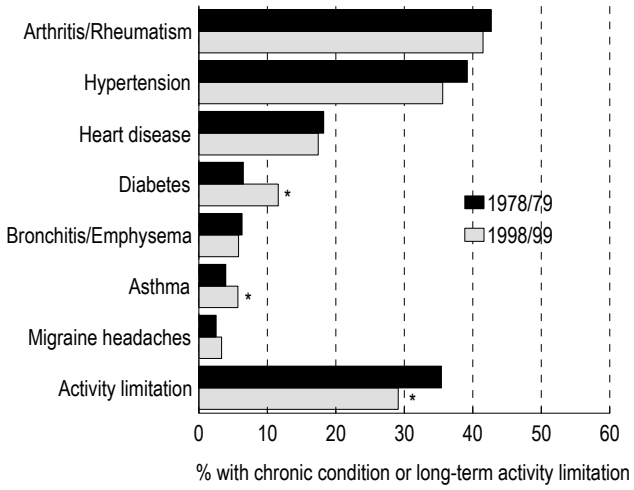
***Data sources**: 1981, 1986, 1991 and 1996 Census of Canada*

Chart 2
Prevalence of long-term activity limitation, by age group, household population aged 15 or older, selected years, 1978/79 to 1998/99



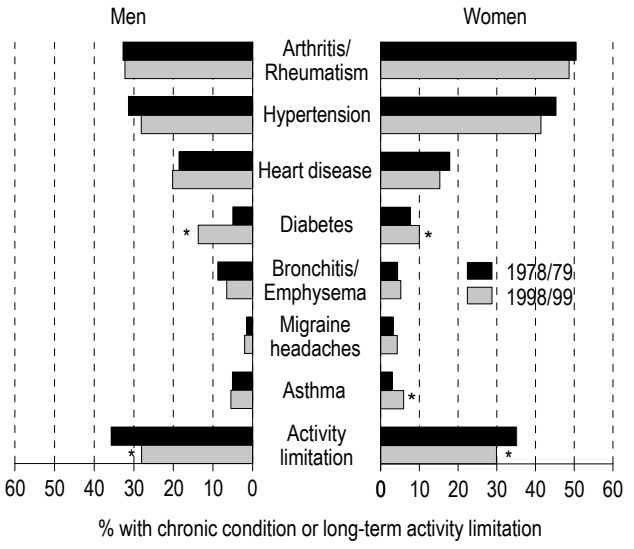
***Data sources**: 1978/79 Canada Health Survey; 1985 and 1990 Health Promotion Survey; 1994/95, 1996/97 and 1998/99 National Population Health Survey*

Chart 3
Prevalence of chronic conditions or long-term activity limitation, household population aged 65 or older, Canada excluding territories, 1978/79 and 1998/99



Data sources: *1978/79 Canada Health Survey; 1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from 1978/79, p < 0.05*

Chart 4
Prevalence of chronic conditions or long-term activity limitation, by sex, household population aged 65 or older, Canada excluding territories, 1978/79 and 1998/99



Data sources: *1978/79 Canada Health Survey; 1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from 1978/79, p < 0.05*

which means the average age for those aged 75 or older has also been increasing. Furthermore, the percentage of individuals aged 75 or older living in health care institutions has decreased since 1986. One might expect, therefore, that more seniors aged 75 or older who are still residing in households would report activity limitation in recent years compared with 1978/79. This is not the case, however.

Prevalence of chronic conditions

Chronic conditions are more prevalent among seniors than among adults aged 45 to 64 (Chart 3; also see Chart 2 in *Health in mid-life*, p. 40).

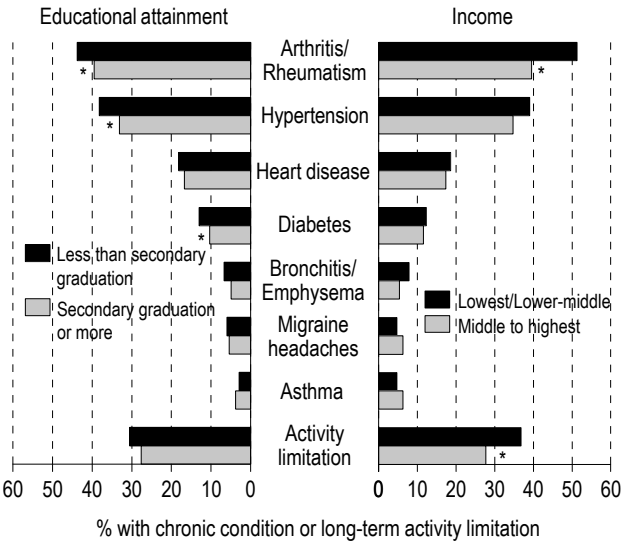
The prevalence of most chronic conditions among adults aged 65 or older did not change significantly between the 1978/79 CHS and the 1998/99 NPHS, with the exception of diabetes and asthma, which increased significantly in prevalence (Chart 3). The prevalence of diabetes increased significantly among older men and women (Chart 4), while the prevalence of asthma increased significantly among older women.

Currently, the prevalence of arthritis or rheumatism, high blood pressure and migraine headaches is significantly higher among women than among men, while the prevalence of heart disease and diabetes is significantly higher among men than among women.

Some chronic conditions are more prevalent among seniors who have not graduated from high school and who have lower levels of income (Chart 5). However, this socioeconomic disparity is not associated with as many chronic conditions among seniors as among adults aged 45 to 64 (see Chart 5 in *Health in mid-life*, p. 42).

There are regional variations in the prevalence of chronic conditions and activity limitation among adults aged 65 or older (see Table 3 in *Health in mid-life*, p. 41). In 1998/99, the prevalence of high blood pressure in the Atlantic region was significantly higher than the Canadian average. The prevalence of arthritis or rheumatism in Ontario was higher than the national average. The lowest prevalence of arthritis or rheumatism and long-term activity limitation was in Québec in 1998/99. While there were regional differences in the prevalence of these

Chart 5
Prevalence of chronic conditions or long-term activity limitation, by educational attainment and household income, household population aged 65 or older, Canada excluding territories, 1998/99



Data sources: *1998/99 National Population Health Survey, cross-sectional sample, General file*
** Significantly different from less than secondary graduation or from lowest/ lower-middle, p < 0.05*

chronic conditions in 1978/79, the differences were generally not statistically significant.

Changes in health status

Using the NPHS longitudinal file, it was possible to examine transitions in health status over the four-year period from 1994/95 to 1998/99. Declines in health are more frequent among older adults than the rest of the population, particularly among the very elderly (aged 85 or older). However, some older adults—even those of advanced age—also experience improvements in health.[6-8]

When considering changes in health status, it is important to examine the interplay of physical, social and environmental factors that may influence health.[9] These include age, income, education, health behaviours, chronic conditions and other health impairments, psychological well-being, and social support. In order to examine the determinants of changes in health status, multivariate regression analyses were conducted taking account of these factors to determine the independent association of these factors with four key transitions in the health status of seniors: mortality, institutionalization, functional status, and self-perceived health.

Mortality and institutionalization

Of the seniors in private households who were surveyed in 1994/95, 16% had died by 1998/99 and 3% were residing in institutions. As one might expect from current life expectancy, the odds of dying were greater among those aged 75 or older and among men (Table 1). Not surprisingly, age was also associated with institutionalization. Individuals aged 75 to 84 had five times the odds of residing in an institution by 1998/99, compared with those aged 65 to 74. The odds ratio for individuals aged 85 or older was 10 times that for 65- to 74-year-olds.

Research indicates that functional status and self-perceived health are associated with mortality.[7,8,10-14] Consistent with these research findings, in this analysis based on NPHS data, individuals who reported an activity dependence in 1994/95 (cycle 1) had increased odds of dying (odds ratio=3.6), compared with those who had no limitations at cycle 1, as did those who were not dependent but had an activity limitation (odds ratio=1.8). The lack of a significant association between mortality and self-perceived health at baseline is due in part to the correlation between self-perceived health and functional status. Indeed, when the functional status variables are not included in the multivariate analysis to predict mortality, individuals who reported fair or poor health in 1994/95 had increased odds of dying, compared with those who reported excellent, very good or good health (data not shown). Some studies have found that self-rated health is predictive of death independent of more objective measures of health status.[11] The relatively short timeframe (four years) on which this analysis is based may result in the lack of association between mortality and self-perceived health when controlling for functional status.

An association was found between self-perceived health and institutionalization. Seniors who reported fair or poor health in 1994/95 had over 2.5 times the odds of living in an institution in 1998/99,

Table 1
Adjusted odds ratios relating selected characteristics to mortality and institutionalization between 1994/95 and 1998/99, household population aged 65 or older in 1994/95, Canada excluding territories

	Mortality		Institutionalization	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Sex				
Men	1.9*	1.2, 2.8	0.4	0.2, 1.1
Women†	1.0	...	1.0	...
Age				
65-74†	1.0	...	1.0	...
75-84	2.9*	1.9, 4.2	5.0*	2.3, 11.0
85+	3.8*	2.1, 6.9	10.1*	2.7, 38.3
Educational attainment				
Less than secondary graduation‡	1.5*	1.0, 2.1	0.9	0.4, 2.0
Household income				
Lowest/Lower-middle	1.1	0.7, 1.6	2.2*	1.1, 4.5
Middle/Upper-middle/Highest†	1.0	...	1.0	...
Social support				
Living alone‡	1.0	0.7, 1.5	1.2	0.5, 3.1
Low emotional support‡	1.1	0.7, 1.6	1.3	0.6, 2.7
Health behaviours				
Daily smoker‡	1.2	0.7, 2.1	- -	- -
Infrequent exercise‡	1.3	0.7, 1.9	- -	- -
Functional status§				
Activity-dependent	3.6*	2.2, 5.7	0.9	0.4, 2.0
Activity-limited	1.8*	1.1, 2.8		
No limitation†	1.0	...	1.0	...
Self-perceived health status				
Fair/Poor	1.4	1.0, 2.0	2.6*	1.1, 5.9
Excellent/Very good/Good†	1.0	...	1.0	...
Chronic and other health conditions††				
Arthritis or rheumatism‡	0.8	0.6, 1.1	0.9	0.4, 2.1
Back problems‡	0.7	0.4, 1.1	- -	- -
Diabetes‡	1.3	0.8, 2.2	- -	- -
Heart disease‡	1.4	0.9, 2.1	0.8	0.3, 1.9
Cancer‡	2.6*	1.4, 4.7	- -	- -
Effects of a stroke‡	1.2	0.5, 2.7	- -	- -
Urinary incontinence‡	1.1	0.5, 2.4	2.1	0.7, 6.2
Cognitive impairment‡	1.6	0.7, 3.6	3.2*	1.1, 9.8
Visual impairment‡	1.3	0.7, 2.3	3.0*	1.3, 7.1

***Data source**: National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
***Notes:** The mortality model is based on 2,402 respondents aged 65 or older in 1994/95; 402 of them had died by 1998/99; 31 records were removed from the analyses because of missing values. The institutional model is based on 1,986 respondents aged 65 or older in 1994/95 who were still living in 1998/99; 92 of them had been institutionalized by 1998/99; 39 records were removed from the analyses because of missing values. Missing categories for the income, emotional support and exercise variables were included in the model to maximize sample size, but their odds ratios are not shown.*
† Reference category for which the odds ratio is always 1.0
‡ Reference category is absence of characteristic; for example, the reference category for "living alone" is "living with others."
§ For the institutionalization model, activity-dependent and activity-limited were combined. The reference category is no limitation.
†† For the institutionalization model, chronic and other health conditions included conditions that existed in 1994/95 or in 1996/97.
- - Sample size too small to include variable in model
... Not applicable
** $p \leq 0.05$*

compared with those who reported excellent, very good or good health. Functional status at baseline was not associated with institutionalization.

Socioeconomic factors were also associated with mortality and institutionalization. When controlling for other variables included in the multivariate model, seniors who did not graduate from high school had increased odds of dying, compared with seniors who had attained higher levels of education. Income was not associated with mortality. Although there is a positive correlation between education and income, when education is not included in the multivariate analysis to predict mortality, income remains non-significant among the elderly population (data not shown).

Consistent with other research based on Canadian data,[15] level of income was associated with institutionalization. Seniors in the lowest or lower-middle income groups had over twice the odds of being institutionalized, compared with those in the middle or highest incomes groups.

Institutionalization was associated with certain health conditions. Individuals who reported a severe cognitive impairment in either 1994/95 or 1996/97 had increased odds of living in an institution in 1998/99. The same was true for individuals who had an uncorrected visual impairment.

The only health condition found to be associated with mortality was cancer. Individuals with cancer at baseline had over 2.5 times the odds of dying.

Changes in functional status

The remainder of this article examines transitions in health status among seniors who were surveyed in 1994/95 and who were still alive and residing in households in 1998/99 (81% of seniors).

While the majority of seniors were free from activity limitations and dependencies in both 1994/95 (70%) and 1998/99 (63%), a higher percentage were activity-dependent in 1998/99, compared with four years earlier in 1994/95 (24% in 1998/99 versus 12% in 1994/95) (Table 2). This is consistent with research indicating that age at baseline exerts a powerful effect on subsequent functional status.[7]

Of the 1.8 million seniors who were without any limitations in 1994/95, 15% reported activity dependence four years later, and 8% reported activity limitation without activity dependence—a decline in functional status. However, improvements in functional status were realized for some seniors. Of the 310,000 seniors who reported activity dependence in 1994/95, 13% reported in 1998/99 that they were limited but not dependent; a further 19% reported no activity limitation at all—an improvement in functional status.

Determinants of functional decline or improvement

In order to explore the determinants of functional decline and improvement, two groups of seniors

Table 2
Four-year transition rates in functional status, household population aged 65 or older in 1994/95, Canada excluding territories

Functional status in 1994/95	Total		Functional status in 1998/99							
			Total	Activity dependent		Activity limited, but not dependent		No limitation		Not stated
	'000	%	%	'000	%	'000	%	'000	%	
Total	**2,590**	**100**	**100**	**620**	**24**	**330**	**13**	**1,640**	**63**	**- -**
Activity-dependent	310	12	100	210	68 †‡	40	13 ††	60	19 ††	- -
Activity-limited, but not dependent	470	18	100	140	29 ‡	140	30 ‡§	190	41 §	- -
No limitation	1,810	70	100	270	15	140	8	1,390	77 †§	- -

***Data source**: National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
***Note:** Based on 1,923 longitudinal respondents aged 65 or older in 1994/95 who were still residing in households in 1998/99.*
† Significantly higher than activity-limited in 1994/95
‡ Significantly higher than no limitation in 1994/95
§ Significantly higher than activity-dependent in 1994/95
†† Coefficient of variation between 16.6% and 25.0%
- - Amount too small to provide reliable estimate

Table 3
Adjusted odds ratios relating selected characteristics to changes in functional status between 1994/95 and 1998/99, household population aged 65 or older in 1994/95, Canada excluding territories

	Functional decline (activity-dependent in 1998/99)		Functional improvement (no limitation in 1998/99)	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Sex				
Men	0.6*	0.4, 1.0	0.7	0.4, 1.3
Women†	1.0	...	1.0	...
Age				
65-74†	1.0	...	1.0	...
75-84	2.6*	1.7, 4.0	1.0	0.5, 1.8
85+	9.0*	2.9, 27.5		
Educational attainment				
Less than secondary graduation‡	1.2	0.8, 1.8	1.0	0.5, 1.8
Household income				
Lowest/Lower-middle	0.9	0.6, 1.4	1.1	0.6, 2.2
Middle/Upper-middle/Highest†	1.0	...	1.0	...
Social support				
Living alone‡	1.1	0.7, 1.6	0.7	0.4, 1.3
Low emotional support‡	1.2	0.8, 2.0	1.2	0.6, 2.5
Health behaviours				
Daily smoker‡	1.3	0.7, 2.4	1.0	0.4, 2.5
Infrequent exercise‡	1.3	0.8, 2.1	1.0	0.6, 1.8
Functional status§				
Activity-dependent	...	...	0.4*	0.2, 0.6
Activity-limited	2.0*	1.3, 3.2	1.0	...
No limitation	1.0	...	...	...
Self-perceived health status				
Fair/Poor	1.7*	1.0, 2.9	0.5*	0.3, 0.9
Excellent/Very good/Good†	1.0	...	1.0	...
Chronic and other health conditions††				
Arthritis or rheumatism‡	1.2	0.8, 1.9	0.9	0.5, 1.7
Back problems‡	0.9	0.6, 1.5	0.9	0.5, 1.6
Diabetes‡	1.2	0.7, 2.3	1.5	0.6, 3.4
Heart disease‡	1.2	0.8, 1.9	0.8	0.4, 1.5
Effects of a stroke‡	1.6	0.6, 4.5	- -	- -
Urinary incontinence‡	1.9*	1.0, 3.6	- -	- -
Visual impairment‡	1.5	0.7, 3.2	2.4	0.8, 6.7

***Data source**: National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
***Notes:** The functional decline model is based on 1,619 respondents aged 65 or older with no activity dependence or limitation in 1994/95 and who were still living in households in 1998/99; 284 of them reported an activity dependency by 1998/99; 38 records were removed from the analyses because of missing values. The functional improvement model is based on 606 respondents aged 65 or older who were activity-dependent or activity-limited in 1994/95 and who were still living in households in 1998/99; 191 of them reported no activity dependence or limitation in 1998/99; 13 records were removed from the analyses because of missing values. Missing categories for the income, emotional support and exercise variables were included in the model to maximize sample size, but their odds ratios are not shown.*
† Reference category for which the odds ratio is always 1.0
‡ Reference category is absence of characteristic; for example, the reference category for "living alone" is "living with others."
§ The reference category for function status is "no limitation" for the functional decline model, and "activity dependent" for the functional improvement model.
†† For the functional decline model, chronic and other health conditions included conditions that existed in 1994/95 or in 1996/97.
- - Sample size too small to include variable in model
... Not applicable
** $p \leq 0.05$*

were formed. Seniors who reported an activity limitation or dependence in 1994/95 were selected to examine factors associated with an improvement in functional health (an improvement to no limitation four years later). Conversely, seniors who reported an activity limitation or no limitation in 1994/95 were selected to examine factors associated with a decline to activity dependence four years later.

Consistent with previous research,[7,8] functional decline was associated with poorer self-perceived health. Seniors who reported fair or poor health in 1994/95 had increased odds of being activity dependent four years later (Table 3). Conversely, seniors who reported fair or poor health in 1994/95 had decreased odds of having no limitations in 1998/99.

As might be expected, age was a significant factor in functional decline. Seniors aged 75 to 84 and 85 or older had increased odds of becoming activity-dependent, compared with those aged 65 to 74.

Existing functional limitations were also significant. Seniors who had an activity limitation in 1994/95 had twice the odds of becoming activity dependent by 1998/99, compared with those who had no limitation. Conversely, those who were activity dependent in 1994/95 had decreased odds of reporting no limitation in 1998/99, compared with those who were limited but not dependent.

The only chronic condition associated with functional decline was urinary incontinence. Seniors who reported incontinence in 1994/95 or 1996/97 had close to twice the odds of reporting an activity

Definitions

The *self-perceived health* indicator reflects respondents' global evaluation of their overall health. Individuals were asked to rate their general health on a five-point scale as excellent (1), very good, good, fair, or poor (5).

Research has indicated that there is substantial stability in this single global rating of health across time.[16] Based on the National Population Health Survey (NPHS) longitudinal file, the correlation of this item is 0.55 between 1994/95 and 1996/97, 0.55 between 1996/97 and 1998/99, and 0.49 between 1994/95 and 1998/99. Consistent with the previous research findings, these correlations indicate substantial stability.

Both the NPHS and the Canada Health Survey (CHS) assessed chronic conditions with a checklist of conditions. In the NPHS, respondents were asked if they had "any long-term health conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." Because of differences in questionnaire wording, only seven conditions were relatively comparable, and therefore, selected for the analyses of prevalence rates over time: heart disease, high blood pressure, diabetes, arthritis or rheumatism, bronchitis or emphysema, asthma, and migraine headaches. In the CHS, respondents were asked if they had any "long-term health problems." The CHS also gathered additional information on blood pressure from physical measurements. This information was used in the analyses in this article, based on recent recommendations for the cut-offs of high-blood pressure (systolic BP greater than or equal to140 mm Hg; diastolic BP greater than or equal to 90 mm Hg).[17]

Activity limitation is defined in the NPHS and the HPS as any long-term physical or mental condition or disability that has lasted or is expected to last six months or longer and that limits the kind or amount of activity an individual can do at home, at school, at work, or in other settings. In the CHS, respondents who reported a limitation that lasted for at least six months were considered to have an activity limitation for the purposes of the analyses in this article.

Activity dependence refers to the need for help (for health reasons) with basic activities of daily living such as personal care (washing, dressing or eating) or moving about inside the house. Activity dependence also includes the need for help with instrumental activities of daily living (IADL) such as preparing meals, shopping for groceries or other necessities, or doing normal everyday housework.

The trends produced for residence in *health care institutions*, based on data from the census, include residents of nursing homes, chronic care hospitals, residences for senior citizens, psychiatric institutions, general hospitals and institutions for the physically handicapped.

(See *Appendix* for definitions of socioeconomic, social support, health behaviour and psychological variables).

Limitations

A number of studies have shown that the prevalence of chronic conditions may be affected by the use of proxy responses. While some studies have documented under-reporting of some chronic conditions by proxies, other studies have reported no under-reporting of chronic conditions by proxies.[18-23] Therefore, some changes in prevalence rates may be partially attributable to proxy response. The prevalence estimates of chronic conditions from the NPHS and the CHS were based on data collected for all members of selected households as reported by one knowledgeable member. However, the exact proxy response rate for the CHS cannot be determined, so it is not possible to assess the potential influence of proxy reporting.

Ideally, a study of the health of older adults should include people residing in long-term health care facilities. Data from the Census of Population show that the percentage of seniors who reside in these facilities has decreased over the past 20 years. Consequently, the downward trends in the prevalence of some chronic conditions and activity limitation may be underestimated.

The CHS asked all household members if they had high blood pressure. As well, some members of sampled households participated in the physical measures component of the CHS. All respondents who reported having high blood pressure were considered to have high blood pressure. Respondents who did not report high blood pressure but whose physical measure of blood pressure was high were also defined as having high blood pressure. By contrast, the NPHS data on blood pressure are based only on data reported by the respondent, which may result in a lower prevalence estimate.

dependence in 1998/99. When controlling for other factors in the multivariate model, no associations were found for arthritis, back problems, diabetes, heart disease, effects of a stroke, or visual impairment.

Changes in self-perceived health

Research based on the elderly has found that self-perceived health is associated with mortality, institutionalization, and the use of health care services.[7,8,11,13,24,25] Although self-ratings of health cannot serve as a substitute for epidemiological diagnosis, they have been found to be consistent with more objective ratings of health made by physicians based on medical and psychiatric evaluations.[16]

The percentage of seniors who reported fair or poor health in 1994/95 and 1998/99 remained about the same: a little more than 20%. However, while the overall rate remained stable, there were improvements and declines for individuals (Table 4). Of the 2 million seniors who reported excellent, very good, or good health in 1994/95, 15% reported a decline to fair or poor health in 1998/99. On the other hand, of the smaller group of seniors (560,000) who reported fair or poor health in 1994/95, close to half (46%) reported an improvement to excellent, very good or good health in 1998/99.

Table 4
Four-year transition rates in self-perceived health, household population aged 65 or older in 1994/95, Canada excluding territories

Self-perceived health in 1994/95	Total		Self-perceived health in 1998/99				
			Total	Excellent, very good or good		Fair or poor	
	'000	%	%	'000	%	'000	%
Total	**2,590**	**100**	**100**	**1,990**	**77**	**600**	**23**
Excellent, very good or good	2,030	79	100	1,730	85†	300	15
Fair or poor	560	21	100	260	46	300	54‡

***Data source**: National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
***Note:** Based on 1,921 longitudinal respondents aged 65 or older in 1994/95 who were still residing in households in 1998/99*
† Significantly higher than fair or poor in 1994/95
‡ Significantly higher than excellent, very good or good in 1994/95

Determinants of changes in self-perceived health

To study the determinants of improvements in self-perceived health, seniors who reported fair or poor health in 1994/95 were selected to examine factors associated with reporting excellent, very good or good health in 1998/99. Conversely, to study the determinants of declines in self-perceived health,

Table 5
Adjusted odds ratios relating selected characteristics to changes in self-perceived health between 1994/95 and 1998/99, household population aged 65 or older in 1994/95, Canada excluding territories

	Decline in self-perceived health		Improvement in self-perceived health	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Sex				
Men	1.2	0.7, 2.1	0.4*	0.2, 0.9
Women†	1.0	···	1.0	···
Age				
65-74†	1.0	···	1.0	···
75+	1.1	0.6, 1.7	1.2	0.6, 2.6
Educational attainment				
Less than secondary graduation‡	1.6	0.9, 2.8	0.6	0.3, 1.6
Household income				
Lowest/Lower-middle	0.8	0.5, 1.4	1.0	0.4, 2.6
Middle†	1.0	···	1.0	···
Upper-middle/Highest	0.7	0.3, 1.2	2.0	0.6, 7.0
Social support				
Living alone‡	0.7	0.4, 1.1	0.8	0.3, 2.2
Low emotional support‡	1.2	0.7, 2.2	0.8	0.3, 1.8
Health behaviours				
Daily smoker‡	1.1	0.5, 2.3	1.0	0.4, 2.9
Infrequent exercise‡	1.1	0.6, 1.9	1.3	0.6, 2.9
Activity-dependent‡§	1.9*	1.1, 3.4	0.4*	0.2, 0.9
Chronic and other health conditions§				
Arthritis or rheumatism‡	1.3	0.8, 2.1	0.9	0.4, 2.1
Back problems‡	0.7	0.4, 1.1	0.9	0.4, 2.0
High blood pressure‡	1.5	0.9, 2.4	1.2	0.6, 2.5
Diabetes‡	1.2	0.5, 2.6	0.9	0.3, 2.9
Heart disease‡	2.2*	1.3, 3.8	0.9	0.4, 2.0
Cancer‡	0.9	0.3, 2.6	- -	- -
Stomach or intestinal ulcers‡	1.4	0.5, 4.0	1.2	0.4, 3.8
Urinary incontinence‡	1.8	0.7, 4.5	- -	- -
Visual impairment‡	1.1	0.5, 2.5	0.9	0.2, 3.2
Psychological well-being				
Low self-esteem‡	1.9	0.8, 4.3	0.7	0.3, 1.7
High chronic stress‡	1.4	0.7, 2.9	0.8	0.4, 1.9

***Data source**: National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
***Notes:** The model for a decline in self-perceived health is based on 1,408 respondents aged 65 or older in 1994/95, who then reported excellent, very good or good health and who were still living in households in 1998/99; 196 of them reported fair or poor health in 1998/99; 90 records were removed from the analyses because of missing values. The model for an improvement in self-perceived health is based on 384 respondents aged 65 or older in 1994/95, who then reported fair or poor health and who were still living in households in 1998/99; 163 of them reported excellent, very good or good health in 1998/99; 39 records were removed from the analyses because of missing values. A missing category for the income variable was included in the model to maximize sample size, but its odds ratio is not shown.*
† Reference category for which the odds ratio is always 1.0
‡ Reference category is absence of characteristic; for example, the reference category for "living alone" is "living with others."
§ For the model on decline in self-perceived health, activity dependence, chronic and other health conditions included conditions that existed in 1994/95 or in 1996/97.
- - Sample size too small to include variable in model
··· Not applicable
** $p \leq 0.05$*

seniors who reported excellent, very good or good health in 1994/95 were selected to examine factors associated with reporting fair or poor health in 1998/99.

Activity dependence was associated with a decline in self-perceived health. Seniors who were activity dependent in 1994/95 or who became dependent by 1996/97 had almost twice the odds of reporting a decline in self-perceived health in 1998/99 (Table 5). Conversely, those who were activity dependent in 1994/95 had less than half the odds of reporting an improvement to excellent, very good or good health in 1998/99.

The only chronic condition associated with a decline in self-perceived health was heart disease. Those who reported heart disease in 1994/95 or 1996/97 had over twice the odds of reporting a decline in self-perceived health. Other chronic conditions (arthritis, back problems, high blood pressure, diabetes, cancer, ulcers, urinary incontinence and visual impairment) were not associated with a decline in self-perceived health.

Finally, it is noteworthy that men had less than half the odds of reporting an improvement in self-perceived health compared with women.

Concluding remarks

Researchers have proposed two alternative theories about how older adults can expect to live out their final years, given the advances that have been made in life expectancy. If the age of onset for debilitating chronic conditions increases more rapidly than life expectancy, then the period between the onset of illness and the end of life is shortened, resulting in more years of better health. This theory is called the "compression of morbidity."[26,27] However, if the age of onset of less fatal debilitating conditions such as arthritis and dementia remains constant or does not increase in proportion to life expectancy, then older adults can expect to live their final years in poorer health, requiring the help of others in the activities of daily living. This alternative theory is called the "expansion of morbidity."[28,29] The analyses conducted in this article support the theory of compression of morbidity, and are consistent with the findings of recent Statistics Canada demographic research.[1] Over the past 20 years, the prevalence of most chronic conditions among adults aged 65 or older has not changed significantly. The prevalence of activity limitation has decreased for the 65-to-74 age group and remained stable for the population aged 75 or older. The proportion of seniors aged 75 or older residing in health care institutions has declined. These trends have occurred even though the average age of individuals 65 or older has increased due to increases in life expectancy.

Positive health perceptions—perceiving excellent, very good or good health—were associated with lower odds of institutionalization and functional decline as well as increased odds of functional improvement. This was the case even after controlling for more objective measures of health and health behaviours. This suggests that self-perceived health is valid as a measure of health, both at the time the question is asked and as a predictor of future health problems. Different interpretations of this association are possible. Older adults with a positive assessment of their health may be less likely to experience declines in health. Alternatively, reporting fair or poor perceived health at baseline may act as a proxy for the severity of an existing health problem, which, in turn, results in a decline in health status.

The increase in the prevalence of diabetes among older men, which has also occurred among men aged 45 to 64, is cause for concern, because it is a risk factor for heart disease, stroke, blindness, kidney diseases, disability and mortality (see *Health in mid-life*, p. XX).[30-32] To the extent that these conditions contribute to activity limitation, activity dependence or cognitive and visual impairments, they add to the risk of functional decline and institutionalization among older adults.

The socioeconomic trends observed in younger age groups continue among older adults, although somewhat less markedly. Seniors who did not graduate from high school have increased odds of dying, and seniors with lower incomes have increased odds of being institutionalized. It is interesting, in this regard, that activity limitation and activity dependence were not associated with

institutionalization. Possibly seniors with adequate income are able to pay for assistance in their own homes, thereby avoiding or delaying institutionalization. If so, this would suggest that home care services could prevent institutionalization among older adults with reduced income. ●

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References

1 Martel L, Bélanger A. An analysis of changes in dependence-free life expectancy in Canada between 1986 and 1996. *Report on the Demographic Situation in Canada, 1998- 1999* (Statistics Canada, Catalogue 91-209) 1999: 164-86.

2 Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18(2): 209-17.

3 Rust KF, Rao JNK. Variance estimation for complex surveys in using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 283-310.

4 Yeo D, Mantel H, Liu TP. Bootstrap variance estimation for the National Population Health Survey. *American Statistical Association: Proceedings of the Survey Research Methods Section.* Baltimore: August 1999.

5 Shah BV, Barnwell BG, Bieler GS. *SUDAAN User's Manual.* Release 7.5. Research Triangle Park, North Carolina: Research Triangle Institute, 1997.

6 Crimmins EM, Saito Y. Getting better and getting worse. *Journal of Aging and Health* 1993; 5(1): 3-36.

7 Branch LG, Leighton KU. Transitional probabilities to dependency, institutionalization and death among the elderly over a decade. *Journal of Aging and Death,* 1989; 1(3): 370-408.

8 Mor V, Wilcox V, Rakowski W, et al. Functional transitions among the elderly: patterns, predictors, and related hospital use. *American Journal of Public Health* 1994; 84(8): 1274-80.

9 Evans RG, Stoddart GL. *Producing Health, Consuming Health Care.* (CHEPA working paper series #90-6) Hamilton, Ontario: McMaster University, 1990.

10 Harris T, Kovar MG, Suzman R, et al. Longitudinal study of physical ability in the oldest-old. *American Journal of Public Health* 1989; 79(6): 698-702.

11 Mossey JM, Shapiro E. Self-rated health: a predictor of mortality among the elderly. *American Journal of Public Health* 1982; 72: 800-8.

12 Idler EL, Kasl S. Health perceptions and survival: do global evaluations of health status really predict mortality? *Journal of Gerontology,* 1991; 46: S55-S65.

13 Pijls LTJ, Feskens EJM, Kromhout D. Self-rated health, mortality, and chronic diseases in elderly men: the Zutphen Study, 1985-1990. *American Journal of Epidemiology* 1993; 138: 840-8.

14 Reuben DB, Rubenstein LV, Hirsch SH, et al. Value of functional status as a predictor of mortality: results of a prospective study. *American Journal of Medicine* 1992; 93: 663-69.

15 Mustard C, Finlayson M, Derksen S, et al. What determines the need for nursing home admission in a univerally insured population? *Journal of Health Services Research and Policy* 1999; 4: 197-203.

16 Maddox GL, Douglass EB. Self-assessment of health: a longitudinal study of elderly subjects. *Journal of Health and Social Behavior* 1973; 14: 87-93.

17 Joffres MR, Hamet P, Rabkin SW, et al. Prevalence, control and awareness of high blood pressure among Canadian adults. *Canadian Medical Association Journal* 1992; 146(11): 1997-2005.

18 Koons DA. Quality control and measurement of nonsampling error in the Health Interview Survey. *Health and Vital Statistics* 1973; 2(54): 1-24.

19 Corder LS, Woodbury MA, Manton KG. Proxy response patterns among the aged: effects on estimates of health status and medical care utilization from the 1982-1984 long-term care surveys. *Journal of Clinical Epidemiology* 1996; 49(2): 173-82.

20 Mathiowetz NA, Groves RM. The effects of respondent rules on health survey reports. *American Journal of Public Health* 1985; 75(6): 639-44.

21 Kovar MG, Wright RA. An experiment with alternate respondent rules in the National Health Interview Survey. *American Statistical Association: Proceedings of the Social Statistics Section*, 1973; 311-16.

22 Lawrence RH. The structure of physical health status. Comparing proxies and self-respondents. *Journal of Aging and Health* 1995; 7(1): 79-98.

23 Miller RE, Massagli MP, Clarridge BR. Quality of proxy reports vs. self-reports: evidence from a health survey with repeated measures. *American Statistical Association: Proceedings of the Section on Survey Research Methods.* Washington, DC: American Statistical Association, 1986: 546-51.

24 Evashwick C, Rowe G, Diehr P, et al. Factors explaining the use of health care services by the elderly. *Health Services Research* 1984; 19: 357-82.

25 Blaum CS, Liang J, Liu X. The relationship of chronic diseases and health status to the health services utilization of older Americans. *Journal of the American Geriatrics Society* 1994; 42: 1087-93.

26 Fries JF. The compression of morbidity. *Milbank Memorial Fund Quarterly/Health and Society* 1983; 61(3): 397-419.

27 Fries JF. The compression of morbidity: near or far? *Milbank Quarterly* 1989; 67(2): 208-32.

28 Verbrugge LM. Longer life but worsening health? Trends in health and mortality of middle-aged and older persons. *Milbank Memorial Fund Quarterly/Health and Society,* 1984;

62(3): 475-519.

29 Olshansky SJ, Rudberg MA, Carnes BA, et al. Trading off longer life for worsening health. *Journal of Aging and Health* 1991; 3(2): 194-216.

30 Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, improved fasting glucose, and impaired glucose tolerance in US adults. *Diabetes Care* 1998; 21(4): 518-24.

31 American Diabetes Association. *Diabetes 1996: Vital Statistics*. Alexandra, Virginia: American Diabetes Association, 1996.

32 *Mortality and Morbidity Weekly Reports*. Trends in the prevalence and incidence of self-reported diabetes mellitus–United States, 1980-1994. November 1997; 46(43): 1027-8.

Appendix

Socioeconomic, social support, health behaviour and psychological variables

The *education* variable was based on the highest level of education attained and was classified into two groups: less than secondary school graduation and secondary school graduation or more.

In the analyses based on National Population Health Survey (NPHS) data, *income* was defined based on the number of people in the household and total household income from all sources in the 12 months before the survey. The following income groups were used:

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

In the analysis based on Canada Health Survey data, income was defined based on a derived economic family income quintile variable.

Social support variables included living arrangements and emotional support. *Living arrangement* categories were defined as living alone or living with at least one other person. Four "yes"/"no" questions were used to measure *emotional support*. Respondents were asked if they had someone they could confide in, count on, who could give them advice, and who could make them feel loved. If the answer to any of these questions was "no," the respondent was classified as having low emotional support.

Health behaviour variables included smoking status and frequency of exercise. *Smoking status* was defined as less than daily or daily smoking. *Frequency of exercise* was based on the number of times in the previous three months that respondents had participated in a leisure-time physical activity lasting more than 15 minutes. Respondents who averaged less than four times per month were classified as having *infrequent exercise*.

Vision was classified into the following categories: no problem, problem corrected by lenses, uncorrected problem seeing close, uncorrected problem seeing distance, uncorrected problem seeing close and distance, and no sight. Respondents were classified as having a *visual impairment* if they had an uncorrected problem (that is, the last four categories).

A variable derived from a question on thinking ability and another question on memory were used to determine *cognitive function*. Six categories were identified: no cognitive problems, some difficulty thinking, somewhat forgetful, somewhat forgetful and some difficulty thinking, very forgetful or a great deal of difficulty thinking, unable to remember or think. For this analysis, respondents were considered to have a cognitive impairment if they were in either of the last two categories.

Psychological well-being was assessed with two variables: self-esteem and chronic stress. To measure *chronic stress*, NPHS respondents were asked whether the following statements were true or false:

You are trying to take on too many things at once.
There is too much pressure on you to be like other people.
Too much is expected of you by others.
You don't have enough money to buy the things you need.
Your partner doesn't understand you.
Your partner doesn't show enough affection.
Your partner is not committed enough to your relationship.
You find it is very difficult to find someone compatible with you.
One of your children seems very unhappy.
A child's behaviour is a source of serious concern to you.
Your work around the home is not appreciated.
Your friends are a bad influence.

You would like to move but you cannot.

Your neighbourhood or community is too noisy or too polluted.

You have a parent, a child or partner who is in very bad health and may die.

Someone in your family has an alcohol or drug problem.

People are too critical of you or what you do.

A score of 1 was assigned to each "true" response. Adjustments were made if certain items were not applicable to a respondent (for example, respondents without partners) so that total scores were all based on the same denominator. Respondents whose total scores fell in the upper quartile of the distribution for the 18-or-older population (scores greater than or equal to 5) were categorized as having high chronic stress.

Self-esteem measures the "positiveness" with which individuals regard themselves. On a five-point scale from "strongly disagree" (score 0) to "strongly agree" (score 4), NPHS respondents replied to six statements:

You feel that you have a number of good qualities.

You feel that you are a person of worth at least equal to others.

You are able to do things as well as most other people.

You take a positive attitude toward yourself.

On the whole, you are satisfied with yourself.

All in all, you are inclined to feel you're a failure (scoring reversed).

Respondents whose total scores fell in the lower quartile of the distribution for the 18-or-older population (scores less than or equal to 17) were categorized as having low self-esteem.

Psychological health—depression

Highlights

- Depression is twice as prevalent in women as in men.
- Depression is much more common among younger women than older women.
- Depression is a chronic disease—one episode is highly predictive of future episodes.
- Social support may be a protective factor. Women who lacked emotional support had higher odds of a future depressive episode compared with women with emotional support.
- There is a strong association between smoking and depression, but the research evidence concerning the underlying reason is complex.

Depression causes substantial suffering and disruption in the lives of those affected and those around them. One study projects it to be the second leading cause of the overall burden of illness in 2020, following ischaemic heart disease.[1] Psychological distress and depression are associated with substantial use of hospitals and physician visits.[2]

The National Population Health Survey (NPHS) includes a set of questions designed to determine whether or not respondents have experienced symptoms of depression in the year prior to their interview. The responses are used to estimate the probability that respondents were clinically depressed (see *Methods* and *Appendix).* Using information from the first three cycles of the NPHS (1994/95, 1996/97 and 1998/99), this article reports on the prevalence and incidence of depression among Canadians aged 12 or older. It also identifies factors that are predictive of depression in 1996/97 or 1998/99. These factors are based on information provided in 1994/95 regarding personal characteristics, socioeconomic status, physical health, health behaviours, psychological well-being and social resources.

Methods

Data source

The prevalence estimates presented in this article are based on cross-sectional data from the household component of the first (1994/95), second (1996/97) and third (1998/99) cycles of the National Population Health Survey (NPHS) for the 10 provinces (see *Annex*). Data from the longitudinal component of the NPHS were used for the analysis of factors associated with a future episode of depression.

For 1994/95, the prevalence estimates are based on data from 7,451 men and 9,268 women aged 12 or older for whom information on depression is available from cycle 1. Estimates for 1996/97 are based on data from 32,706 men and 37,832 women; for 1998/99, from 6,720 men and 8,061 women.

The multivariate analysis of factors associated with a future episode of depression is based on 10,456 longitudinal respondents: 4,638 men and 5,818 women 12 or older. These respondents had not experienced a depressive episode in the 12 months prior to their baseline interview (cycle 1 in 1994/95) and had provided information on other cycle 1 variables used in the analysis. In addition, in order to be included, they must have answered cycle 2 and 3 questions that measure the probability of having experienced a depressive episode in the 12 months before the interview.

Analytical techniques

Two groups were formed: respondents who were "free" of depression at all three cycles, and respondents who were free of depression at baseline and who experienced a depressive episode in the 12 months prior to their cycle 2 or cycle 3 interview. Respondents are considered to have experienced a depressive episode if they obtained a score of 5 or more on the depression scale; this translates to a 0.90 probability of having experienced a depressive episode in the 12 months prior to the interview.

Results of the analysis of the factors associated with a future depressive episode are based on a generalized linear model with a repeated measures component. In order to identify factors that increase vulnerability to a future depressive episode, baseline characteristics of persons who had not experienced a depressive episode prior to their cycle 2 or cycle 3 interview are compared with the baseline characteristics of persons who did. Neither group had experienced a depressive episode in the 12 months prior to their cycle 1 interview. In addition to the selected cycle 1 indicators, two additional variables were entered in the model. The first one took into account the timing of the depressive episode; that is, whether it occurred before cycle 1 or cycle 2. The weighted percentage of respondents who experienced a depressive episode prior to their 1996/97 or 1998/99 interview were 2.4% and 2.6%, respectively. The second variable identified respondents who had experienced recurring depressive episodes; that is, at least one prior to their cycle 2 interview and one prior to their cycle 3 interview. Less than 1% (0.55%) of the respondents who had not experienced a depressive episode prior to their cycle 1 interview experienced recurring depression. Separate regressions were done for men and women. Some variables were not included in the model for men because they created instability: recurring depression, occasional smoking and the third grouping of chronic conditions (heart, stroke, cancer and/or incontinence).

The cycle 1 dimensions included in the model were: personal characteristics, health behaviours, chronic conditions, and social and psychological resources (see *Appendix*). Personal characteristics include age, marital status, educational attainment, income, living arrangements and main activity. Health behaviours considered were smoking and drinking. Chronic conditions were measured by three indicators that include combinations of specific chronic conditions. Social resources included emotional support and social involvement; psychological resources was based on a score for self-esteem and mastery. The variables were chosen based on a literature review, face validity and availability in the NPHS. All variables were measured at baseline. The internal consistency of the scales measuring social and psychological resources was estimated by Cronbach' s alpha and was calculated from the cross-sectional weighted 1994/95 sample for respondents 12 or older.

Sample data were weighted to represent the target population in 1994/95, the first cycle of NPHS data collection. To take into account design effects, the bootstrap technique was used to calculate the coefficients of variation for the estimates of rates and proportions. Standard errors used in the calculation of the confidence intervals were also estimated with this technique.[3-5] Results at the $p \leq 0.05$ level were considered significant.

Limitations

The lifetime history of depression for NPHS respondents is unknown. Therefore, respondents classified as not having experienced a depressive episode could have suffered from depression prior to their 1994/95 interview. Moreover, because interviews for the NPHS are done every two years and respondents are only asked about depressive symptoms that occurred during the 12 months before the interview, respondents who had experienced a depressive episode in the year following their 1994/95 or their 1996/97 interviews (but not in the 12 months prior to the interview) are included among respondents who have not suffered from depression. The misclassification of these respondents would weaken the observed associations. The inability to detect an association between certain factors, such as marital status, and a future episode of depression may be, in part, due to the lack of information on the timing or duration of circumstances. For example, the NPHS does not provide information on the number of years a respondent has been widowed, divorced or separated. The finding of few statistically significant associations for men may be the result of a lack of statistical power. Finally, the NPHS data are based on self-report. Therefore, the extent to which the data are biased due to reporting error is unknown.

It should be noted that the structure of the NPHS imposes several important limitations on the analyses of prevalence, incidence and predictive factors. Because the NPHS asks about depressive symptoms during the year prior to the interview and the interviews for the NPHS are done every two years, respondents who experienced depressive symptoms 13 months or more before their interview would be classified as not having experienced a major depressive episode. In addition, the NPHS data are based on self-report (see *Methods*). Therefore, the extent to which they are biased because of reporting error is unknown. Finally, the finding of few statistically significant associations for men may be the result of a lack of statistical power.

Higher prevalence among youth and women

According to the NPHS, 4.3% of Canadians aged 12 or older reported symptoms strongly suggesting that they had experienced at least one major depressive episode (see *Definitions* and *Appendix*) in the year before their 1998/99 NPHS interview. The percentage was 5.2% in 1994/95 and 4.1% in 1996/97. These prevalence estimates are lower than those reported for the United States. According to the National Comorbidity Survey conducted in the United States between 1990 and 1992, where the same instrument was used, the 12-month prevalence of depression was 10% (around 13% for women and 8% for men).[6]

The prevalence of depression is not uniform across age groups. In all three cycles of the NPHS, it peaked among those aged 15 to 24, declined in mid-life, and was lowest among those aged 65 or older (Appendix Table A).

Depression is more prevalent among women than men. Approximately twice as many women reported symptoms that indicate a high probability of a major depressive episode in the first three cycles of the NPHS: around 7.1% of women compared with 3.3% of men in 1994/95; 5.4% of women compared with 2.7% of men in 1996/97; and 5.7% of women compared with 2.9% of men in 1998/99. This male-female pattern holds true, roughly, for all age groups between 12 and 64 (Charts 1 and 2 and Appendix Table A).

Definitions

A major depressive episode is characterized by a depressed mood and/or lack of interest in most things, along with other symptoms, all lasting at least two weeks. These symptoms include appetite or sleep disturbance, decreased energy, difficulty concentrating, feelings of worthlessness and/or suicidal thoughts (see *Appendix* for more definitions of variables).

Prevalence of depression is the percentage of the population that is estimated to have experienced a major depressive episode at some time in the year before the 1994/95, 1996/97 or 1998/99 NPHS interview.

Two-year incidence of depression is the percentage of respondents who did not experience a major depressive episode in the year prior to their 1994/95 interview, but who did experience one in the year before their 1996/97 interview. Four-year incidence is based on the percentage of respondents who did not experience a depressive episode in the year prior to either their 1994/95 or 1996/97 interview but who did experience one in the year before their 1998/99 interview. Because information on lifetime history of depression is unknown, as well as information on symptoms experienced 13 to 24 months prior to the 1996/97 and 1998/99 interviews, it is not possible to have a "true" measure of incidence.

Highest incidence among young women

The incidence of depression was higher among women between the ages of 12 to 24, compared with women aged 25 or older (Appendix Table B). And compared with women, the incidence of depression in men was substantially lower (Appendix Table C). It ranged from 2.2% to 2.9% among men aged 12 to 44, and then dropped to below 2% among men aged 45 or older.

Predictive factors

Depression is the result of a complex set of influences.[7] These influences include risk and vulnerability factors and provoking agents. Emotional reactivity, a risk factor, is thought to be inherited. Vulnerability increases following exposure to childhood trauma, and childhood trauma seems to be a stronger predisposing factor for women than men.[8] Provoking agents include negative life events or chronic stress. Studies also indicate that social

support acts protectively.[7] Depression has been conceptualized by some as an adaptive response that inhibits a response to a situation that may result in danger or loss.[9]

Based on their availability in the NPHS, various factors that measure environmental influences were selected and their association with the incidence of depression is presented. These factors include personal characteristics, socioeconomic status, health behaviours, chronic conditions, psychological well-being and social resources. With multivariate regression analysis, it is possible to determine the relative contribution of each factor to the odds of experiencing a major depressive episode. Results presented below are based on information provided in the 1994/95 NPHS by individuals who had not experienced a depressive episode prior to their interview and who had responded to the questions on depression in their 1996/97 and 1998/99 interviews.

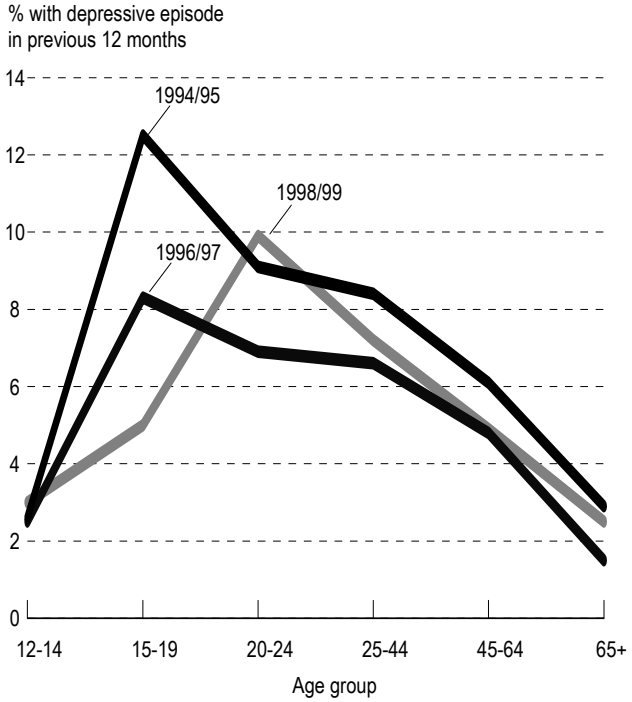
Younger age for women

As might be expected from the incidence rates for depression, the odds of having a major depressive episode were lower for women aged 65 or older, compared with any of the younger age groups considered (Table 1). Among men, age was not a significant predictor of a future depressive episode.

Smoking

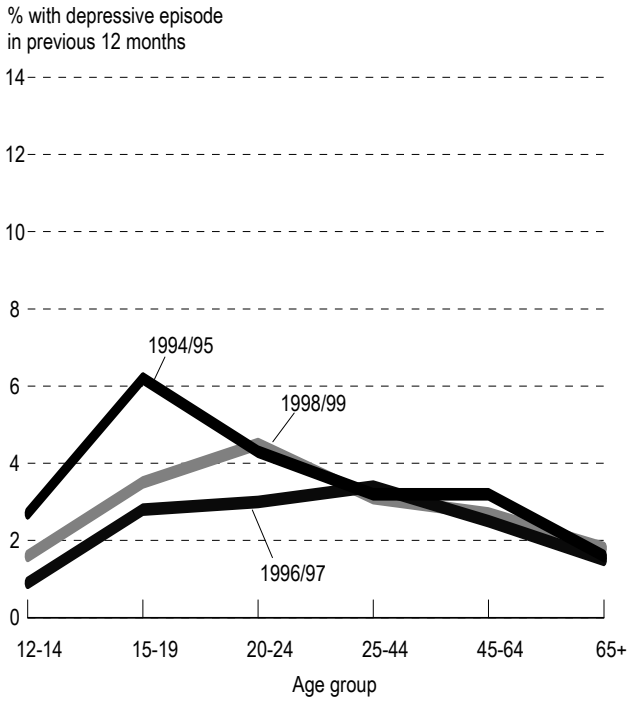
Nicotine is thought to have antidepressant effects.[10] Studies indicate that smokers who have a history of depression have more difficulty quitting smoking, have more severe withdrawal symptoms and are more susceptible to depression after they stop smoking than smokers who are not prone to depression.[11] Adolescents who were free of depressive symptoms at baseline and who were "established smokers," that is, they had smoked at least 100 cigarettes in their lifetime and had smoked

Chart 1
Prevalence of depression, by age group, female household population aged 12 or older, Canada excluding territories, 1994/95, 1996/97 and 1998/99



Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Note*: See Appendix Table A for confidence intervals.*

Chart 2
Prevalence of depression, by age group, male household population aged 12 or older, Canada excluding territories, 1994/95, 1996/97 and 1998/99



Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Note*: See Appendix Table A for confidence intervals.*

Table 1
Adjusted odds ratios of a depressive episode in 1996/97 and/or 1998/99, by selected characteristics in 1994/95, household population aged 12 or older, Canada excluding territories

	Women		Men	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Personal characteristics				
Age				
12-14	5.24*	1.96, 14.02	...	...
15-19	6.11*	2.59, 14.42	3.71	0.93, 14.73
20-24	4.61*	2.06, 10.34	3.62	0.99, 13.12
25-44	3.30*	1.75, 6.23	2.35	0.76, 7.26
45-64	2.14*	1.18, 3.88	1.41	0.52, 3.87
65+†	1.00	...	1.00	...
Marital status				
Married†‡	1.00	...	1.00	...
Never married	1.06	0.68, 1.64	0.56	0.31, 1.01
Previously married	1.19	0.80, 1.75	1.24	0.39, 3.96
Educational attainment				
Less than secondary	0.84	0.57, 1.24	1.19	0.68, 2.08
Secondary graduation	0.85	0.59, 1.24	1.20	0.58, 2.49
Some postsecondary	0.76	0.56, 1.04	1.30	0.85, 2.00
Postsecondary graduation†	1.00	...	1.00	...
Inadequate income§	1.26	0.93, 1.73	1.19	0.64,2.22
Lives alone§	0.81	0.50, 1.30	0.98	0.38,2.54
Main activity				
Working†	1.00	...	1.00	...
In school	0.81	0.46, 1.43	2.14*	1.04,4.39
Retired	0.78	0.47, 1.30	1.10	0.42,2.92
Ill, disabled or caring for someone	0.86	0.61, 1.22	1.08	0.36,3.25
Not working	0.75	0.35, 1.62	1.61	0.76,3.42
Health behaviours				
Smoking				
Daily smoker	1.46*	1.08, 1.98	1.90*	1.25, 2.89
Occasional smoker	0.92	0.47, 1.81	1.00[a]	...
Non-smoker†	1.00	...	1.00	...
Drinking				
Binge drinking§††	1.19	0.62, 2.28	1.90	0.84, 4.29
Chronic conditions				
Back problem, high blood pressure, migraine and/or ulcer‡‡	1.77*	1.34, 2.34	1.42	0.86, 2.35
Arthritis, emphysema, diabetes and/or glaucoma‡‡	1.28	0.89, 1.84	1.81	0.99, 3.31
Heart, stroke, cancer and/or incontinence‡‡	1.09	0.68, 1.74	[a]	[a]
Social resources				
Low emotional support	1.47*	1.06, 2.04	1.12	0.71, 1.78
Low social involvement	1.18	0.93, 1.51	0.89	0.60, 1.33
Psychological resources				
Low self-esteem§	1.09	0.87, 1.38	1.17	0.83, 1.64
Low mastery§	1.80*	1.38, 2.33	1.21	0.81, 1.81
Timing of depressive episode§§	0.96	0.73, 1.27	1.06	0.75, 1.51
Recurring depressive episode†††	2.97*	1.03, 8.55	[a]	[a]

Data source: *National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
Notes: *The results are based on 4,638 men and 5,818 women. Of this group, 4.5% (n=210) men and 8.8% (n=510) women experienced a depressive episode before their 1996/97 or 1998/99 interview. In the regression model for men, the age groups 12 to 14 and 15 to 19 were combined into one group, 12 to 19.*
† Reference category for which odds ratio is always 1.00
‡ Includes common-law and living with partner.
§ Reference category is absence of the characteristic.
††Binge drinking was defined as every other week, on average, for women and weekly, on average, for men.
‡‡ One or more of the four chronic conditions versus none
§§ This dichotomous variable measures the elapsed time between baseline and a depressive episode. Respondents coded as "yes" had a depressive episode in the 12 months before their 1998/99 interview.
††† This dichotomous variable measures recurring depressive episodes. Respondents coded as "yes" had a depressive episode in the 12 months before their 1996/97 and 1998/99 interviews.
[a] Occasional smoker, the third grouping of chronic conditions, and recurring depression were omitted from the regression model for men because sample counts were too low and they were creating instability in the model. With regard to smoking, never and occasional smokers is the reference category for men.
** $p \leq 0.05$*

in the past 30 days, had increased odds of having developed depressive symptoms at follow-up.[12] Adolescents with depressive symptoms were also more likely than other adolescents to start smoking.[13] While this may indicate that depression-prone smokers use tobacco to self-medicate,[14] evidence from another study has shown that, at least in women, smoking and depression are the result of a familial predisposition, possibly gene-related.[15]

Evidence that smoking is related to depression can also be documented from the NPHS. People who smoked daily had increased odds of having a major depressive episode compared with non-smokers. The odds were almost double for men who smoked daily, and were one-and-a-half times higher for women who smoked daily (Table 1).

Chronic conditions

Research in a community sample has shown that the 12-month prevalence of depression is positively associated with the number of chronic conditions present.[16] A recent extensive review of the literature concluded that depression is more common among patients with chronic pain, and that individuals with a history of depression may be at an increased risk of depression following the onset of chronic pain (the scar hypothesis).[17] It is suspected that depression and chronic pain share a common biologic pathway, as both can be relieved by selective serotonin reuptake inhibitors or other antidepresssants.[18] Research also suggests that interpersonal stress experienced by patients with rheumatoid arthritis or osteoarthritis who are depressed increases disease flare-ups.[19] Depression has also been implicated in the development of heart disease. Depressed patients are more likely to die following a heart attack than non-depressed patients.[20] Increased platelet function observed in depressed patients is the suspected mechanism, as it would promote plaque formation and contribute to coronary occlusion and coronary heart disease.[21]

According to the NPHS data, the diagnosis of a chronic health problem is predictive of depression for women only. Among women, the odds of experiencing a major depressive episode were almost double for those who reported a diagnosis of a back problem, high blood pressure, migraine and/or an ulcer in 1994/95. No significant association was found between a future episode of depression and a prior diagnosis of arthritis, emphysema, diabetes and/or glaucoma or a diagnosis of heart disease, stroke, cancer and/or incontinence for women or men in 1994/95.

Social resources and psychological well-being

Results from the NPHS indicate that among women, three measures of psychological well-being and social support were significantly associated with having a major depressive episode.

A previous major depressive episode was predictive of future depression. Women who had experienced a major depressive episode in the year before their 1996/97 NPHS interview had three times the odds of having a subsequent major depressive episode in the year before their 1998/99 interview.

Depression is often accompanied by feelings of being overwhelmed and out of control. Women who scored below the median on the scale for sense of mastery in their 1994/95 NPHS interview had almost twice the odds of having a major depressive episode in the year before their 1996/97 or 1998/99 interviews as women who scored above the median (see *Appendix*).

The buffering hypothesis suggests that social support protects individuals from the negative effects of stress.[22] Women who lacked emotional support in 1994/95 had higher odds of a future depressive episode than women who had adequate social support.

Marital status and living circumstances

Marital status and living circumstances were not associated with increased odds of having a major depressive episode for men or women. Likewise, educational attainment, inadequate income and main activity were not predictive of a depressive episode, with one exception. Men who were in school had twice the odds of a future depressive episode than men who were working. As stated previously, the inability to detect associations that are statistically

significant for men may be the result of a lack of statistical power.

Concluding remarks

Previous studies based on the first cycle of the NPHS reported that depression is most prevalent among youth and young adults and least prevalent among older adults.[23-25] This analysis extends this finding, as it indicates that, relative to older adults, those in the youngest age groups have much higher odds of having a future depressive episode. This is the reverse of patterns identified in the past, when depression was more prevalent among older adults than younger adults. It has been suggested that this reversal may have occurred after the late 1970s, when socioeconomic conditions improved for older Canadians and worsened for youth and young adults.[25]

The prevalence of depression among women is double that among men. This is consistent with previous studies,[26, 27] and tends to pertain to all age groups up to 65. The higher prevalence of depression among women underscores the importance of prevention and health promotion efforts that address the mental health needs of women. The analysis of predictive factors among women suggests that such efforts are particularly needed among women with a history of depression, who suffer from a chronic illness, who lack social support, and who have little sense of control in their lives.

The association between daily smoking and increased risk of depression among men and women is consistent with other studies.[6-11] Depression-prone individuals may use tobacco to self-medicate, or depression and smoking may share a common genetic basis. ●

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References

1 Ustun TB. The global burden of mental disorders. Commentaries. *American Journal of Public Health* 1999; 89(9): 1315-8.

2 De Boer AF, Wijker W, Haes HC. Predictors of health care utilization in the chronically ill: review of the literature. *Health Policy* 1997; 42(2): 101-15.

3 Rust KF, Rao JNK. Variance estimation for complex surveys using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 283-310.

4 Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18(2): 209-17.

5 Yeo D, Mantel H, Liu TP. Bootstrap variance estimation for the National Population Health Survey. *American Statistical Association: Proceedings of the Survey Research Methods Section.* Baltimore: August 1999.

6 Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Archives of General Psychiatry* 1994; 51: 8-19.

7 Checkley, S. The neurodendocrinology of depression and chronic stress. *British Medical Bulletin* 1996; 51(3): 597-617.

8 Veijola J, Puukka P, Lehtinen V, et al. Sex differences in the association between childhood experiences and adult depression. *Psychological Medicine* 1998; 28(1): 21-7.

9 Nesse RM. Is depression an adaptation? *Archives of General Psychiatry* 2000; 57(1): 14-20.

10 Gamberino WC, Gold MS. Neurobiology of tobacco smoking and other addictive disorders. *Addictive Disorders* 1999; 22(2): 301-12.

11 Covey LS. Tobacco cessation among patients with depression. *Primary Care* 1999; 26(3): 691-706.

12 Choi WS, Patten CA, Gillin JC, et al. Cigarette smoking predicts development of depressive symptoms among US adolescents. *Annals of Behavioral Medicine* 1997; 19(1): 42-50.

13 Escobedo LG, Reddy M, Giovino GA. The relationship between depressive symptoms and cigarette smoking in US adolescents. *Addiction* 1998; 93(3): 433-40.

14 Anda RF, Willamson DF, Escobedo LG, et al. Depression and the dynamics of smoking. *Journal of the American Medical Association* 1990; 264(12): 1541-5.

15 Kendler KS, Neale MC, MacLean CJ, et al. Smoking and major depression. A causal analysis. *Archives of General Psychiatry* 1993; 50(1): 36-43.

16 Kessler RC, Zhao S, Blazer DG. Prevalence, correlates, and course of minor depression and major depression in the national comorbidity survey. *Journal of Affective Disorders* 1997; 45(1-2): 19-30.

17 Fishbain DA, Cutler R, Rosomoff HL, et al. Chronic pain-associated depression: Antecedent or consequence of chronic pain? A review. *The Clinical Journal of Pain* 1997; 13(2): 116-37.

18 Ruoff GE. Depression in the patient with chronic pain. *The Journal of Family Practice* 1996; 43(6): S25-34.

19 Zautra AJ, Hamilton NA, Potter P, et al. Field research on the relationship between stress and disease activity in rheumatoid arthritis. *Annals of the New York Academy of Sciences* 1999; 876: 397-412.

20 Glassman AH, Shapiro PA. Depression and the course of coronary artery disease. *American Journal of Psychiatry* 1998; 155(1): 4-11.

21 Nair GB, Gurbel PA, O'Connor CM, et al. Depression, coronary events, platelet inhibition, and serotonin reuptake inhibitors. *The American Journal of Cardiology* 1999; 84(3): 312-23.

22 Monroe SM, Bromet EJ, Connell MM, et al. Social support, life events, and depressive symptoms: A 1-year prospective study. *Journal of Consulting and Clinical Psychology* 1986; 54(4): 424-31.

23 Wade TJ, Cairney J. Age and depression in a nationally representative sample of Canadians: A preliminary look at the National Population Health Survey. *Canadian Journal of Public Health* 1997; 88(5): 297-302.

24 Beaudet M. Depression. *Health Reports* (Statistics Canada, Catalogue 82-003) 1996: 7(4): 11-24.

25 Stephens T, Dulberg D, Joubert N. Mental health of the Canadian population: A comprehensive analysis. *Chronic Diseases in Canada*, 1999; 20(3): 118-26.

26 Bland RC, Newman SC, Orn H. Period prevalence of psychiatric disorders in Edmonton. *Acta Psychiatrica Scandinavia* 1988; 77 (supplement 338): 33-42.

27 Kessler RC, McGonagle KA, Swartz M, et al. Sex and depression in the National Comorbidity Survey I: Lifetime prevalence, chronicity and recurrence. *Journal of Affective Disorder*, 1993; 29: 85-96.

28 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Third rev. ed. Washington, DC: American Psychiatric Association, 1987.

29 Rosenberg M. *Society and the Adolescent Self-image*. Princeton: Princeton University Press, 1965.

30 Pearlin LI, Lieberman M. Menaghan E, et al. The stress process. *Journal of Health and Social Behavior* 1981; 22: 337-56

Appendix

Table A

Prevalence of depression, by age group and sex, household population aged 12 or older, Canada excluding territories, 1994/95, 1996/97 and 1998/99

	Cycle 1, 1994/95		Cycle 2, 1996/97		Cycle 3, 1998/99		Significant comparisons*		
	%	95% confidence interval	%	95% confidence interval	%	95% confidence interval	Cycle 1/Cycle 2	Cycle 2/Cycle 3	Cycle1/Cycle 3
Total									
12-14	2.7‡	1.1, 4.2	1.7†	1.1, 2.3	2.3§	0.8, 3.8			
15-19	9.2	7.1, 11.3	5.5	4.1, 6.8	4.2†	2.7, 5.8	1 > 2		1 > 3
20-24	6.8	5.0, 8.6	4.9	3.9, 5.9	7.2	5.2, 9.2		3 > 2	
25-44	5.8	5.1, 6.6	5	4.5, 5.6	5.2	4.5, 5.8			
45-64	4.7	3.9, 5.4	3.7	3.2, 4.2	3.8	3.1, 4.5	1 > 2		
65+	2.3	1.7, 2.9	1.5	1.1, 1.9	2.2	1.5, 2.9			
Women									
12-14	2.6§	0.7, 4.5	2.5†	1.4, 3.6	3§	0.0, 5.9			
15-19	12.5	9.1, 15.8	8.3	5.9, 10.7	5†	2.7, 7.3	1 > 2		1 > 3
20-24	9.1	6.0, 12.1	6.9	5.2, 8.6	9.9	6.7, 13.1		3 > 2	
25-44	8.4	7.2, 9.6	6.6	5.8, 7.5	7.2	6.0, 8.4	1 > 2		
45-64	6.1	4.9, 7.4	4.8	4.0, 5.6	4.9	3.8, 6.0	1 > 2		
65+	2.9	2.0, 3.8	1.5†	1.0, 2.0	2.5†	1.5, 3.5	1 > 2		
Men									
12-14	2.7§	0.2, 5.2	0.9§	0.2, 1.5	1.6§	0.0, 3.2			
15-19	6.2†	3.5, 8.8	2.8†	1.8, 3.8	3.5‡	1.3, 5.6	1 > 2		
20-24	4.3†	2.5, 6.2	3†	1.8, 4.2	4.5‡	2.1, 6.9			
25-44	3.2	2.5, 4.0	3.4	2.7, 4.1	3.1	2.4, 3.9			
45-64	3.2	2.1, 4.2	2.5	1.9, 3.1	2.7	1.9, 3.5			
65+	1.6†	0.8, 2.3	1.5†	0.8, 2.2	1.8‡	0.1, 2.7			

***Data source**: 1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
† Coefficient of variation between 16.6% and 25.0%
‡ Coefficient of variation between 25.1% and 33.3%
§ Coefficient of variation greater than 33.3%
** $p \leq 0.05$; critical value adjusted for multiple comparisons*

Table B

Two- and four-year incidence of a depressive episode, by selected characteristics in 1994/95, female household population aged 12 or older, Canada excluding territories

	Two-year incidence		Four-year incidence		Significant comparisons*	
	%	95% confidence interval	%	95% confidence interval	Two-year incidence	Four-year incidence
Personal characteristics						
Age						
12-14	§	§	§	§		
15-19	7.9†	4.8, 10.9	7.2†	3.8, 10.6	> 65+	> 65+
20-24	5.1†	2.9, 7.3	8.4‡	3.6, 13.3	> 65+	
25-44	4.7	3.6, 5.8	4.4	3.5, 5.4	> 65+	> 65+
45-64	3.7	2.6, 4.7	3.2†	2.0, 4.4	> 65+	
65+	1.3‡	0.6, 1.9	1.6‡	0.6, 2.6		
Marital status						
Married††	3.7	3.1, 4.3	3.8	2.9, 4.6		
Never married	6.3	4.4, 8.2	5†	3.2, 6.8	>married; previously married	
Previously married	3.4†	2.1, 4.6	4†	2.5, 5.6		
Educational attainment						
Less than secondary	5.0	3.7, 6.2	4.3	2.9, 5.7		
Secondary graduation	5.2	3.5, 6.9	2.6†	1.5, 3.7		
Some postsecondary	3.8	2.5, 5.1	4	2.8, 5.2		
Postsecondary graduation	3.5	2.4, 4.5	4.9	3.3, 6.4		
Inadequate income						
No	3.9	3.2, 4.7	3.6	2.8, 4.4		
Yes	5.3	3.9, 6.7	5.1‡	3.2, 7.1		
Lives alone						
No	4.6	3.8, 5.3	4.3	3.4, 5.1	>yes	
Yes	2.4†	1.5, 3.3	3.1†	1.9, 4.3		
Main activity						
Working	4.5	3.6, 5.5	4.8	3.6, 6.0	> retired	
In school	6.9‡	2.8, 11.0	4.6‡	1.6, 7.6		
Retired	1.8‡	0.8, 2.7	2.2‡	1.0, 3.3		
Ill or disabled	§	§	§	§		
Caring for someone	4.1†	2.7, 5.5	3.1†	1.9, 4.3		
Had a job in last 12 months	§	§	§	§		
Did not work in last 12 months	§	§	§	§		
Health behaviours						
Smoking						
Daily smoker	6.8	4.9, 8.6	5.8	4.3, 7.4	> not a smoker	> not a smoker
Occasional smoker	§	§	§	§		
Not a smoker	3.7	3.0, 4.3	3.6	2.8, 4.4		
Binge drinking‡‡						
No	4.3	3.6, 5.0	4	3.3, 4.7		
Yes	§	§	§	§		
Chronic conditions						
Back problem, high blood pressure, migraine and/or ulcer§§						
No	3.9	3.2, 4.6	3.7	2.8, 4.6	> no	> no
Yes	5.3	3.9, 6.8	5.2	3.9, 6.5		
Arthritis, emphysema, diabetes and/or glaucoma§§						
No	4.2	3.5, 4.9	4.2	3.3, 5.0		
Yes	4.7†	3.1, 6.2	3.9†	2.4, 5.4		
Heart, stroke, cancer and/or incontinence§§						
No	4.4	3.7, 5.1	4.2	3.4, 4.9		
Yes	3.4‡	1.6, 5.2	3.6‡	1.8, 5.4		
Social resources						
Low emotional support						
No	4.2	3.5, 4.9	3.8	3.0, 4.5		
Yes	5.1†	3.2, 7.0	6.4†	3.7, 9.1		
Low social involvement						
No	3.8	2.9, 4.6	3.1	2.2, 3.9		> no
Yes	4.9	3.9, 5.8	5.2	4.1, 6.4		
Psychological resources						
Low self-esteem						
No	3.5	2.8, 4.3	3.6	2.7, 4.5		
Yes	5.1	4.0, 6.1	4.6	3.4, 5.8	> no	
Low mastery						
No	2.6	1.8, 3.3	3.3	2.4, 4.2		
Yes	5.8	4.8, 6.9	4.7	3.7, 5.8	> no	> no

Data source: *National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*

Notes*: The results are based on 5,879 women, 8% (n = 468) of whom had experienced a depressive episode before their 1996/97 or 1998/99 interview. Two-year incidence is the percentage of respondents who did not experience depressive episode in the year before their 1994/95 interview, but did experience one in the year before their 1996/97 interview. Four-year incidence is the percentage of respondents who did not experience a major depressive episode in the year before their 1994/95 or 1996/97 interview, but who did experience one in the year before their 1998/99 interview.*

† Coefficient of varaition between 16.6% and 25.0%

‡ Coefficient of variation between 25.1% and 33.3%

§ Coefficient of variation greater than 33.3%

†† Includes common-law and living with partner

‡‡ Every other week, on average

§§ One or more of the chronic conditions

** $p \leq 0.05$; critical value adjusted for multiple comparisons*

Table C
Two- and four-year incidence of a depressive episode, by selected characteristics in 1994/95, male household population aged 12 or older, Canada excluding territories

	Two-year incidence		Four-year incidence		Significant comparisons*	
	%	95% confidence interval	%	95% confidence interval	Two-year incidence	Four-year incidence
Personal characterisitics						
Age						
12-14	§	§	§	§		
15-19	§	§	§	§		
20-24	§	§	§	§		
25-44	2.9†	1.7, 4.2	2.2†	1.5, 2.9		
45-64	1.8†	0.9, 2.6	1.8‡	0.8, 2.8		
65+	1.8‡	0.7, 2.8	§	§		
Marital status						
Married††	2.6†	1.7, 3.4	2	1.4, 2.6		
Never married	2.3†	1.2, 3.3	2.4†	1.4, 3.5		
Previously married	§	§	§	§		
Educational attainment						
Less than secondary	2.7‡	1.4, 4.1	2.3†	1.3, 3.3		
Secondary graduation	§	§	§	§		
Some postsecondary	2.8†	1.8, 3.8	2.5‡	1.2, 3.8		
Postsecondary graduation	1.6†	0.8, 2.4	2†	1.2, 2.8		
Inadequate income						
No	2.2	1.5, 2.9	2.2	1.6, 2.7		
Yes	§	§	2.9‡	1.4, 4.4		
Lives alone						
No	2.6	1.8, 3.3	2.1	1.6, 2.7		
Yes	2.1‡	0.9, 3.2	2.4‡	1.1, 3.8		
Main activity						
Working	2.3†	1.5, 3.2	1.7	1.2, 2.3		
In school	§	§	6.3‡	2.3, 10.2		
Retired	1.6‡	0.6, 2.6	§	§		
Ill or disabled	§	§	§	§		
Caring for someone	§	§	§	§		
Had a job in last 12 months	§	§	§	§		
Did not work in last 12 months	§	§	§	§		
Health behaviours						
Smoking						
Daily smoker	4.1†	2.3, 6.0	3.2†	1.9, 4.5		
Occasional smoker	§	§	§	§		
Not a smoker	1.9†	1.2, 2.6	1.9	1.3, 2.5		
Binge drinking‡‡						
No	2.3	1.7, 2.9	2.1	1.6, 2.6		
Yes	§	§	§	§		
Chronic conditions						
Back problem, high blood pressure, migraine and/or ulcer§						
No	2.1†	1.4, 2.8	2.1	1.5, 2.8		
Yes	3.9‡	1.9, 5.9	2.2†	1.2, 3.2		
Arthritis, emphysema, diabetes and/or glaucoma§						
No	2.4	1.6, 3.2	2	1.5, 2.6		
Yes	3.2‡	1.4, 5.0	3‡	1.1, 5.0		
Heart, stroke, cancer and/or incontinence§						
No	2.5	1.8, 3.2	2.3	1.7, 2.8		
Yes	§	§	§	§		
Social resources						
Low emotional support						
No	2.1†	1.4, 2.8	2.4	1.8, 3.0		>yes
Yes	4.1‡	2.0, 6.2	1.3‡	0.5, 2.1		
Low social involvement						
No	2.0†	1.0, 2.9	2.6†	1.6, 3.6		
Yes	2.9†	1.9, 3.9	1.8	1.2, 2.4		
Psychological resources						
Low self-esteem						
No	2.2†	1.3, 3.1	1.9†	1.2, 2.6		
Yes	2.9†	1.9, 3.9	2.5	1.7, 3.2		
Low mastery						
No	1.8‡	0.9,2.7	2.3†	1.5, 3.1		
Yes	3.1†	2.0, 4.1	2.1	1.4, 2.7		

Data source: *National Population Health Survey, Longitudinal file, 1994/95 to 1998/99*
Notes*: The results are based on 4,693 men, 4.2% (n = 199) of whom had experienced a depressive episode before their 1996/97 or 1998/99 interview. Two-year incidence is the percentage of respondents who did not experience a major depressive episode in the year before their 1994/95 interview, but did experience one in the year before their 1996/97 interview. Four-year incidence is the percentage of respondents who did not experience a major depressive episode in the year before their 1994/95 or 1996/97 interview, but who did experience one in the year before their 1998/99 interview.*
† Coefficient of varaition between 16.6% and 25.0%
‡ Coefficient of variation between 25.1% and 33.3%
§ Coefficient of variation greater than 33.3%
†† Includes common-law and living with partner
‡‡ Every other week, on average
§§ One or more of the chronic conditions
** p ≤0.05; critical value adjusted for multiple comparisons*

Definition of variables

Using the methodology of Kessler et al,[6] the National Population Health Survey measures a *major depressive episode (MDE)* with a subset of questions from the Composite International Diagnostic Interview. These questions cover a cluster of symptoms for a depressive disorder, which are listed in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R)*.[28]

The question numbers refer to those used in the mental health section of the NPHS questionnaire. There are three possible paths through these questions: "yes" to 2, then 3 to 13; "no" to 2, "yes" to 16, then 17 to 26; and "no" to 2 and "no" to 16.

2 "During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row?" (Yes - go to 3; No - go to 16)

16 "During the past 12 months, was there ever a time lasting two weeks or more when you lost interest in most things like hobbies, work, or activities that usually give you pleasure?" (Yes - go to 17; No - end)

3/17 "For the next few questions, please think of the two-week period during the past 12 months when: 3. these feelings were worst." 17. you had the most complete loss of interest in things."
"During that time how long did these feelings usually last?" (All day long; Most of the day; About half of the day; Less than half the day)

4/18 "How often did you feel this way during those two weeks?" (Every day; Almost every day; Less often)

5 "During those two weeks did you lose interest in most things?" (Yes; No)

6/19 "Did you feel tired out or low on energy all of the time?" (Yes; No)

7/20 "Did you gain weight, lose weight, or stay about the same?" (Gained weight; Lost weight; Stayed about the same; Was on a diet)

8/21 "About how much did you gain/lose?"

9/22 "Did you have more trouble falling asleep than you usually do?" (Yes; No)

10/23 "How often did that happen?" (Every night; Nearly every night; Less often)

11/24 "Did you have a lot more trouble concentrating than usual?" (Yes; No)

12/25 "At these times, people sometimes feel down on themselves, no good, or worthless. Did you feel this way?" (Yes; No)

13/26 "Did you think a lot about death—either your own, someone else's, or death in general?" (Yes; No)

A value of 1 was assigned to any "yes" answer to the "yes/no" questions. For questions 8 and 21, a score of 1 was assigned if the change in weight was at least 10 pounds (4.5 kilograms). For questions 10 and 23, a score of 1 was given to respondents who reported having trouble falling asleep every night or nearly every night. Those who replied "yes" to question 2, and whose symptoms lasted all day or most of the day, and had occurred every day or almost every day, had a maximum possible score of 8. For those who responded "yes" to question 16, and whose symptoms lasted all day or most of the day, and had occurred every day or almost every day, the maximum possible was 7. Respondents who replied "no" to questions 2 and 16 scored 0.

Response scores were totalled, and the results were transformed into a probability estimate of a diagnosis of MDE. For this article, if the estimate was 0.9 or more, that is, 90% likelihood of a positive diagnosis of MDE, the respondent was considered to have experienced a depressive episode in the previous 12 months. To obtain a probability of 0.90, respondents had to score 5 or more. Respondents were classified as having experienced a new MDE if their scores indicated a depressive episode before their 1996/97 or 1998/99 interview, but not in the 12 months before their 1994/95 interview.

Personal characteristics included in the analysis were: age, marital status, educational attainment, income adequacy, living arrangements, and main activity.

Age was subdivided into 6 groups: 12 to 14, 15 to 19, 20 to 24, 25 to 44, 45 to 64, and 65 or older.

Respondents were asked for their current *marital status*. Those who indicated the "now married," "common-law" or "living with a partner" options were grouped together as "married." Individuals who answered "single" were classified as "never married," and "widowed," "separated" and "divorced" were categorized as "previously married."

Educational attainment was grouped into four categories: less than secondary graduation, secondary graduation, some postsecondary, and postsecondary graduation.

Income adequacy is based on household income in relation to household size. Household income is classified as inadequate according to the following criteria:

Household income	Household size
Less than $15,000	1 or 2 persons
Less than $20,000	3 or 4 persons
Less than $30,000	5 or more persons.

Lives alone was coded "yes" for all individuals who were not sharing a household with another person.

Respondents were categorized according to their main activity. Categories were mutually exclusive. These include currently working, in school, retired, ill or disabled, caring for someone, had a job in the last 12 months but not currently working, and did not work in the last 12 months. For the multivariate analysis, ill or disabled was combined with caring for someone, and the not working category included those who had a job in the last 12 months but were not currently working and did not work in the last 12 months.

Health behaviours include *smoking* and *drinking*. To assess smoking behaviour, respondents were asked: "At the present time do you smoke cigarettes daily, occasionally or not at all?"

To assess drinking behaviour, respondents were asked: "During the past 12 months, have you had a drink of beer, wine, liquor or any other alcoholic beverage?" Those who answered "yes" were asked: "How often in the past 12 months have you had 5 or more drinks on one occasion?" Men who reported that they had 52 or more occurrences of drinking 5 or more drinks in one occasion in the last

year were considered to be binge drinkers. For women the cut-off was 26 or more occurrences or every two weeks on average. Respondents who stated that they had not used alcohol in the past 12 months were coded "0" on the indicator measuring drinking behaviour.

Respondents were asked if they had "long-term conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health care professional." Only a subset of *chronic conditions* was retained, and they were combined into three major groupings. The first group included back problems, high blood pressure, migraine, and ulcer. The second group was composed of arthritis, emphysema, diabetes, and glaucoma. The last group included heart disease, stroke, cancer and incontinence. In the 1994/95 interview, a list was read, and the interviewer marked all the conditions that applied. In 1996/97 and 1998/99, the respondent was asked to answer "yes" or "no" to each condition. Respondents were categorized as having none or one or more chronic conditions for each grouping.

Social resources include perceived emotional support and social involvement. Four "yes/no" questions measured emotional support. Those who answered "no" to one or more questions (16%) were classified as lacking social support.

1. Do you have someone you can confide in, or talk to about your private feelings or concerns?
2. Do you have someone you can really count on to help you out in a crisis situation?
3. Do you have someone you can really count on to give you advice when you are making important personal decisions?
4. Do you have someone who makes you feel loved and cared for?

The estimated internal consistency for this index is .64.

Social involvement measures frequency of participation in associations or voluntary organizations and frequency of attendance at religious services in the last year. Respondents were asked: "Are you a member of any voluntary organizations or associations such as school groups, church social groups, community centres, ethnic associations or social, civic or fraternal clubs? (Yes; No - go to 3). If "yes," respondents answered the following question on a five-point scale ("at least once a week," "at least once a month," "at least three or four times a year," "at least once a year," "not at all"): (Question 2) "How often did you participate in meetings or activities sponsored by these groups in the past 12 months?" and "If you belong to many, just think of the ones in which you are most active."

All respondents were also asked (Question 3): "Other than on special occasions (such as weddings, funerals or baptisms), how often did you attend religious services or religious meetings in the past 12 months?"

Questions 2 and 3 were scored from 0 ("not at all") to 4 ("at least once a week"). Respondents who answered "no" to question 1 were given a score of 0 on question 2. Answers were summed for a potential range of 0 to 8. The median value for the 1994/95 cross-sectional distribution was used to as the cut-off for low social involvement (a score below 3). Around 52% of the longitudinal respondents had low social involvement. The estimated internal consistency for this index is .45.

Psychological resources include self-esteem and mastery. Self-esteem measures the "positiveness" with which individuals regard themselves.[29] On a five-point scale from "strongly disagree" (score 0) to "strongly agree" (score 4), respondents to the NPHS replied to the following statements:

1. You feel that you have a number of good qualities.
2. You feel that you're a person of worth at least equal to others.
3. You are able to do things as well as most other people.
4. You take a positive attitude toward yourself.
5. On the whole, you are satisfied with yourself.
6. All in all, you're inclined to feel you're a failure (scoring reversed).

Respondents who scored below the median of the cross-sectional distribution (a score of 20) (54%) were considered to have low self-esteem. The internal consistency of the scale was estimated at 0.84.

Sense of mastery measures the extent to which people believe that their life chances are under their control.[30] On a five-point scale from "strongly agree" (score 0) to "strongly disagree" (score 4) respondents replied to the following statements:

1. You have little control over the things that happen to you.
2. There is really no way you can solve the problems you have.
3. There is little you can do to change many of the important things in your life.
4. You often feel helpless in dealing with the problems of life.
5. Sometimes you feel that you are being pushed around in life.
6. What happens to you in the future mostly depends on you (scoring reversed).
7. You can do just about anything you really set your mind to (scoring reversed).

Respondents who scored below the median of the 1994/95 cross-sectional distribution (a score of 20) were classified as having a low sense of mastery. The scale's internal consistency estimate is 0.75.

Income inequality and mortality among working-age people in Canada and the US

Highlights

- Canadian provinces and metropolitan areas had generally lower income inequality and lower mortality than their US counterparts.
- Within Canada, there was no association between income inequality and mortality at either the provincial or metropolitan area levels. However, this relationship is strong in the United States.
- This Canada-US comparison suggests that the Canadian urban environment may be more beneficial to health than its US counterpart.

When we study large groups of individuals in industrialized countries, people with higher socioeconomic status (SES) (for example, higher incomes and education levels) report better health than those in lower SES groups. Richer individuals are also less likely to be sick and to die prematurely than are poorer individuals. The relationship between SES and health is one of the most pervasive in the epidemiologic literature and has held up over time and in countries throughout the world.

Given this relationship at the individual level, we might expect that the richest countries would also have the healthiest populations (measured by life expectancy or age-standardized mortality rates). But when researchers looked at the relationship between gross national product (GNP) per capita and mortality, they found that higher GNP is associated with lower mortality primarily at lower levels of GNP.[1,2] Between $5,000 and $10,000 per capita (1991 US dollars),[3] the gain in life expectancy is about three years. Beyond $10,000, the gains in life expectancy are very slight. The highest-income countries such as the United States and Germany do not fare as well in life expectancy as upper

middle-income societies such as Iceland or Greece. On the other hand, among these higher-income countries, there is an association between income inequality within the country and its average mortality rate.

These findings suggest that what matters for mortality and health in an industrialized society may not be so much the absolute level of income of that society, but rather how evenly that income is distributed. Studies in support of this idea have examined data from different countries,[1,2] US states[4] and US metropolitan areas.[5]

There are two broad ways of thinking about why the income distribution of a particular place might affect the health of the population living there. A *psychosocial* interpretation suggests that income inequality affects health through perceptions of level in the social hierarchy. Individuals at the bottom of the income distribution could feel greater anxiety and shame in their social relationships with those

Methods

Data sources

US data: Mortality data for the 50 US states are from the Centers for Disease Control (CDC) Wonder website. Mortality rates by state, sex and age were averaged over three years (1989-1991) to improve the stability of the estimates. State median share proportions and the median income values were generated from the 1990 US Census and have appeared in a previous paper.[3] Metropolitan area mortality rates and median share proportions are from Lynch and colleagues.[4]

Canadian data: the income inequality data for Canada are from a 1991 Census of Canada microdata file. Canadian mortality data were based on three-year averages (1990-1992) by province, sex and age group, and by metropolitan area and age group.

Analytical techniques

Associations between income inequality and working-age mortality were studied in the 50 US states and the 10 Canadian provinces, as well as in 282 US and 53 Canadian metropolitan areas with populations greater than 50,000 (1990 in the United States and 1991 in Canada). All mortality rates were age-standardized to the Canadian population in 1991. The associations were examined separately by the following age and sex groupings for the states and provinces: infants (less than one year), children and youth (1 to 24), working-age men (25 to 64), working-age women (25 to 64), elderly men (65 or older) and elderly women (65 or older). Age groupings were the same for metropolitan areas, but breakdowns by sex for US metropolitan areas were unavailable. Correlation and weighted regression analyses were the key analytic techniques.

Limitations

The study is cross-sectional in nature and, therefore, cannot determine that income inequality is a cause of mortality. Instead, this study suggests that there is something about the social environment of unequal places in North America that is contemporaneously related to mortality. The study design is also "ecologic" in that it compares attributes of geographically defined populations (mortality rates and income inequality measures are fundamentally characteristics of populations) and not individual people. Another approach, more demanding in terms of data requirements, would consider health outcomes of individuals as a simultaneous function of individual attributes and social context characteristics.

In analyses like these that consider associations between variables, there is always the chance that a third variable is important to the explanation of the observed association. For example, these analyses do not rule out the possibility that regions with high income inequality are also regions with high dispersion in educational attainment.

Definitions

Inequality was measured as the 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 perfect 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 0.50. In this range from 0 to 0.50, higher median share values indicate more equal income distributions.

Income included income for all household members from wages and salaries, net self-employment income, government transfers and investment income, before deducting income tax.

further up the social hierarchy. Over time, such negative emotions may translate into poorer health through biological responses in the human body to chronic stress. Another interpretation, *neo-material,* suggests that the health effects of income inequality result primarily from "the differential accumulation of exposures and experiences that have their sources in the material world."[6] According to this view, the adverse effects on health result from the underinvestment in social resources, like education and health care, in places that tolerate larger gaps in income between the rich and the poor.

These two mechanisms may be interrelated. Varying levels of income inequality can be associated with social situations that generate unhealthy environments in the home, at work, and in the community. These unhealthy environments are deprived both materially and socially, but the psychosocial effects of exposure to them take on increased importance in well-off but more unequal places. Those at the bottom of a steep social hierarchy are affected disproportionately by their day-to-day, year-to-year interactions with unhealthy environments—made worse for psychosocial health when those on the bottom are acutely aware that others manage to escape or avoid those environments altogether.[7]

This analysis, based on a recent research article,[8] reports on the relationship between income inequality and death among working-age Canadians and Americans. In doing so, the Canada-US comparison recognizes that citizens in both countries experience similar cultural influences. Despite these similarities, there are also major historical differences between the two countries in social policy, racial make-up, and in the gap between the rich and the poor.

Associations between income inequality and working-age mortality were studied in 50 US states and 10 Canadian provinces, as well as in 282 US and 53 Canadian metropolitan areas with populations greater than 50,000 (1990 in the United States and 1991 in Canada) (see *Methods*).

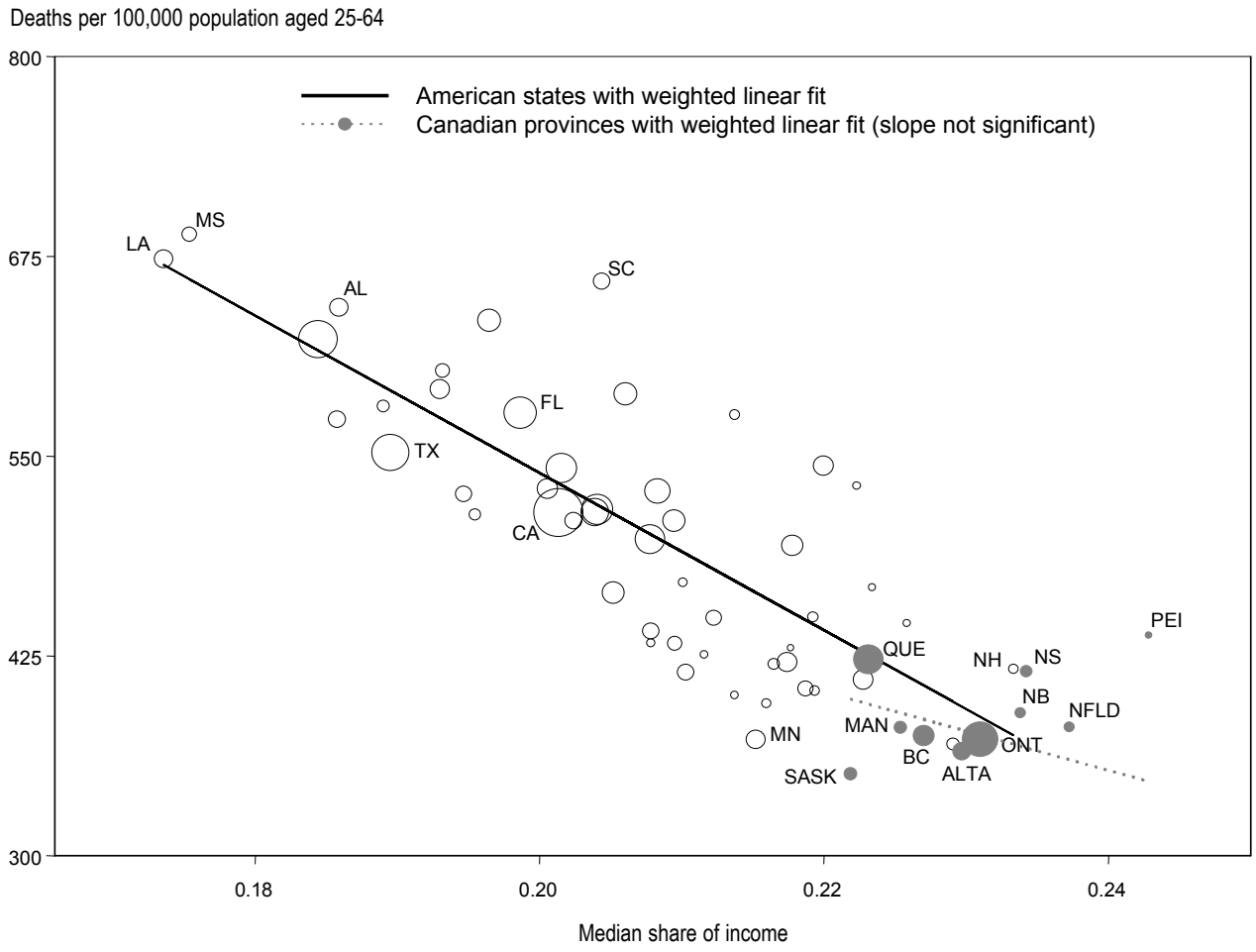
We focus here on the working-age (25 to 64) population, mainly because we found that the association between inequality and mortality is strongest for this population group.[8] There are at least two related explanations that might account for the strong association of income inequalities on mortality for those of working-age. The first is that these are the years when one is most likely to be aware of social position. This interpretation is consistent with a hypothesis suggesting that perceptions of relative status operate through psychological effects on physiological functions. The second is that by the time individuals reach working age, they have had the opportunity to receive a reasonable "dose" of the material features of an unequal society that affect their health.[7]

States and provinces

Chart 1 shows the pooled results for US states and Canadian provinces. The median share values for the states/provinces ranged from .17 (least equal) in Louisiana to .23 (most equal) in New Hampshire for the US states, while the range for the Canadian provinces was .22 (least equal) for Saskatchewan to .24 (most equal) for Prince Edward Island (Chart 1). The vertical axis of the figure is an age-standardized mortality rate for working-age males per 100,000 population, while the horizontal axis is the median share income inequality measure. The open circles represent US states, and solid circles are Canadian provinces. The areas of the circles are proportional to the population sizes of the states and provinces. There was little overlap between US states and Canadian provinces in regard to income inequality, with only Wisconsin, Vermont, Utah and New Hampshire sharing levels of income inequality similar to the Canadian provinces. The Canadian provinces as a group appear almost as a more equal extension of US states, having both lower mortality and lower inequality.

When we consider all 60 points together, there is a strong association between income inequality and mortality in North America, combining the Canada and US observations. The strongest relationship with inequality was for working-age populations, and in particular, working-age males, compared with analyses of infants, youth and the elderly. However, when the Canadian and US observations are examined separately, significant differences emerge.

Chart 1
Mortality rates† of population aged 25 to 64 in Canadian provinces and American states, by percentage of total household income in province or state received by households with income below the median, 1991 (Canada) and 1990 (United States)



***Data sources**: 1991 Census of Canada; Canadian Vital Statistics Data Base; Centers for Disease Control*
† Standardized to 1991 Canadian population

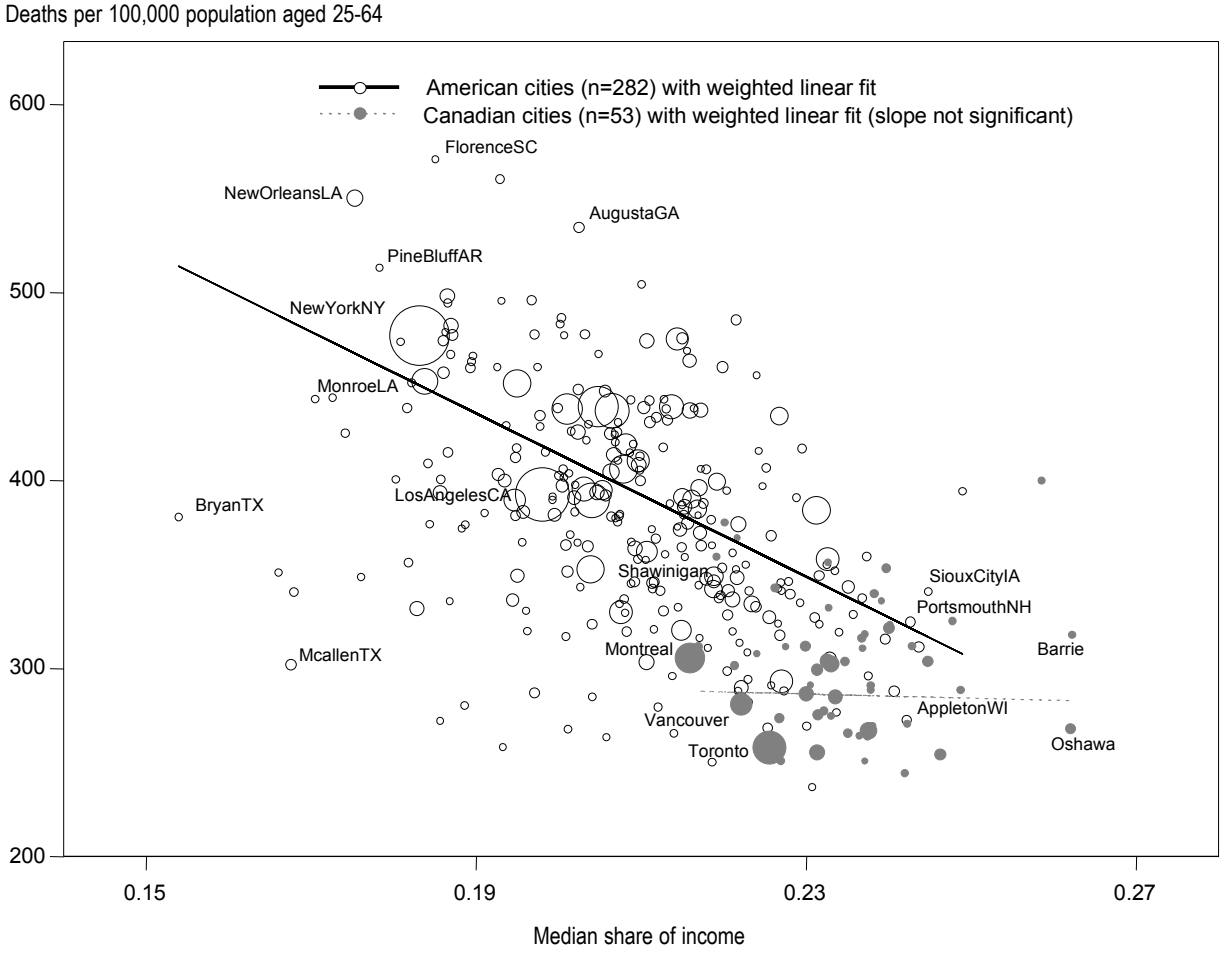
The solid sloped line through the US observations shows a significant linear statistical relationship. When we look only at the Canadian data points, on the other hand, there is no statistically significant relationship between income inequality and mortality for any of the age groups, though the small number of observations means that the ability to detect a relationship is very limited.

Metropolitan areas

Chart 2 shows similar data, but this time the observations correspond to US and Canadian metropolitan areas. The populations of the 282 metropolitan areas in the United States ranged from 56,700 (Enid, Oklahoma) to 18,087,300 (New York, New York) with a median size of 242,800. The populations of the 53 metropolitan areas in Canada ranged from 50,200 (Saint-Hyacinthe, Québec) to 3,893,000 (Toronto, Ontario) with a median size of 116,100. This large number of observations will support stronger statistical conclusions. The median share values ranged from .15 (least equal) in Bryan, Texas, to .25 (most equal) in Jacksonville, North Carolina, for the United States. The range in Canada was .22 (least equal) for Montréal, Québec, to .26 (most equal) for Barrie, Ontario.

Similar to the state/provincial analyses, the relationship between income inequality and mortality

Chart 2
Mortality rates† of population aged 25 to 64 in Canadian and American metropolitan areas, by percentage of total household income in metropolitan area received by households with income below the median, 1991 (Canada) and 1990 (United States)



***Data sources**: 1991 Census of Canada; Canadian Vital Statistics Data Base; Centers for Disease Control*
† Standardized to 1991 Canadian population

was strong for the combined 335 metropolitan areas in North America. The relationship is also strong for the 282 US metropolitan areas (the open circles). The strength of these associations, furthermore, is unaffected in a multivariate analysis, which also includes the median incomes of the metropolitan areas. When the 53 Canadian metropolitan areas (the solid circles) are considered on their own, however, there is no statistically significant association. This finding is a major counter-result to the US and international research to date.

Concluding remarks

For states, provinces and metropolitan areas in North America, overall income inequality is strongly related to mortality, and this relationship is strongest for working-age populations. However, there is no relationship between income inequality and mortality within Canada, even though the association is very strong in the United States. The juxtaposition of Canadian and US polities in these analyses raises questions about differences in the social and material conditions of the two countries that appear to mute

inequality's relationship to mortality in Canada, compared with that in the United States.

A major difference between the two countries is the way in which resources such as health care and high-quality education are distributed. In the United States, these resources tend to be distributed by the marketplace, so their utilization tends to be associated with ability to pay; in Canada, they are publicly funded and universally available. As a consequence, in the United States, an individual's income, in both a relative and absolute sense, is a much stronger determinant of one's life chances, and, in turn, their "health chances," than in Canada.

American metropolitan areas also differ from Canadian metropolitan areas in terms of the extent of economic and social inequality. One conjecture is that US cities tend to have much more concentrated areas of affluence and of poverty than Canadian cities. The possibility that such urban residential segregation affects health is the focus of ongoing Canadian-US comparative research.

These results raise intriguing questions about the nature of Canadian society; particularly, about the nature of urban environments in Canada, that appears to exempt Canadian cities from the adverse association of inequality with mortality, seen so clearly in the US data. ●

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References

1 Rodgers GB. Income and inequality as determinants of mortality: an international cross-section analysis. *Population Studies* 1979; 33: 343-51.

2 Wilkinson RG. Income distribution and life expectancy. *British Medical Journal* 1992; 304: 165-8.

3 World Bank. *World Development Report 1993: Investing in Health.* New York: Oxford University Press, 1993.

4 Kaplan GA, Pamuk E, Lynch JW, et al. Income inequality and mortality in the United States: analysis of mortality and potential pathways. *British Medical Journal* 1996; 312: 999-1003.

5 Lynch JW, Kaplan GA, Pamuk ER, et al. Income inequality and mortality in metropolitan areas of the United States. *American Journal of Public Health* 1998; 1074-80.

6 Lynch JW, Davey Smith G, Kaplan GA, et al. Income inequality and health: A neo-material interpretation. *British Medical Journal* 2000: 320 (in press).

7 Ross NA, Wolfson MC, Dunn JR. Why is mortality higher in unequal societies? Interpreting income inequality and mortality in Canada and the United States. In: Boyle P, Moore E, Gatrell A, et al, eds. *The Geography of Health Inequalities in the Developed World* (in press).

8 Ross NA, Wolfson MC, Dunn JR, et al. Income inequality and mortality in Canada and the United States: A cross-sectional assessment using census data and vital statistics. *British Medical Journal* 2000; 320 (in press).

Personal health practices: Smoking, drinking, physical activity and weight

Highlights

- The proportion of young adults aged 20 to 24 who are at least moderately physically active in their leisure time increased between 1994/95 and 1998/99.
- The prevalence of smoking among teen girls aged 15 to 19 is higher than among teenage boys.
- Heavier drinking (at least five alcoholic drinks per occasion) increased among both males and females between 1994/95 and 1998/99. Fully 45% of males aged 20 to 24 did so at least monthly in 1998/99.

Personal health practices have an important influence on health at any age. However, decisions made in the teen and young adult years may be particularly important to future health. For example, the vast majority of daily adult smokers begin smoking daily in their teens.[1] Further, it has been shown that the younger the age of daily smoking initiation, the lower the chances of quitting as an adult, and the stronger the addiction to nicotine.[1] The proportion of youths practising risky lifestyle behaviours may also differ from the rest of the population. For example, while smoking has been declining in the Canadian population as a whole, the prevalence of youth smoking increased between 1991 and 1994/95.[2]

This article looks at some of the most recent findings from the 1998/99 National Population Health Survey (NPHS) related to smoking, binge drinking and physical activity patterns, as well as the prevalence of overweight (see *Methods* and *Definitions*). Coefficients of variation (CVs) and changes in proportions across data years were examined only for NPHS data, and these tests accounted for multiple

comparisons: 1994/95 versus 1996/97; 1994/95 versus 1998/99; and 1996/97 versus 1998/99. In addition, data from the 1978/79 Canada Health Survey (CHS) and the 1985 and 1991 General Social Survey (GSS) were used to produce time series data for rates of smoking and overweight. The tables show rates for respondents aged 15 or older, by age group. However, the analysis focuses on young Canadians aged 15 to 19 and 20 to 24.

Data analyzed for this article pertain only to the provinces. In addition, body mass index figures in the teen years may change substantially in adulthood. However, tracking overweight trends in teens and young adults is still useful in determining overall trends.

Fluctuations in youth smoking not significant

For the 15-to-19 and 20-to-24 age groups, both daily and current smoking remained fairly stable across the three NPHS cycles (1994/95, 1996/97 and 1998/99) when the sexes are combined (Table 1). And although it appears that rates observed separately by sex for these age groups see greater changes, none of these was statistically significant. For example, the "current" smoking rate for boys aged 15 to 19 dropped by 5 percentage points between cycles 1 and 3 (28% compared with 23%), but this failed to reach statistical significance. Similarly, the current smoking rate for girls aged 15

Methods

Data sources

The time series on at least monthly or at least weekly binge drinking and on at least moderate exercise are from the first three cross-sectional National Population Health Survey (NPHS) Health files (1994/95, 1996/97 and 1998/99) (see *Annex*). In addition to these files, data from the Canada Health Survey (1978/79) and from the General Social Survey (GSS) (1985 and 1991) were used to produce time series data for current and daily smoking rates, as well as some excess weight and overweight rates. Surveys were selected based on the comparability of occasional smoking data.[3] (A brief description of these surveys can be found in reference 2.) In addition, to perform the longitudinal analysis on new smokers and new binge drinkers, the 1994/95-to-1998/99 longitudinal NPHS file was used.

Analytical techniques

All analyses performed utilized respondent data weighted to represent the Canadian population. Coefficients of variation (CVs) for prevalence estimates, comparisons between prevalences (1994/95 versus 1996/97; 1994/95 versus 1998/99; 1996/97 versus 1998/99) and p-values for odds ratios were performed only for NPHS data, using the bootstrap variance estimation technique, which accounts for sample design complexity, such as clustering.[4-6] Tests for statistically significant differences were adjusted for multiple (three) comparisons using the Bonferroni approach.

Multiple logistic regression was performed to investigate which 1994/95 respondent characteristics were associated with becoming a new smoker or new binge drinker by 1998/99. Respondents kept for the multivariate analysis on new daily/occasional smokers were aged 12 to 15 or 16 to 19 in 1994/95 and had reported being a "never smoker" at that time. They had then either become a daily/occasional smoker or had remained a never smoker by 1998/99. All other respondents were removed from the analysis. Similar criteria were used in selecting respondents for analysis on new daily smoking. For the models used to investigate new monthly or more frequent binge drinking by 1998/99, respondents had to report no binge drinking or binge drinking on less than a monthly basis in cycle 1. A similar definition was used for new weekly or more frequent binge drinkers.

Limitations

Analysis was performed for provincial data only. Body mass index figures calculated to obtain some excess weight and overweight rates are not usually used for people under the age of 21 or over the age of 65, because they are not considered reliable. However, time series data can still provide useful trend information for these sub-populations. Pregnant women are out-of-scope for BMI measurements, but they could not be identified, and, therefore, they were not removed from the GSS files. Information on binge drinking was collected differently in 1994/95. Respondents were asked how many times in the last year they had had five or more alcoholic drinks per occasion, whereas in 1996/97 and 1998/99, they were asked how often in the last year they had had five or more alcoholic drinks per occasion (that is, more than weekly, weekly, monthly, etc).

to 19 seems to have increased slightly between NPHS cycles, but the changes were not statistically significant. However, the difference between the sexes in that age group was significant in the last NPHS cycle, with girl smokers at 32%, compared with 23% of boys. What makes these smoking rates all the more troubling, particularly in teenage girls, is that young smokers are almost as well aware as young non-smokers of the health risks associated with lighting up.[7]

Young adults aged 20 to 24 are more likely than any other age group to smoke. And although it appears that men and women in this age category have been fluctuating back and forth in terms of having the higher smoking prevalence, the only time point in the NPHS collection periods where this difference was significant was in 1996/97, when it was a greater proportion of men smoking (38% compared with 31% of women).

Some of the changes observed in the older age groups did achieve statistical significance. For women aged 25 to 44, the rate of 31% observed in cycles 2 and 3 of the NPHS were both lower than the 34% observed in cycle 1. Similarly, men in that age group saw lower rates in both 1996/97 and 1998/99 as compared with 1994/95. A significant drop was also observed for men in the next age category (45- to 64-years-old) between cycles 1 and 3 of the NPHS.

A multivariate analysis was conducted using the 1994/95-to-1998/99 NPHS longitudinal file to observe which factors, if any, were associated with youths taking up current or daily smoking four years later (Table 2). Variables examined include sex, low self-esteem, being overweight, having two or more chronic conditions, and differences in household income. None of these factors had any association with future smoking, either before or after adjusting for multiple factors (unadjusted results not shown).

Table 1
Smoking, by age and sex, household population aged 15 or older, Canada excluding territories, 1978/79 to 1998/99

	Current smoking†						Daily smoking‡					
	1978/79	1985	1991	1994/95	1996/97	1998/99	1978/79	1985	1991	1994/95	1996/97	1998/99
	%						%					
Both sexes												
Total	**41**	**35**	**31**	**31**	**29§**	**28§**	**37**	**30**	**26**	**25**	**25**	**24§**
15-19	38	27	23	28	29	28	33	20	16	20	22	22
20-24	51	42	40	36	35	37	47	35	28	29	28	29
25-44	45	39	36	37	33§	33§	41	34	31	31	29§	28§
45-64	39	35	30	29	26	26§	37	32	26	25	24	23
65+	22	21	16	15	15	13	21	18	13	12	12	11
Men												
Total	**44**	**37**	**32**	**33**	**31**	**29§††**	**41**	**33**	**26**	**27**	**27**	**25§**
15-19	36	26	20	28	28	23	32	20	12	19	21	19
20-24	52	39	44	33	38	38	49	32	28	27	31	30
25-44	48	43	37	39	36§	34§	45	38	33	33	32	30
45-64	44	38	29	32	29	27§	42	36	25	27	26	25
65+	32	26	18	17	17	15	30	23	15	14	15	13
Women												
Total	**37**	**32**	**30**	**28**	**26§**	**26§**	**33**	**28**	**26**	**24**	**22§**	**22**
15-19	40	28	26	30	31	32	34	21	20	21	23	25
20-24	50	45	35	38	31	36	45	38	27	30	25	27
25-44	41	35	34	34	31§	31§	37	31	30	29	27	26
45-64	34	33	31	25	24	24	32	29	28	22	22	22
65+	15	17	15	13	13	12	14	15	12	10	10	10

***Data sources**: 1978/79 Canada Health Survey; 1985 and 1991 General Social Survey; 1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Household files*
***Notes**: All National Population Health Survey (NPHS) estimates have coefficients of variation less than 16.6%. Pairwise comparisons were done for NPHS estimates; tests of differences were adjusted for multiple (3) comparisons (1994/95 vs 1996/97, 1994/95 vs 1998/99 and 1996/97 vs 1998/99).*
† Daily or occasional smokers as a percentage of all respondents
‡ Daily smokers as a percentage of all respondents
§ Significantly different from 1994/95, p ≤0.05
†† Significantly different from 1996/97, p ≤0.05

Some of these factors, such as income, may play a role in adult smoking rates, but perhaps other factors not examined here, such as peer pressure, may play a more important role in youth smoking initiation.

It should be noted that, although binge drinking (having at least five alcoholic drinks in one occasion) in 1994/95 was not associated with future "current" or "daily" smoking for these age groups, monthly or more binge drinking in 1998/99 was highly associated with concurrent smoking (data not shown). It is not possible, however, to determine if the smoking habit really developed concurrently with the drinking, or if one behaviour preceded the other.

Further analysis of smoking rates can be obtained from other published reports.[3,8]

Table 2
Adjusted odds ratios relating new current or daily smoking and new monthly or weekly binge drinking in 1998/99 to selected 1994/95 characteristics, household population aged 12 to 15 and 16 to 19 in 1994/95, Canada excluding territories

1994/95 characteristics	New current smoking†	New daily smoking†	New monthly alcohol bingeing‡	New weekly alcohol bingeing§
Male	0.8	1.0	2.2*	4.4*
Age 12-15††	1.0	1.1	1.0	1.0
2+ chronic conditions	1.5	1.8	0.9	2.0*
At least monthly binge drinker	1.0	1.0	...	3.9*
At least some excess weight	0.6	0.6	0.8	0.8
Regular, moderate leisure-time physical activity	1.1	1.0	1.4	1.3
Rural	0.9	1.4	1.3	1.3
Lowest/Lower-middle income‡‡	0.7	1.1	0.9	0.8
Someone else in household smoked	1.3	1.8	1.5	1.8*
Low self-esteem‡‡	0.9	1.1	0.9	1.4
Current smoker (1994/95)	...	...	1.6	1.8

Data sources: *National Population Health Survey, Longitudinal File, 1994/95 to 1998/99*
Notes: *Bingeing means having 5 or more drinks per occasion; a drink is one bottle or can of beer or glass of draft, one glass of wine or a wine cooler, or one drink or cocktail with 1.5 ounces of liquor.*
† Reported never smoking in 1994/95.
‡ Reported bingeing fewer than 12 times (including no bingeing) in year before 1994/95.
§ Reported bingeing fewer than 52 times (including no bingeing) in year before 1994/95.
†† Reference category is 16-19.
‡‡ A missing category was included in the models, but is not shown.
··· Not applicable
** $p \leq 0.05$*

Binge drinking rises sharply among young males

Binge drinking by young Canadians, at least on a yearly basis, is relatively prevalent among teens and young adults.[9] But even when examining binge drinking on at least a monthly basis, figures are

Table 3
Binge drinking, by age and sex, household population aged 15 or older, Canada excluding territories, 1994/95 to 1998/99

	Binge at least monthly†			Binge at least weekly‡		
	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99
	%			%		
Both sexes						
Total	**11**	**14§**	**15§††**	**4**	**5§**	**5§**
15-19	13	19§	24§††	4‡‡	5	7§
20-24	20	30§	32§	6	11§	10§
25-44	13	16§	17§	4	5§	6§
45-64	9	10	12§††	3	3	4
65+	3	3	3	1‡‡	1‡‡	1‡‡
Men						
Total	**18**	**20§**	**24§††**	**6**	**7§**	**9§**
15-19	17	21	29§††	6‡	7	10‡‡
20-24	31	40§	45§	11	16§	17§
25-44	21	24§	27§††	7	9§	10
45-64	16	16	19§††	6	6	7
65+	5	5	6	2‡‡	2‡‡	2‡‡
Women						
Total	**4**	**7§**	**7§**	**1**	**2§**	**2§**
15-19	8‡‡	16§	19§	†††	4‡‡	3§§
20-24	11	21§	19§	†††	6‡‡	4‡‡
25-44	5	7§	7§	1‡‡	2§	2
45-64	3	4§	5§	1§§	1‡	2‡‡
65+	†††	†††	†††	†††	†††	†††

Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Household files*
Notes: *Bingeing means having 5 or more drinks per occasion; a drink is one bottle or can of beer or glass of draft, one glass of wine or a wine cooler, or one drink or cocktail with 1.5 ounces of liquor. For 1994/95, binge drinking was determined to be at least monthly or weekly if 12 or 52 or more binges, respectively, were reported for the past year. For 1996/97 and 1998/99, binge drinking was determined to be at least monthly (weekly) if binges were reported as taking place " monthly" ("weekly"). Pairwise comparisons of percentages were done; tests of differences were adjusted for multiple (3) comparisons (1994/95 vs 1996/97, 1994/95 vs 1998/99 and 1996/97 vs 1998/99).*
† Respondents who binged at least monthly as a percentage of all respondents
‡ Respondents who binged at least weekly as a percentage of all respondents
§ Significantly different from 1994/95, $p \leq 0.05$
†† Significantly different from 1996/97, $p \leq 0.05$
‡‡ Coefficient of variation between 16.6% and 25.0%
§§ Coefficient of variation between 25.1% and 33.3%
††† Coefficient of variation greater than 33.3%

relatively high for teens and young adults (Table 3). Over the last three NPHS cycles, the prevalence of binge drinking at least monthly among all teens aged 15 to 19, increased sharply and significantly from 13% to 19% to 24% by 1998/99. Unlike smoking, the prevalence is lower for girls than for boys, but sharp increases over the three surveys are also evident for girls (8% to 16% to 19% by 1998/99), although the last increase was not statistically significant.

Binge drinking on a much more frequent basis (that is, at least weekly) is much less prevalent; nonetheless, it reached 10% for boys aged 15 to 19 by 1998/99.

Young adult males in the 20-to-24 age group are by far the most likely to engage in at least monthly

Definitions

A *current smoker* is someone who smokes either daily or on an occasional basis.

At least monthly binge drinking in 1994/95 refers to having had five or more alcoholic drinks per occasion at least 12 times in the year preceding the National Population Health Survey (NPHS) interview. In 1996/97 and 1998/99, it refers to reporting bingeing on at least a "monthly" basis in the year prior to the NPHS interview.

At least weekly binge drinking in 1994/95 refers to having had five or more alcoholic drinks per occasion at least 52 times in the year preceding the NPHS interview. In 1996/97 and 1998/99, it refers to reporting bingeing on at least a "weekly" basis in the year prior to the NPHS interview.

Some excess weight refers to having a body mass index (weight/height^2, with weight in kilograms and height in metres) of 25.0 or greater. This coincides with the Canadian standard for "some excess weight and overweight" and the World Health Organization standard for "overweight and obese." Respondents who were under 3 feet (0.914 m) tall, over 6 feet, 11 inches (2.108 m), or pregnant were out of scope for a BMI measurement and were excluded in the estimation of these proportions (see *Limitations*).

Overweight refers to having a body mass index of 27.0 or greater. This coincides with the Canadian standard for "overweight" (see note for *some excess weight*).

At least moderate leisure-time physical activity refers to reporting physical activities requiring at least medium energy expenditure (at least 1.5 kilocalories per day, based on the duration and independently established energy demand of the activity) and reporting activities at least 12 times per month, where the duration of each session is at least 15 minutes. Only recreational activities are considered for this measure (for example, physical activities at work or while commuting to and from work are not included).

Respondents were asked if they had any conditions that had lasted or were expected to last at least six months and that had been diagnosed by a health professional. Respondents were read a list of 20 chronic conditions (for example, arthritis or rheumatism, back problems, high blood pressure, cancer) to which a "yes" or "no" answer was required. Respondents were also asked to specify if they had any other chronic conditions not mentioned in the list. Respondents having *two or more chronic conditions* were flagged as such.

Income was defined based on the number of people in the household and total household income from all sources in the 12 months before the survey. The following income groups were defined:

Household income group	People in household	Total household income
Lowest	1 or 2	Less than $15,000
	3 or 4	Less than $20,000
	5 or more	Less than $30,000
Lower-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

Self-esteem was defined from the following items. Respondents had to strongly disagree (score 0), disagree (score 1), neither agree nor disagree (score 2), agree (score 3) or strongly agree (score 4) with each of the following:

- You feel that you have a number of good qualities.
- You feel that you're a person of worth at least equal to others.
- You are able to do things as well as most other people.
- You take a positive attitude toward yourself.
- On the whole, you are satisfied with yourself.
- All in all, you're inclined to feel you're a failure (reverse scale on this item.)

If respondents scored less than 18, then they were deemed to have *low self-esteem*.

or at least weekly binge drinking. The prevalence of at least monthly bingeing observed for males in this age group increased by 14 percentage points (95%, confidence interval; 7 to 22 percentage points) in four years to 45% in 1998/99. The prevalence of binge drinking on a weekly basis also increased in four years for males this age, from 11% in 1994/95 to 17% in 1998/99.

As was the case with smoking, youths aged 12 to 15 and 16 to 19 in 1994/95 were used in multiple logistic regression models to examine the associations between selected factors and future binge drinking (Table 2). This time, sex was a significant factor, even when all other factors were accounted for in the model. Males had more than twice the adjusted odds of at least monthly binge drinking than females. The corresponding odds for at least weekly binge drinking were 4.5 times higher for males than females. Having multiple chronic conditions and the presence of a smoker other than the respondent in the household also increased the adjusted odds of bingeing frequently. As mentioned earlier, both "current" and "daily" smoking in 1998/99 were highly associated with either monthly or weekly binge drinking in the same cycle, but only 1994/95 "current" smoking was examined in the binge drinking models.

The increase in monthly bingeing may signal a continued increase in weekly bingeing in future NPHS cycles, given that young drinkers who binged monthly or more, but not as much as weekly in 1994/95, had significantly higher adjusted odds of becoming new weekly binge drinkers by 1998/99.

Table 4
Overweight, by age and sex, household population aged 15 or older, Canada excluding territories, 1978/79 to 1998/99

	At least some excess weight (BMI ≥ 25)						Overweight (BMI ≥ 27)					
	1978/79	1985	1991	1994/95	1996/97	1998/99	1978/79	1985	1991	1994/95	1996/97	1998/99
	%						%					
Both sexes												
Total	**40**	**32**	**40**	**45**	**44**	**47†‡**	**27**	**17**	**22**	**28**	**27†**	**30†‡**
15-19	10	11	13	16	17	17	7	5	5	8	9	9
20-24	28	17	25	30	27	27	17	8	10	17	15	14
25-44	39	31	37	43	42	47†‡	24	16	21	27	26	30†‡
45-64	63	46	53	58	55	58‡	42	26	32	39	36†	39‡
65+	58	43	48	49	50	52	39	24	27	32	31	34‡
Men												
Total	**44**	**40**	**49**	**53**	**53**	**56‡**	**29**	**20**	**26**	**32**	**32**	**35†‡**
15-19	11	12	29	21	20	20	8	6	8	10	12	10
20-24	34	23	32	37	37	36	22	10	13	19	20	19
25-44	49	42	50	55	54	59†‡	31	21	27	32	33	37†‡
45-64	67	55	63	67	65	67	41	29	36	44	41	44
65+	55	46	55	54	56	56	32	23	28	33	32	35
Women												
Total	**35**	**25**	**30**	**36**	**34†**	**38‡**	**25**	**15**	**18**	**25**	**22†**	**25‡**
15-19	9	8	7	11	13	13§	5	4	3	6§	7	8§
20-24	23	11	17	23	17	17	12	7	7	16	10†	10‡§
25-44	29	20	25	31	30	34‡	17	11	15	22	19	23‡
45-64	59	37	43	50	46	50	43	22	27	34	31	34
65+	60	40	43	46	45	49	44	25	26	32	30	33

Data sources: *1978/79 Canada Health Survey; 1985 and 1991 General Social Survey; 1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Household files*

Notes: *Based on Body Mass Index (BMI), where BMI=weight/height^2, with weight in kilograms and height in metres. Some excess weight is BMI 25 to 26.9; overweight is BMI ≥ 27. Respondents under 3' (0.914m), over 6'11" (2.108m) or pregnant were out of scope for a BMI measurement and were excluded. In the 1985 and 1991 General Social Survey, pregnant women could not be identified and were, therefore, not excluded. Pairwise comparisons were done for National Population Health Survey estimates; tests of difference were adjusted for multiple (3) comparisons (1994/95 vs 1996/97, 1994/95 vs 1998/99 and 1996/97 vs 1998/99).*

† Significantly different from 1994/95, p ≤0.05

‡ Significantly different from 1996/97, p ≤0.05

§ Coefficient of variation between 16.6% and 25.0%

Overweight among young people

Proportions of males aged 15 to 19 and 20 to 24 with at least some excess weight (a body mass index of 25 or more) have held stable since 1994/95, at approximately 20% and 36%, respectively (Table 4).

For 15- to 19-year-old girls, there was a 2-percentage-point climb between cycles 1 and 2 of the NPHS (from 11% to 13%), but this change was not statistically significant, and the rate held stable in cycle 3. For young women (aged 20 to 24), the reverse pattern can be seen, with a 6-point drop to 17% by cycle 2, which then held steady for another cycle. Again, the drop did not reach statistical significance.

Being "definitely overweight" (a body mass index of 27 or more) may carry with it more substantial health risks than having some excess weight.[10] These rates are lower, of course, and while there is a statistically significant increase from 1994/95 to 1995/96 and then again in 1998/99 for the entire population aged 15 or older, no differences can be observed among youths aged 15 to 19 and 20 to 24.

Leisure-time physical activity

Maintaining physical activity is known to be associated with a variety of health benefits.[11] Using data collected in the NPHS, it is possible to determine if respondents participated in leisure-time activities that required "moderate" or higher levels of energy expenditure and if these occurred on a "regular" basis. It must be noted, however, that this indicator takes into account recreational activities only and does not include physical activity at work or while commuting to and from work, for example.

The proportion of teens aged 15 to 19 engaging in moderate leisure-time physical activity appears to have increased 5 percentage points, from 54% to 59% between 1994/95 and 1996/97 (Table 5). The apparent increase was similar for boys (up to 66%) and for girls (up to 51%). However, a statistical difference could not detected.

The story is different for young adults. Although this group has a smaller proportion of moderately active individuals than do teenagers, their percentages increased from 44% (95% confidence interval, 40% to 47%) in 1994/95 to 54% (95% confidence interval, 50% to 58%) by 1998/99. Both sexes saw an increase in cycle 3 of the NPHS.

Table 5
Moderate leisure-time physical activity, by age and sex, household population aged 15 or older, Canada excluding territories, 1994/95 to 1998/99

	1994/95	1996/97	1998/99
		%	
Both sexes			
Total	**37**	**40†**	**44†‡**
15-19	54	59	57
20-24	44	49†	54†
25-44	36	39†	43†‡
45-64	35	37	43†‡
65+	32	32	35‡
Male			
Total	**40**	**42**	**47†‡**
15-19	62	66	65
20-24	47	51†	57
25-44	38	40†	46‡
45-64	34	38†	44‡
65+	37	37	41
Female			
Total	**35**	**38†**	**41†‡**
15-19	45	51	49
20-24	40	47	52‡
25-44	34	39†	41‡
45-64	36	37	42†‡
65+	28	28	31

Data sources: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Household files*
Notes: *Percentages refer to respondents who reported at least moderate physical activity, that is, at least medium energy expenditure (EE) on leisure-time activity on a regular basis, as a proportion of the total population aged 15 or older. At least medium EE refers to a sum of 1.5 or more kcal/kg/day, based on frequency, duration and independently established metabolic energy demand of all leisure-time physical activities reported for the last three months. Regular frequency refers to engaging in a leisure-time physical activity at least 12 times per month, with each session lasting at least 15 minutes. All estimates have coefficients of variation less than 16.6%. Pairwise comparisons of percentages were done; tests of difference were adjusted for multiple (3) comparisons (1994/95 vs 1996/97, 1994/95 vs 1998/99 and 1996/97 vs 1998/99).*
† Significantly different from 1994/95
‡ Significantly different from 1996/97

Concluding remarks

The health behaviours reported here provide a mixed report for young people. More people aged 20 to 24 are moderately active, and rates of overweight have remained relatively stable. Smoking rates appear to have fluctuated somewhat, but the changes did not prove to be significant for individuals aged 15 to 19 and 20 to 24. Binge drinking, particularly among boys and young men,

raises some concerns for the health and well-being of young people, both now and in the future.

Gender differences in these behaviours are worthy of future study and need to be carefully taken into account when programs and policies are developed to prevent and reduce smoking and binge drinking among young people.

The association between binge drinking and smoking is not surprising, given that both behaviours are relatively prevalent among teens, and especially, young adults. An interrelationship of alcohol and smoking dependence has been discussed in other research.[12-15] It may be necessary to address both issues simultaneously in order to reduce their prevalence.

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References

1 Chen J, Millar WJ. Age of smoking initiation: Implications for quitting. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 9(4): 39-46.

2 Stephens M, Siroonian J. Smoking prevalence, quit attempts and successes. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 9(4): 31-7.

3 Gilmore J. *Report on smoking prevalence in Canada, 1985 to 1999* (Statistics Canada, Catalogue 82F0077XIE) Ottawa: Minister of Industry, 2000.

4 Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18(2): 209-17.

5 Rust KF, Rao JNK. Variance estimation for complex surveys in using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 283-310.

6 Yeo D, Mantel H, Liu TP. Bootstrap variance estimation for the National Population Health Survey. *American Statistical Association: Proceedings of the Survey Research Methods Section*. Baltimore: August 1999.

7 Ross N, Pérez C. Attitudes towards smoking. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 10(3): 23-33.

8 Health Canada. *1. Summary of Results*. CTUMS (Canadian Tobacco Use Monitoring Survey), Wave 1: February-June 1999.

9 Galambos N, Tilton-Weaver L. Multiple-risk behaviour in adolescents and young adults. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 10(2): 9-20.

10 Gilmore J. Body mass index and health. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 11(1): 31-43.

11 Chen J, Millar W. Health effects of physical activity. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 11(1): 21-30.

12 Gulliver SB, Kalman D, Rohsenow DJ, et al. Smoking and drinking among alcoholics in treatment: cross-sectional and longitudinal relationships. *Journal of Studies on Alcohol* 2000: 61(1): 157-63.

13 Gulliver SB, Rohsenow DJ, Colby SM, et al. Interrelationship of smoking and alcohol dependence, use and urges to use. *Journal of Studies on Alcohol* 1995, 56(2): 202-6.

14 Zacny JP. Behavioral aspects of alcohol-tobacco interactions. *Recent Developments in Alcoholism* 1990, 8: 205-19.

15 Batel P, Pessione F, Maitre C, et al. Relationships between alcohol and tobacco dependencies among alcoholics who smoke. *Addiction* 1995, 90(7): 977-80.

Health care services—recent trends

Highlights

- In 1998/99, Canadians with low incomes were more likely than those with higher incomes to be heavy users of physician services, to visit emergency departments, to be admitted to hospital, to take multiple medications, and to require home care services.
- Despite an increase in coverage in most provinces for prescription drug and dental insurance, significant differences in use of these services remain. Youth, older adults and Canadians with low incomes are less likely to have insurance coverage for dental care and prescription drugs.
- The percentage of Canadians who said they had health care needs that were not met increased from 4% in 1994/95 (1.1 million people) to 6% in 1998/99 (1.5 million people).
- The likelihood of going to hospital increases with age, having a lower income, having less than a secondary level of education, believing oneself to be in poor health, and being a smoker, physically inactive, and overweight.
- The risk of hospitalization is similar for both female smokers and male smokers. This represents an important change from past studies that showed smaller relative risks of hospitalization for female smokers than for male smokers.

Appropriate health care is not necessarily the principal determinant of the health of populations. While the availability of services or their lack may be decisive in individual cases, it cannot completely explain observed differences among the health of populations.[1] Genetic, social and environmental factors also play an important role in determining population health status. Nevertheless, once an individual becomes ill or injured, access to effective health care becomes paramount.

Under the provisions of the Canada Health Act of 1984, Canadians in each province are assured comprehensive and universal services administered by a public insurance plan. However, prescription medications outside of hospitals and most dental care are the responsibility of the individual.

During the past decade, all provinces and territories have made efforts to contain costs in treatment services and to increase the focus on community-based care. They have also moved toward a population health approach that places more emphasis on other determinants of health, such as social support, education, improved working conditions and personal health practices.

Methods

Data sources

This article is based on Statistics Canada's National Population Health Survey (NPHS)[2] (see *Annex*) and hospital discharge files for 1994/95 through 1997/98.

Person-Oriented Information (POI) morbidity data are from acute care, convalescent and chronic care hospitals. The data do not contain information on cases treated as outpatients or as patients in mental hospitals (patients treated in psychiatric units of general and allied special hospitals are included). Each record contains information abstracted from a patient's hospital chart and pertains to one continuous hospital stay.

Within the hospital records, diagnoses not related to diseases or injuries were excluded. This category included pregnancy-related diagnoses (ICD 630.0-678.9), congenital abnormalities (ICD 740.0-759.4), and non-disease-specific diagnoses (ICD V01.0-V82.9).

Analytical techniques

For the cross-sectional data on the use of health services, the population aged 12 or older is considered. The age groups 12 to 14, 15 to 24, 25 to 44, 45 to 64 and 65 or older constitute youth and young adults, the young working-age population, the older working-age population, and seniors. For trend analysis, the summary rates were age-adjusted to the estimated 1998 population (both sexes) using the direct standardization method. Bootstrap procedures were used to calculate the standard errors of estimates and the differences between prevalence rates in 1994/95 and 1998/99. The comparisons of rates between 1994/95 and 1998/99 are based on the unadjusted rates. At the time of writing, bootstrap procedures to compare adjusted rates at two time periods were not available. Where multiple means tests were employed, multiple comparisons were adjusted by the Exacted Alpha/L method.

For the follow-up study, data were used from seven provinces in the share file of the 1994/95 National Population Health Survey: Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Saskatchewan, Alberta and British Columbia. In this survey, 9,601 respondents aged 25 or older gave permission to link and share their information. These survey data were combined with hospital discharge data from the years 1994/95, 1995/96, 1996/97 and 1997/98, using the health insurance number. In all, 8.9 million records were reviewed. Of these, 2,673 hospital discharge records in the seven provinces were linked to survey respondents.

All analyses are based on weighted data. Prevalence estimates of risk factors and socioeconomic characteristics by sex and future hospital use were calculated. Because the population using hospitals has an older age distribution than the population not affected, weighted logistic regression was used to adjust for age, as well as other factors.

Because of the complex nature of the survey design, bootstrap procedures were employed to derive the variances of estimates for odds ratios and percentages and to compare differences between percentages (age was adjusted).[3] The 0.05 level was used to denote statistical significance.

Limitations

Data from the NPHS are subject to the problems inherent in self-reported information. Specifically, there was no independent source to verify whether people who reported that they had been diagnosed with heart disease, diabetes, and high blood pressure actually did have those conditions.

The NPHS data used in this analysis were collected from people residing in households. Although the percentage of the population living in institutions is quite small, their characteristics may differ from those of household residents in ways that would affect the outcomes if the former were included in the analysis. And even for the household population, those who participated in the survey may have been healthier and more likely than non-respondents to engage in health-promoting behaviour.

Cholesterol and blood pressure levels were not measured, and height and weight were self-reported. However, NPHS body mass index (BMI) results are very close to actual measurements taken in the Canadian Heart Health Surveys (1986 to 1992), which found 57% of men and 39% of women to have BMIs over 27.0 Estimates of the prevalence of smoking in the Heart Health Surveys were also similar to NPHS results. On the other hand, high blood pressure prevalence estimates from the Heart Health Surveys exceed those derived from the NPHS, probably because they are based on actual blood pressure measurements rather than on self-reported values and treatment information. As well, the Heart Health Surveys estimated a slightly higher prevalence of diabetes (5%).

Linkage between the NPHS and hospital morbidity data was done separately for each province, but not across provinces. Visits occurring outside the patient's province of residence were not included.

The ability to link records between the NPHS and the hospital records depends on the accuracy of the health insurance numbers on both sets of data. Data from the NPHS for Québec, Manitoba and Newfoundland could not be linked to hospital data, as the identifiers on the hospital records were scrambled differently.

A limitation of this study was the lack of clinical severity indicators that could play a role in the patients' outcome. Ideally, one would control for severity, but such data were not available.

Information from the National Population Health Survey (NPHS) allows examination of some of the trends and recent changes that have occurred in the last decade (see *Methods*). Linking these data with hospital records enables us to better understand the key risk factors for hospitalization.

Contacts with a physician

In 1998/99, 81% of the population aged 12 or older contacted a medical doctor (includes general practitioners and specialists) on one or more occasions in the year before the survey (Table 1) (see *Health care use*). The contact rate increased with age, from 71% among youth aged 12 to 14 to 91% among persons in the 65-or-older age group. With the exception of the 12-to-14 age group, contact rates were higher among females than among males.

In general, contact with any medical doctor was more common in urban than rural areas. About 82% of urban residents had contacted a doctor, compared with 77% of rural residents. The disparity between rural and urban residents in contact rates was apparent in all three surveys.

The highest rates of contact with a family physician and/or specialist occurred in Prince Edward Island (86%) and Newfoundland (85%). In contrast, rates in Quebec (77%) and Alberta (79%) were among the lowest. Prince Edward Island and Newfoundland were the only provinces which had a significant increase in physician contact rates between 1994/95 and 1998/99.

There are also provincial differences in the proportion of the population that contacts doctors frequently. In Nova Scotia, 17% of the population had contacted a physician 10 or more times, compared with 8% in the province of Québec. In most provinces, the proportion of frequent users declined between 1994/95 and 1998/99. Exceptions to this pattern included Québec, Newfoundland and New Brunswick, where rates of frequent contact remained stable.

Contacts with dentists or orthodontists and dental health insurance

In 1998/99, 60% of the population aged 12 or older had contacted a dentist/orthodontist on one or more occasions in the year preceding the survey (Table 2). The contact rate declined with age, from 84% among youth aged 12 to 14, to 40% among persons in the 65-or-older age group. With the exception of the 65-or-older group, contact rates were higher among females than among males.

About 61% of urban residents had contacted a dentist, compared with 54% of rural residents. The disparity between rural and urban residents in contact rates was apparent in all three cycles of the survey.

There was a wide range in provincial rates of dentist contact. Rates were above the national average (60%) in Ontario (66%) and British Columbia (63%). The province with the greatest increase in dental visits was Newfoundland, where rates increased from 36% in 1994/95 to 43% in 1998/99.

While contact with any medical doctor has remained relatively stable over time, the proportion of the population aged 15 or older that contacted a dentist increased slowly but steadily between 1978/79 (48%) and 1998/99 (61%) (data not shown).

According to the 1998/99 NPHS, 56% of the population aged 12 or older had some form of dental insurance (Table 3). Coverage tended to be highest among youth aged 12 to 14 (about 65%), then declined slightly in the 15-to-24 age group and rose to 63% for those aged 25 to 44. Only one-quarter of the 65-or-older age group (25%) was covered.

There were marked provincial differences in the proportion of the population with dental insurance. The lowest rates were in the province of Québec (41%), Prince Edward Island (43%) and Newfoundland (44%). The highest rates occurred in the provinces of Alberta (66%) and Ontario (64%). In Alberta, dental insurance rates increased from 57% in 1996/97 to 66% in 1998/99, a 9-percentage-point increase. Increases of 4 to 5 percentage points occurred in Newfoundland, Nova Scotia, and Ontario. Significant differences in dental insurance by socioeconomic status are discussed later, along with socioeconomic patterns for other kinds of health care use.

Table 1
Contact with medical doctor in previous 12 months, household population aged 12 or older, by selected characteristics, Canada excluding territories, 1994/95, 1996/97 and 1998/99

	Total population			Unadjusted percentage who contacted medical doctor			Age-adjusted percentage who contacted medical doctor		
	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99
		'000			%			%	
Both sexes									
Total	23,950	24,590	24,920	80	80	81	80	80	81
12-14	1,330	1,150	1,130	75	75	71*	...	...	...
15-24	3,790	3,980	4,070	77	76	77	...	...	...
25-44	9,620	9,710	9,550	79	77	79	...	...	...
45-64	5,970	6,340	6,680	80	82	83*	...	...	...
65+	3,250	3,420	3,490	90	90	91	...	...	...
Males									
Total	11,780	12,100	12,260	74	73	74	74	73	74
12-14	710	580	600	68	70	73	...	...	...
15-24	1,890	2,030	2,060	69	68	68	...	...	...
25-44	4,810	4,850	4,780	71	68	70	...	...	...
45-64	2,970	3,150	3,310	75	77	77	...	...	...
65+	1,400	1,480	1,520	90	89	89	...	...	...
Females									
Total	12,140	12,500	12,660	86	87	87	86	87	87
12-14	620	570	540	84	79	68*	...	...	...
15-24	1,890	1,950	2,010	85	85	87	...	...	...
25-44	4,810	4,860	4,770	86	87	88	...	...	...
45-64	2,970	3,180	3,370	85	87	88*	...	...	...
65+	1,850	1,940	1,970	89	90	91*	...	...	...
Residence									
Rural	4,020	4,310	4,620	75	77	77	75	77	77
Urban†	19,820	20,270	20,290	81	81	82	81	81	82
Missing	100	10	10	75	- -	- -	- -	- -	...
Household income									
Lowest	4,100	3,230	3,160	79	81	82	79	81	81
Lower-middle	6,860	6,190	6,120	80	79	80	80	78	79
Upper-middle	8,170	7,960	8,530	80	80	81	81	81	82
Highest	3,670	3,110	5,240	81	80	82	82	81	82
Missing	1,140	4,100	1,860	80	80	79	79	80	79
Province									
Newfoundland	480	480	460	77	79	85*	77	80	85
Prince Edward Island	110	110	110	83	80	87*	83	80	86
Nova Scotia	760	770	770	83	82	82	83	82	82
New Brunswick	630	630	630	79	80	80	79	80	80
Québec	6,030	6,130	6,100	76	76	77	76	76	77
Ontario	9,050	9,320	9,460	83	82	83	83	82	83
Manitoba	890	900	890	81	80	83	81	81	83
Saskatchewan	790	800	810	80	80	83	80	79	83
Alberta	2,170	2,240	2,360	79	79	79	79	79	79
British Columbia	3,040	3,200	3,320	81	82	80	81	82	80

Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Notes: *At the time of the analysis, bootstrap programs were not available for comparisons of age-adjusted rates over time. Consequently, comparisons between 1994/95 and 1998/99 were based on unadjusted rates. Because there was very little difference between the unadjusted and adjusted rates, reliance on the comparison of unadjusted rates is unlikely to have led to incorrect inferences. Because of rounding, detail may not add to totals.*
† Continuously built-up areas with population of 1,000 or more and population density of 400 or more per square kilometre, based on previous census
··· Not applicable
- - High sampling variability
** Significantly different from 1994/95*

Table 2
Contact with dentist/orthodontist in previous 12 months, household population aged 12 or older, by selected characteristics, Canada excluding territories, 1994/95, 1996/97 and 1998/99

	Total population			Unadjusted percentage who contacted dentist/orthodontist			Age-adjusted percentage who contacted dentist/orthodontist		
	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99
		'000			%			%	
Both sexes									
Total	23,950	24,590	24,920	56	58	60*	56	58	60
12-14	1,330	1,150	1,130	78	81	84	...	...	...
15-24	3,790	3,980	4,070	62	64	65	...	...	...
25-44	9,620	9,710	9,550	59	62	62*	...	...	...
45-64	5,970	6,340	6,680	52	56	59*	...	...	...
65+	3,250	3,420	3,490	38	38	40	...	...	...
Males									
Total	11,780	12,100	12,260	55	56	57	55	56	57
12-14	710	580	600	79	81	83	...	...	...
15-24	1,890	2,030	2,060	61	60	63	...	...	...
25-44	4,812	4,854	4,775	56	58	57	...	...	...
45-64	2,970	3,150	3,310	52	55	56*	...	...	...
65+	1,400	1,480	1,520	41	36	42	...	...	...
Females									
Total	12,140	12,500	12,660	57	61	62*	57	61	62
12-14	620	570	540	77	80	85	...	...	...
15-24	1,890	1,950	2,010	62	67	67	...	...	...
25-44	4,810	4,860	4,770	63	66	67*	...	...	...
45-64	2,970	3,180	3,370	52	58	62*	...	...	...
65+	1,850	1,940	1,970	36	40	38	...	...	...
Residence									
Rural	4,020	4,310	4,620	48	52	54*	48	52	54
Urban†	19,820	20,270	20,290	58	60	61*	57	59	61
Missing	100	10	10	- -	- -	- -	- -	- -	- -
Household income									
Lowest	4,100	3,230	3,160	39	40	39	39	40	39
Lower-middle	6,860	6,190	6,120	48	50	47	48	51	48
Upper-middle	8,170	7,960	8,530	63	65	65	62	64	64
Highest	3,670	3,110	5,240	75	78	79*	76	78	79
Missing	1,140	4,100	1,860	59	58	57	59	59	56
Province									
Newfoundland	480	480	460	38	40	44*	36	39	43
Prince Edward Island	110	110	110	55	57	57	54	57	56
Nova Scotia	760	770	770	53	53	55	53	53	55
New Brunswick	630	630	630	49	49	51	49	49	52
Québec	6,030	6,130	6,100	49	51	53*	49	51	53
Ontario	9,050	9,320	9,460	63	66	66*	63	66	66
Manitoba	890	900	890	53	56	58	53	57	59
Saskatchewan	790	800	810	43	45	49	43	46	49
Alberta	2,170	2,240	2,360	55	54	57	54	53	56
British Columbia	3,040	3,200	3,320	59	62	63	59	62	63

Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Notes: *At the time of the analysis, bootstrap programs were not available for comparisons of age-adjusted rates over time. Consequently, comparisons between 1994/95 and 1998/99 were based on unadjusted rates. Because there was very little difference between the unadjusted and adjusted rates, reliance on the comparison of unadjusted rates is unlikely to have led to incorrect inferences. Because of rounding, detail may not add to totals.*
† Continuously built-up areas with population of 1,000 or more and population density of 400 or more per square kilometre, based on previous census
··· Not applicable
- - High sampling variability
** Significantly different from 1994/95*

Table 3
Dental insurance, household population aged 12 or older, by selected characteristics, Canada excluding territories, 1996/97 and 1998/99

	Total population		Unadjusted percentage with dental insurance		Age-adjusted percentage with dental insurance	
	1996/97	1998/99	1996/97	1998/99	1996/97	1998/99
	'000		%		%	
Both sexes						
Total	24,590	24,920	53	56*	52	56
12-14	1,150	1,130	52	65*	...	...
15-24	3,980	4,070	54	58*	...	...
25-44	9,710	9,550	62	63	...	...
45-64	6,340	6,680	55	59*	...	...
65+	3,420	3,490	21	25*	...	...
Males						
Total	12,100	12,260	53	56*	52	56
12-14	580	600	51	67*	...	...
15-24	2,030	2,060	52	57*	...	...
25-44	4,850	4,780	61	61	...	...
45-64	3,150	3,310	55	60*	...	...
65+	1,480	1,520	24	29*	...	...
Females						
Total	12,500	12,660	52	56*	53	56
12-14	570	540	53	64*	...	...
15-24	1,950	2,010	56	58	...	...
25-44	4,860	4,770	62	66*	...	...
45-64	3,180	3,370	54	58*	...	...
65+	1,940	1,970	20	23*	...	...
Residence						
Rural	4,310	4,620	46	50*	46	49
Urban†	20,270	20,290	54	58*	54	58
Missing	10	10	- -	- -	- -	- -
Household income						
Lowest	3,230	3,160	23	30*	24	31
Lower-middle	6,190	6,120	41	41	42	42
Upper-middle	7,960	8,530	66	65	64	63
Highest	3,110	5,240	75	78*	70	75
Missing	4,100	1,860	50	49	51	48
Province						
Newfoundland	480	460	41	45*	40	44
Prince Edward Island	110	110	47	43	47	43
Nova Scotia	770	770	48	53*	49	54
New Brunswick	630	630	52	55	52	55
Québec	6,130	6,100	39	41	39	41
Ontario	9,320	9,460	60	64*	60	64
Manitoba	900	890	55	55	56	56
Saskatchewan	800	810	48	53	50	55
Alberta	2,240	2,360	57	67*	57	66
British Columbia	3,200	3,320	58	59	58	59

Data source: *1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Notes*: At the time of the analysis, bootstrap programs were not available for comparisons of age-adjusted rates over time. Consequently, comparisons between 1996/97 and 1998/99 were based on unadjusted rates. Because there was very little difference between the unadjusted and adjusted rates, reliance on the comparison of unadjusted rates is unlikely to have led to incorrect inferences. Because of rounding, detail may not add to totals.*
† Continuously built-up areas with population of 1,000 or more and population density of 400 or more per square kilometre, based on previous census
··· Not applicable
- - High sampling variability
** Significantly different from 1996/97*

Contacts with chiropractors and alternative health care providers

In 1998/99, 11% of the population aged 12 or older had contacted a chiropractor during the previous year. In the total population (both sexes), the utilization rates increased from 5% among youth aged 12 to 14 to 13% in the 45-to-64 age group. Utilization rates were about the same for males and females. Urban residents were less likely to use chiropractic services than rural residents. This may reflect differences in provincial coverage for such services.

In 1998/99, about 8% of Canadians aged 12 or older (1.9 million people) visited an alternative

Health care use

To determine *contacts with health care professionals*, National Population Health Survey (NPHS) respondents were asked, "Not counting when you were an overnight patient in the past 12 months, how many times have you seen or talked on the telephone with the following: family doctor or general practitioner, eye specialist, other medical doctor, dentist or orthodontist, chiropractor?" A derived variable was constructed to measure the number of visits with any medical doctor.

Heavy or frequent users of doctor services had contacted a doctor 10 or more times during the last 12 months.

Dental health insurance was determined with the question, "Do you have insurance that covers all or part of your dental expenses?" The question relating to prescription drug and dental insurance coverage was not asked on the 1994/95 NPHS. In an effort to be as inclusive as possible, the NPHS referred to "insurance" rather than "dental plan coverage." The NPHS data do not indicate the scope or type of coverage for dental services. There is no information about the proportion of the cost that individuals would be expected to pay, although such an expense could influence their use of dental services.

Respondents were asked, "In the past 12 months, have/has … seen or talked to an alternative health care provider such as an acupuncturist, naturopath, homeopath or massage therapist about your/his/her physical, emotional or mental health?" Responses to this question were used to determine the proportion of the population that had used an *alternative health care provider*. If the respondent answered "yes," the next question was: "Who did … see or talk to?" Response options were: massage therapist, acupuncturist, homeopath or naturopath, Feldenkrais or Alexander teacher, relaxation therapist, biofeedback teacher, rolfer, herbalist, reflexologist, spiritual healer, religious leader, self-help group (such as AA, cancer therapy, etc.), other. There are no data relating to the path by which people sought alternative health care, nor is there information about the frequency or cost of alternative health care practitioners. Absence of contact does not necessarily mean that the individual did not use alternative remedies.

NPHS respondents were asked about their use of specific *medications* in the month before the survey. Those who reported having taken any medication in the past month were asked to report the number of medications they took in the previous two days. Having taken three or more different medications in those two days is considered multiple medication use.

Prescription medication insurance coverage was determined with the question, "Do you have insurance that covers all or part of the cost of your prescription medications?" Respondents were asked to include any private, government or employer-paid plans.

The use of *home care services* was determined by the question, "Have you received any home care services in the past 12 months?" Home care services were defined as health care or homemaker services received at home, with the cost being entirely or partially covered by the government. Examples of the services included: nursing care, help with bathing or housework, respite care and meal delivery. Formal home care constitutes only a part of all care rendered to people in their home. Although those who receive home nursing services probably have greater physical needs, or at least need more specialized care than can be provided by household members, it is reasonable to expect that in many respects, formal home care recipients do not differ much from people who receive informal care. However, since data on informal care were not available, respondents receiving informal care only were included with those not receiving formal home care.

The 1996/97 survey asked respondents, "Did you use any emergency services in the past 12 months?" The question was not asked in the 1994/95 and 1998/99 surveys. *Emergency services* were defined as medical services for serious health problems that require immediate care.

Hospitalization in the NPHS refers to data collected by the following yes/no question, "In the past 12 months, has . . . been a patient overnight in a hospital, nursing home or convalescent home?" The reason for hospitalization was not asked. Heavy users of hospital services had spent more than three days in hospital.

To determine *access to health services/unmet needs*, respondents in the 1996/97 and 1998/99 surveys were asked about delays in receiving health care in the 12 months prior to the survey. The specific question asked: "During the past 12 months, was there ever a time when you needed health care but didn't receive it?"

practitioner in the year preceding the survey. The three leading alternative services were massage therapy (4%), homeopathy (2%) and acupuncture (2%). Women aged 12 or older (10%) were twice as likely as men (about 5%) to use some form of alternative health care.

There are wide provincial differences in the proportion of residents visiting chiropractors and alternative health care providers. This is probably attributable to differences in the types of services covered by provincial health care plans.

Medication use and prescription drug insurance

The use of multiple medications has implications for the possibility of adverse drug reactions through medication misuse.[4] The measure also gives some insight into the importance of drugs in the medical management of chronic illness. In 1998/99, about 11% of the population aged 12 or older reported using three or more prescription drugs in the previous two days. Multiple drug use was higher among women (14%) than men (9%). The use of multiple medications tended to be higher in Nova Scotia (15%) and Prince Edward Island and New Brunswick (13%).

The population covered by drug insurance benefits has been growing.[5] Among the lower income groups, the increase in coverage may be partly attributable to provincial health care plans. Among the upper income groups, the growth is likely attributable to the purchase of private insurance or the provision of insured benefits through employment. According to the 1998/99 NPHS, about 74% of the population aged 12 or older reported that they had insurance coverage for prescription medications. Drug insurance coverage tends to be relatively lower among younger or older Canadians (Table 4).

The percentage of individuals reporting coverage for prescription drugs varied by province as well, from just over half (55%) in Saskatchewan to 82% in Québec.

The 55% in Saskatchewan seems low, as the province has a prescription drug plan. However, an individual's perception of drug coverage may be influenced by the presence of annual deductibles and co-payments. In Saskatchewan, most residents pay an $850 deductible per person or family semi-annually along with a 35% co-payment, and therefore, some individuals may not regard themselves as having prescription drug insurance.

The dramatic increase in prescription drug insurance in Québec is probably attributable to the introduction of legislation to ensure that all provincial residents are covered by a prescription drug plan.[6] The rise in prescription drug insurance may also represent an increase in awareness of the benefits that are currently available through a variety of provincial health programs. Decreases in the unemployment rate during the period may also be a factor, as access to prescription medication coverage is influenced by employment status.

Home care services

In 1998/99, an estimated 613,000 Canadian adults, or 3% of people aged 18 or older, reported receiving formal home care in the 12 months before the survey. About one-third of them were younger than 65—a clear indication that home care is not limited to geriatric services. However, the younger age group comprises a much smaller share of home care users. Only 1% of the household population under age 65 received home care, compared with 8% of 65- to-79-year-olds and 28% of those aged 80 or older.

There was little difference in the use of home care services by rural/urban residence. Similarly, there were only small provincial differences. Usage ranged from 1% in Prince Edward Island to 3% in Nova Scotia, Ontario, Manitoba, Saskatchewan and British Columbia.

Hospital emergency departments

In 1996/97, 21% of the population aged 12 or older used a hospital emergency department. Usage rates tended to be higher among females (24%) than among males (19%). The age pattern of emergency department use departs from the normal pattern of increasing rates by age. The highest usage rates tended to occur in the 15-to-24 and 25-to-44 age groups among both males and females. This may

Table 4
Prescription drug insurance, household population aged 12 or older, by selected characteristics, Canada excluding territories, 1996/97 and 1998/99

	Total population		Unadjusted percentage with prescription drug insurance		Age-adjusted percentage with prescription drug insurance	
	1996/97	1998/99	1996/97	1998/99	1996/97	1998/99
	'000		%		%	
Both sexes						
Total	24,590	24,920	61	74*	61	74
12-14	1,150	1,130	56	71*	...	...
15-24	3,980	4,070	53	68*	...	...
25-44	9,710	9,550	65	75*	...	...
45-64	6,340	6,680	65	77*	...	...
65+	3,420	3,490	51	72*	...	...
Males						
Total	12,100	12,260	61	73*	61	73
12-14	580	600	56	72*	...	...
15-24	2,030	2,060	50	66*	...	...
25-44	4,850	4,780	65	74*	...	...
45-64	3,150	3,310	65	77*	...	...
65+	1,480	1,520	55	72*	...	...
Females						
Total	12,500	12,660	61	74*	61	74
12-14	570	540	56	70*	...	...
15-24	1,950	2,010	57	70*	...	...
25-44	4,860	4,770	65	76*	...	...
45-64	3,180	3,370	65	76*	...	...
65+	1,940	1,970	48	72*	...	...
Residence						
Rural	4,310	4,620	56	68*	56	68
Urban†	20,270	20,290	62	75*	62	75
Missing	10	10	- -	- -	- -	- -
Household income						
Lowest	3,230	3,160	38	58*	38	56
Lower-middle	6,190	6,120	53	65*	53	64
Upper-middle	7,960	8,530	73	79*	72	79
Highest	3,110	5,240	76	86*	74	85
Missing	4,100	1,860	55	70*	56	70
Province						
Newfoundland	480	460	57	62*	56	62
Prince Edward Island	110	110	58	57	58	57
Nova Scotia	770	770	67	75*	67	75
New Brunswick	630	630	63	67	63	67
Québec	6,130	6,100	55	82*	54	82
Ontario	9,320	9,460	66	74*	66	74
Manitoba	900	890	47	64*	48	65
Saskatchewan	800	810	40	55*	40	55
Alberta	2,240	2,360	67	76*	67	76
British Columbia	3,200	3,320	62	67*	62	67

Data source: *1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Notes: *At the time of the analysis, bootstrap programs were not available for comparisons of age-adjusted rates over time. Consequently, comparisons between 1996/97 and 1998/99 were based on unadjusted rates. Because there was very little difference between the unadjusted and adjusted rates, reliance on the comparison of unadjusted rates is unlikely to have led to incorrect inferences. Because of rounding, detail may not add to totals.*
† Continuously built-up areas with population of 1,000 or more and population density of 400 or more per square kilometre, based on previous census
··· Not applicable
- - High sampling variability
** Significantly different from 1996/97*

Table 5
Hospitalization in previous 12 months, household population aged 12 or older, by selected characteristics, Canada excluding territories, 1994/95, 1996/97 and 1998/99

	Total population			Unadjusted percentage hospitalized			Age-adjusted percentage hospitalized		
	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99	1994/95	1996/97	1998/99
		'000			%			%	
Both sexes									
Total	23,950	24,590	24,920	9	8	7*	9	8	7
12-14	1,330	1,150	1,130	2	3	3	...	...	...
15-24	3,790	3,980	4,070	9	6	5*	...	...	...
25-44	9,620	9,710	9,550	9	8	6*	...	...	...
45-64	5,970	6,340	6,680	8	7	7*	...	...	...
65+	3,250	3,420	3,490	17	15	16*	...	...	...
Males									
Total	11,780	12,100	12,260	7	6	6*	7	7	6
12-14	710	580	600	2	3	5	...	...	...
15-24	1,890	2,030	2,060	6	4	3*	...	...	...
25-44	4,810	4,850	4,780	5	5	3*	...	...	...
45-64	2,970	3,150	3,310	8	7	7	...	...	...
65+	1,400	1,480	1,520	17	16	17	...	...	...
Females									
Total	12,140	12,500	12,660	12	10	9*	12	10	9
12-14	620	570	540	2	2	2	...	...	...
15-24	1,890	1,950	2,010	11	8	8*	...	...	...
25-44	4,810	4,860	4,770	13	11	9*	...	...	...
45-64	2,970	3,180	3,370	9	7	6*	...	...	...
65+	1,850	1,940	1,970	17	14	15	...	...	...
Residence									
Rural	4,020	4,310	4,620	10	10	8*	10	10	8
Urban†	19,820	20,270	20,290	9	8	7*	9	8	7
Missing	100	10	10	- -	- -	- -	- -	- -	- -
Household income									
Lowest	4,100	3,230	3,160	14	11	12*	14	11	12
Lower-middle	6,860	6,190	6,120	10	9	9	9	9	8
Upper-middle	8,170	7,960	8,530	7	7	7	7	8	7
Highest	3,670	3,110	5,240	8	6	5*	9	7	5
Missing	1,140	4,100	1,860	10	7	6*	10	7	6
Province									
Newfoundland	480	480	460	9	10	8	10	10	8
Prince Edward Island	110	110	110	11	11	9*	11	11	9
Nova Scotia	760	770	770	10	9	9	10	9	9
New Brunswick	630	630	630	9	11	12	9	11	12
Québec	6,030	6,130	6,100	10	9	8*	10	9	8
Ontario	9,050	9,320	9,460	9	7	7*	9	7	7
Manitoba	890	900	890	10	9	8	10	9	8
Saskatchewan	790	800	810	10	8	8*	9	8	8
Alberta	2,170	2,240	2,360	10	7	7*	10	8	7
British Columbia	3,040	3,200	3,320	8	8	7*	8	8	7

Data source: *1994/95, 1996/97 and 1998/99 National Population Health Survey, cross-sectional sample, Health file*
Notes*: At the time of the analysis, bootstrap programs were not available for comparisons of age-adjusted rates over time. Consequently, comparisons between 1994/95 and 1998/99 were based on unadjusted rates. Because there was very little difference between the unadjusted and adjusted rates, reliance on the comparison of unadjusted rates is unlikely to have led to incorrect inferences. Because of rounding, detail may not add to totals.*
† Continuously built-up areas with population of 1,000 or more and population density of 400 or more per square kilometre, based on previous census
··· Not applicable
- - High sampling variability
** Significantly different from 1994/95*

reflect the relatively high rates of injury and acute problems such as asthma attacks among young people.

Hospitalization

According to the 1998/99 NPHS, 7% of the household population had been hospitalized in the previous year (Table 5). In the total population (both sexes), utilization rates increased from 3% in the 12-to-14 age group to 16% in the 65-or-older age group. Although females were more likely to be hospitalized, the age pattern of use differed from that of males. Among males, usage rates were higher in the 12-to-14 age group than in the 15-to-24 and 25-to-44 age groups and then increased with age. Among females, hospitalization increased to age 25 to 44 (likely due to pregnancy), decreased in the 45-to-64 age group and then peaked in the 65-or-older age group.

New Brunswick had the highest hospitalization rate (12%); Ontario, Alberta and British Columbia, the lowest (7%). The trend in all provinces was down, except for New Brunswick where the rate increased from 9% to 12%.

In 1998/99, 5% of the population were in hospital for three or more days. As expected, the highest rates of use were concentrated in the older age groups where chronic diseases are more prevalent. Among individuals aged 65 or older, 13% were hospitalized for three or more days.

In New Brunswick, 8% of the population were hospitalized for three or more days, compared with 4% in Ontario, Alberta and British Columbia. In all provinces except New Brunswick, the proportion of the population that was institutionalized for three or more days declined between 1994/95 and 1998/99. In New Brunswick, the proportion remained stable. In 1994/95, the rate was 7%; in 1998/99, 8%.

Risk profile of hospital patients

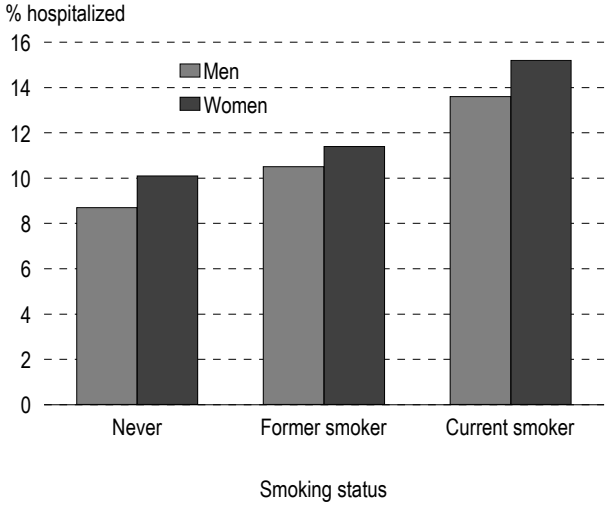
Further analysis of hospitalization was based on an analysis of the 1994/95 NPHS share file linked with hospital morbidity data for the years 1994/95, 1995/96, 1996/97 and 1997/98 in seven provinces. Those who are most likely to be hospitalized are older people and the chronically ill. They are more likely to be men with confounding socioeconomic factors such as lower income and education levels and a higher prevalence of risk factors.

In addition to socioeconomic status (discussed later), factors that predict hospitalization included the following:

• **Smoking**. Age-adjusted percentages show that current smokers (14.7%, 95% confidence interval 13.0-16.3) were admitted to hospital more than those who never smoked (9.8%, 95% confidence interval 8.6-11.0) and more than former smokers (11.3%, 95% confidence interval 10.1-12.5) (Chart 1) (see *Health status and health behaviours*). This substantial effect of current smoking on the risk of hospitalization was similar for women and men (Table 6). This age- and sex-adjusted analysis also shows that former smokers had lower odds of hospitalization than current smokers, providing further evidence of the value of smoking cessation for improving subsequent health.

Some evidence suggests that statistical analyses may overestimate the impact of smoking by failing to control for competing risk factors.[7] For example, some of the difference between smokers and non-

Chart 1
Age-adjusted percentage of household population aged 25 or older in 1994/95 who were hospitalized at least once in next 30 months, by smoking status and sex, seven provinces†



Data source: *1994/95 National Population Health Survey Share file linked with Hospital Morbidity files for 1994/95 to 1997/98*
Note: *Excludes pregnancy-related hospitalizations.*
† Excludes Newfoundland, Québec and Manitoba.

Table 6
Age- and sex-adjusted odds ratios for hospitalization in next 30 months, household population aged 25 or older in 1994/95, by selected characteristics, seven provinces†

	Both sexes (sex-age-adjusted)		Men (age-adjusted)		Women (age-adjusted)	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Household income						
Lowest	1.41*	1.06, 1.87	1.33	0.85, 2.06	1.52 *	1.03, 2.25
Lower-middle	1.31*	1.03, 1.68	1.18	0.81, 1.72	1.41	0.99, 1.99
Upper-middle	1.36*	1.07, 1.73	1.33	0.94, 1.89	1.38	0.96, 1.97
Highest‡	1.00	...	1.00	...	1.00	...
Educational attainment						
Less than secondary	1.57*	1.26, 1.96	1.49 *	1.08, 2.04	1.71 *	1.27, 2.31
Secondary school graduation	1.34	0.99, 1.80	1.08	0.70, 1.67	1.61 *	1.08, 2.38
Some postsecondary	1.23	0.98, 1.54	0.99	0.70, 1.41	1.50 *	1.12, 2.00
Postsecondary graduation‡	1.00	...	1.00	...	1.00	...
Health status and health care use						
One or more disability days§	1.68*	1.36, 2.06	1.64 *	1.19, 2.26	1.65 *	1.27, 2.16
Pain and discomfort§	1.44*	1.12, 1.85	1.27	0.83, 1.96	1.49 *	1.09, 2.04
Overnight hospital stay§	2.23*	1.81, 2.76	3.95 *	2.83, 5.50	2.06 *	1.57, 2.70
Weight						
Insufficient	1.02	0.74,1.39	1.24	0.68, 2.24	1.01	0.69, 1.47
Overweight	1.29*	1.08,1.53	1.07	0.82, 1.41	1.55 *	1.24, 1.94
Acceptable‡	1.00	...	1.00	...	1.00	...
Type of smoker						
Current smoker	1.73*	1.41, 2.11	1.68 *	1.18, 2.40	1.72 *	1.32, 2.23
Former smoker	1.25*	1.03, 1.52	1.28	0.93, 1.78	1.10	0.85, 1.43
Non-smoker‡	1.00	...	1.00	...	1.00	...
Daily cigarette consumption						
1-24	1.48*	1.20, 1.82	1.42	0.98, 2.07	1.53 *	1.18, 2.00
25+	2.10*	1.61, 2.73	1.88 *	1.29, 2.75	2.48 *	1.68, 3.66
None‡	1.00	...	1.00	...	1.00	...
Type of drinker						
Daily drinker	0.86	0.65, 1.13	0.88	0.48, 1.62	0.85	0.61, 1.18
Occasional drinker	0.97	0.69, 1.35	1.08	0.52, 2.23	0.86	0.60, 1.24
Former drinker	1.14	0.85, 1.54	1.42	0.74, 2.70	0.97	0.69, 1.36
Abstainer‡	1.00	...	1.00	...	1.00	...
Alcohol consumption						
Heavy	0.26*	0.12, 0.55	0.25 *	0.11, 0.59	0.11	0.00, >99.00
Light	0.83	0.69, 1.00	0.74	0.54, 1.02	0.88	0.69, 1.12
Non-drinker‡	1.00	...	1.00	...	1.00	...
Physical activity						
Active§	0.77*	0.64, 0.92	0.78 *	0.62, 0.99	0.70 *	0.56, 0.88
Daily§	0.88	0.74, 1.05	0.91	0.70, 1.21	0.82	0.65, 1.04
Psychosocial status						
Depression§	1.74*	1.23, 2.46	1.09	0.56, 2.11	1.99 *	1.31, 3.05
Work stress§	1.00	1.00, 1.01	1.00	0.99, 1.00	1.01	1.00, 1.01
No social support§	1.14	0.90, 1.43	0.98	0.71, 1.34	1.31	0.94, 1.81
No recent life events§	0.75*	0.62, 0.91	0.72 *	0.54, 0.97	0.77 *	0.61, 0.98
Stress§	1.40*	1.12, 1.75	1.09	0.75, 1.59	1.59 *	1.18, 2.15
Chronic conditions						
High blood pressure§	1.38*	1.14, 1.68	1.47 *	1.08, 2.00	1.37 *	1.08, 1.76
Diabetes§	1.40*	1.01, 1.93	1.46	0.92, 2.31	1.31	0.80, 2.14
Heart disease§	1.81*	1.45, 2.27	2.06 *	1.45, 2.91	1.53 *	1.12, 2.09
Asthma§	1.86*	1.36, 2.56	1.18	0.66, 2.10	2.50 *	1.72, 3.63
Cancer§	1.66*	1.13, 2.44	1.76	0.91, 3.42	1.54	0.96, 2.48
Effects of a stroke§	2.14*	1.28, 3.55	1.30	0.56, 3.02	3.36 *	1.67, 6.77
No long-term condition§	0.57*	0.46, 0.71	0.52 *	0.38, 0.72	0.62 *	0.47, 0.82

Data source: *1994/95 National Population Health Survey share file linked with Hospital Morbidity files for 1994/95 to 1997/98*
Note: *Excludes pregnancy-related hospitalizations.*
† Excludes Newfoundland, Québec and Manitoba.
‡ Reference category for which odds ratio is always 1.00
§ Reference category is absence of characteristic or condition.
** $p \leq 0.05$*

smokers may be attributable to their occupational and social groups, which tend to be correlated with smoking habits.[7] However, even when other risk factors were added to the model, those smoking 25 or more cigarettes per day were found to have higher odds of hospitalization (odds of 2.0 for those smoking 25 or more cigarettes per day, 95% confidence interval 1.5-2.6) (Table 7). Also, the odds of hospitalization increased with the number of cigarettes smoked per day for both males and females.

• **Physical activity and weight**. When adjusted by age and sex, physically inactive women and men were more likely to be hospitalized than those who were active (12.3% versus 10.0%, $p<0.01$). This relationship was more apparent for women who were overweight and less active (Table 6). When other risk factors were added to the model, the results for women remained statistically significant for those who were overweight (Table 7). For both sexes together, when other risk factors were added, exercise and being overweight were statistically significant.

Table 7
Adjusted odds ratios for hospitalization in next 30 months, household population aged 25 or older in 1994/95, by selected characteristics, seven provinces†

	Both sexes (including all risk factors in model)		Both sexes (excluding smoking and alcohol consumption from model)		Both sexes (excluding alcohol consumption from model)		Men (including all risk factors in model)		Women (including all risk factors in model)	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Sex‡	0.97	0.81, 1.16	0.97	0.82, 1.16	0.94	0.79, 1.12	...	...	...	...
Age	1.04*	1.03, 1.05	1.04*	1.03, 1.04	1.04*	1.03, 1.05	1.05*	1.04, 1.06	1.03*	1.03, 1.04
Household income										
Lowest	1.19	0.87, 1.63	1.32	0.96, 1.80	1.22	0.90, 1.66	1.16	0.74, 1.81	1.27	0.82, 1.98
Middle	1.20	0.95, 1.54	1.25	0.98, 1.59	1.21	0.95, 1.54	1.11	0.77, 1.59	1.28	0.88, 1.85
High§	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Educational attainment										
Less than secondary	1.36*	1.07, 1.74	1.47*	1.16, 1.87	1.39*	1.10, 1.77	1.41	1.00, 1.99	1.37	0.99, 1.90
Secondary graduation	1.26	0.92, 1.73	1.31	0.96, 1.80	1.27	0.93, 1.74	1.09	0.70, 1.70	1.39	0.91, 2.13
Some postsecondary	1.15	0.91, 1.47	1.20	0.94, 1.52	1.16	0.92, 1.47	0.95	0.67, 1.36	1.37*	1.01, 1.86
Postsecondary graduation§	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Body weight										
Insufficient	0.86	0.61, 1.22	0.91	0.65, 1.29	0.88	0.62, 1.25	0.83	0.41, 1.66	0.93	0.63, 1.39
Overweight	1.23*	1.04, 1.47	1.24*	1.04, 1.47	1.25*	1.05, 1.49	1.03	0.78, 1.37	1.48*	1.17, 1.86
Acceptable§	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Physical activity										
Active††	0.81*	0.69, 0.97	0.80*	0.67, 0.95	0.81*	0.68, 0.97	0.82	0.64, 1.05	0.81	0.63, 1.04
Daily cigarette consumption										
None§	1.00	...	...	...	1.00	...	1.00	...	1.00	...
1-24	1.42*	1.14, 1.77	...	...	1.41*	1.13, 1.75	1.38	0.93, 2.04	1.45*	1.08, 1.94
25+	1.99*	1.51, 2.62	...	...	1.90*	1.45, 2.49	1.86*	1.25, 2.76	2.21*	1.46, 3.33
Alcohol consumption										
Heavy	0.22*	0.10, 0.54	...	...	...	...	0.21*	0.08, 0.55	0.11	0.00, >99.00
Light	0.84	0.69, 1.03	...	...	...	...	0.70*	0.50, 0.98	0.94	0.73, 1.21
Non-drinker§	1.00	...	...	...	...	...	1.00	...	1.00	...

Data source: *1994/95 National Population Health Survey share file linked with Hospital Morbidity files for 1994/95 to 1997/98*
Note: *Excludes pregnancy-related hospitalizations.*
† Excludes Newfoundland, Québec and Manitoba.
‡ Reference category is men.
§ Reference category for which odd ratio is always 1.00
†† Reference category is absence of characteristic.
··· Not applicable
** $p \leq 0.05$*

• **Alcohol consumption**. In this study, age-adjusted percentages showed that non-drinkers (13.1%, 95% confidence interval 11.4-14.9) were hospitalized at almost double the rate of heavy drinkers (7.3%, 95% confidence interval 3.9-10.7). However, daily but not heavy drinkers also had higher levels of hospitalization. When age was taken into account, male heavy drinkers had significantly lower odds of being hospitalized than non-drinkers. The results remained statistically significant when adjusted for other risk factors (Table 7).

The much higher rate of hospitalization among non-drinkers when compared with occasional and heavy drinkers can possibly be explained by confounding risk factors. For example, individuals suffering from pre-existing chronic conditions or illnesses requiring prescription drug therapy may be prohibited from consuming alcoholic beverages. Some studies have found that heavy drinkers are not necessarily more likely to use more health services in comparison with light drinkers. This may be because heavy drinkers often fail to seek care for their health problems.[8,9]

• **Depression**. Women with depression were more likely to be hospitalized than were those without depression (age-adjusted 18.7% versus 11.5%, $p<0.01$). This relationship was not found for men (see *Psychosocial characteristics*).

• **Chronic conditions**. As expected, those without any long term chronic conditions—including high blood pressure, diabetes, asthma and stroke—are less likely to go to the hospital (age- and sex-adjusted 8.1% versus 13.1%, $p<0.01$). Women with depression, asthma, stroke or high

Health status and health behaviours

General health was assessed with the question, "In general, would you say your health is: excellent, very good, good, fair, poor?"

Chronic conditions: Respondents to the NPHS were asked whether they had "long-term conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." The interviewer read a list of conditions. Those included in this analysis are: high blood pressure, diabetes, asthma, arthritis or rheumatism, back problems, chronic bronchitis or emphysema, heart disease, cancer, effects of stroke, urinary incontinence, cataracts, glaucoma, migraine headaches, sinusitis, epilepsy, stomach and intestinal ulcers.

Type of smoker was defined as: current smoker—current daily or occasional smoker; former smoker—former daily smoker or former occasional smoker; and never smoker—never smoked.

Daily cigarette consumption was defined as: 1 to 24 cigarettes—current daily smoker and 1 to 24 cigarettes a day; 25 and more—current daily smoker at least 25 or more cigarettes each day; never or former smoker—current occasionally or never smoked.

Type of drinker was defined as: regular drinker—a drink at least once a month; occasional drinker—less than one drink a month; former drinker—did not have a drink in last 12 months; and abstainer (never drank). In the regression, regular or occasional drinkers were compared with non-drinkers and abstainers.

Alcohol consumption was defined as: heavy drinker—drink daily with three or more drinks a day; light drinker—drink daily but less than three drinks a day or occasional drinker; non drinker—did not have a drink during the past 12 months or never drank.

Physical activity was from the Physical Activity Index. It was categorized as:

Active: Those who averaged 1.5 or more kilocalories per day.

Inactive: Those with an energy expenditure below 1.5 kcal/kg/day.

Daily exercise was based on the monthly frequency of physical activities lasting more than 15 minutes.

Daily: 30 or more times per month.

Not daily: less than 30 times per month.

To measure the occurrence of *injuries*, respondents were asked: "In the past 12 months, did you have any injuries that were serious enough to limit your normal activities?"

Body weight was calculated for persons aged 15 to 49, excluding pregnant women, using the following formula: Body Mass Index (BMI) = weight (kg)/squared height (metres). The four body mass categories were defined as: insufficient weight, BMI less than 20; acceptable weight, BMI 20 to 24.9; some excess weight, BMI 25 to 27; overweight, BMI greater than 27. In the regression, acceptable weight was compared with some excess weight and overweight.

blood pressure were more likely to be hospitalized; men with heart disease and high blood pressure were more likely to be hospitalized (Table 6).

• Believing oneself to be in good health was associated with not going to hospital.

Dissatisfaction is increasing

The proportion of Canadians who said that they needed health care but did not receive it rose from 4% in 1994/95 to 6% in 1998/99. Although this incremental change appears small, from a public health perspective a small shift in prevalence over the entire population has a greater effect than a large change made on a small percentage of the population.[10] It represents the difference between 1.1 million people in 1994/95 and 1.5 million in 1998/99. The perception of an unmet need was higher among females (7%) than males (5%).

An important question is whether the additional number of people with unmet needs represents a subset of the population who continually have unmet needs, or whether the composition of the population with unmet needs is changing over time.

By using the longitudinal NPHS file it is possible to examine the distribution of the population that reported they needed health care but did not receive it in 1994/95, 1996/97 and 1998/99. Among the subset of the total population (4%) that had unmet needs in 1994/95, about 7% had unmet needs in all three surveys, and 70% had unmet needs only in the first survey. The remainder (23%) reported unmet needs once or twice over the three survey periods. However, a limitation of this interpretation is that it is not possible to know whether the unmet needs change over time or whether the same need is being unmet. In addition, since the unmet needs are based on self-reports, it is not possible to judge the severity of the unmet need. Dissatisfaction may range from minimal to substantial.

In summary, in the total population, 79% do not report unmet needs over all three surveys. About 19% report an unmet need one time, and the remaining 2% report unmet needs at two or more survey points.

Socioeconomic differences and disparities

Due to universal coverage for medically needed services, there was no substantive difference between household income groups in whether or not they had contacted any physician (Table 1). At the same time, individuals in lower income groups were much more likely to be heavy users of physician services. Among persons in the lowest income group, 17% contacted a physician 10 or more times, compared with 8% of the highest income group.

In contrast to physician contact, there was a large socioeconomic gradient in dental care use by household income level (see *Socioeconomic characteristics*). In the lowest income households, 39% of the population had contacted a dentist in the past year, compared with 79% of the highest income

Psychosocial characteristics

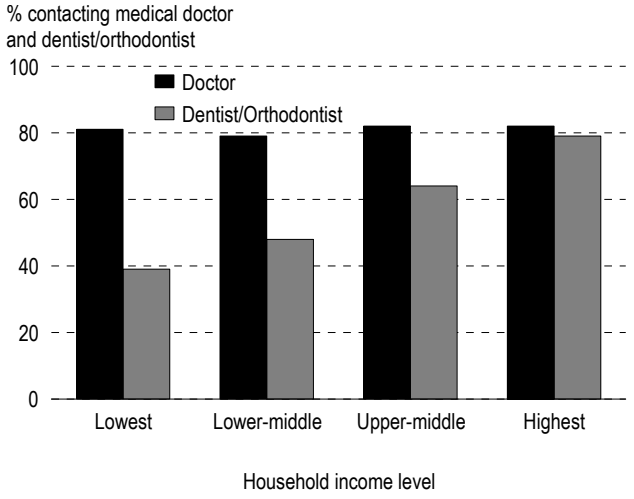
No recent negative life events was measured in two categories by an adjusted recent life events index (0 versus 1-10). Recent negative life events include physical abuse, unwanted pregnancy, abortion or miscarriage, major financial difficulties, and serious problems at work or in school.

Social support was defined from a perceived social support index. It is composed of four items that reflect whether respondents feel that they have someone they can confide in, someone they can count on, someone who can give them advice and someone who makes them feel loved. A high score indicates greater perceived social support.

Stress was measured in two categories from the General Chronic Stress Index. This general stress index is composed of items that are relevant to all respondents. The stressors include activity overload, financial difficulties and problems with relationships. Scores of 4 to 11 were compared with scores of 0 to 3.

Using the methodology of Kessler et al.,[11] the NPHS identifies a major depressive episode (MDE) with 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* (DSM III-R).[12] Responses to these questions were scored on a scale and transformed into a probability estimate of a diagnosis of MDE. If this estimate was 0.9, that is, 90% certainty of a positive diagnosis, then the respondent was considered to have experienced depression in the previous 12 months.

Chart 2
Age-adjusted percentage of household population aged 12 or older who contacted medical doctor and dentist/ orthodontist in past 12 months, by household income level, Canada excluding territories, 1998/99



Data source: *1998/99 National Population Health Survey, cross-sectional sample, Health file*

level, a difference of 40 percentage points (Table 2). The association between income and contact with a dentist is much more pronounced than the association between income and contacts with a medical doctor (Chart 2). This difference reflects the fact that under the Canada Health Act physician services are viewed as medically necessary, while dental services are not.

Between 1994/95 and 1998/99, the proportion of the population who had contacted a dentist increased from 56% to 60%. The increase is apparent by sex, rural/urban residence, and province. However, contact rates within income groups remained relatively stable during the period. Increases in rates that did occur tended to occur in the upper household income groups, with the result that in 1998/99, the disparity between the lowest income group and the highest increased. In 1994/95, the difference in contact rates between the lowest household income group and the highest was 35 percentage points (39% compared with 76%), while in 1998/99, the difference reached 40 percentage points (39% compared with 79%).

Dental insurance coverage is also strongly associated with household income (Table 3). At the highest income level, the rate was over twice that for the lowest (78% compared with 30%).

Canadians in higher income levels are more likely to use chiropractors and alternative health practitioners than are people with lower income levels. Between 1994/95 and 1998/99, the prevalence rates for alternative practitioner use increased in all household income groups, with the result that the disparity in alternative practitioner use between the lowest and highest income group increased. In 1994/95, about 4% of the lowest household income group and 6% of the highest income group used an alternative practitioner. In 1998/99, the corresponding rates were 6% and 10%.

As household income rose, the proportion of the population that used multiple medications declined. In the lowest income group, 16% used multiple medications, compared with 10% of the highest income group.

Although there is no gradient in utilization by income levels, people in the lowest income level had higher odds of using government-funded home

Socioeconomic characteristics

Lives alone was defined as:
Lives alone (size of household = 1).
Not alone (size of household greater than 1).

Household income level was calculated by taking into account both household income and the number of people in the household.

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

care, compared with those in the highest income group.

The NPHS showed an inverse gradient in the use of hospital services by household income. In 1998/99, 12% of people in the lowest income group were hospitalized in the previous year, compared with 7% of the upper-middle income group and 5% of the highest income group. The disparity between the lowest and highest income groups increased from 1994/95 (5%) to 1998/99 (7%). People in lower income groups were also more likely to be hospitalized for three or more days—8% in the lowest income group and 3% in the highest income group.

The 1996/97 NPHS also showed an inverse association between emergency department use and household income level. Among people in the lowest income group, 24% had contacted a hospital emergency department, compared with 19% in the highest income group.

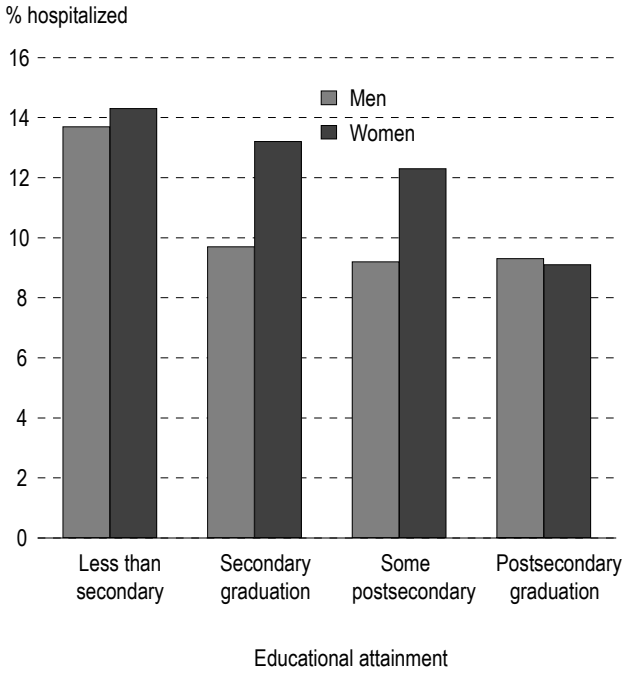
People in the lowest income levels were (10%) more likely to state they had not received care when they needed it.

After linking 1994/95 NPHS and hospital data, a clear relationship emerges between socioeconomic conditions (measured by income and education levels) and hospitalization.

Age-adjusted percentages show more men and women in the lowest income level (12.9%) were hospitalized, compared with the highest income group (8.5%, p=0.03). There was a definite relationship between income and hospital utilization. Those with lower incomes still had higher odds of going to the hospital than those with the highest incomes (Table 6). However, when risk factors were added to the model, the results for income were not statistically significant (Table 7). This is likely due to the correlation of risk factors with socioeconomic status.

Men and women with less than secondary education (13.8%, 95% confidence interval 12.0-15.6) were more likely to be hospitalized than were their counterparts with college or university education (9.3%, 95% confidence interval 9.7-10.7). There is a clear relationship between education level and hospital utilization, with persons with lower levels of education using more hospital services than those with high school education and above (Chart 3). When adjustments for age and sex were made, those with the lowest education still had higher odds of hospitalization (Table 6). If one adjusts for risk factors as well, education was still significant (Table 7). If smoking and alcohol consumption are removed from this model, the importance of education on future hospitalization increases. This is a reflection of the fact that the effect of education on hospitalization is moderated by the correlation between risk factors and socioeconomic status.

Chart 3
Age-adjusted percentage of household population aged 25 or older in 1994/95 who were hospitalized at least once in next 30 months, by educational attainment and sex, seven provinces†



Data source: *1994/95 National Population Health Survey Share file linked with Hospital Morbidity files for 1994/95 to 1997/98*
Note: *Excludes pregnancy-related hospitalizations.*
† Excludes Newfoundland, Québec and Manitoba.

Concluding remarks

To a large extent, Canada's universal medical care system has ensured equitable access to medical and hospital services, but not necessarily to good health. Canadians living in low-income situations are more

likely than those with higher incomes to be heavy users of physician services and emergency department visits, to be admitted to hospital, to take multiple medications and to require home care services. People with less than secondary education (especially women) are almost twice as likely to be hospitalized. These are all indications of poorer health status among low-income Canadians.

Significant inequities exist in access to health services (dental care, for example) that are not covered by Canada's medical insurance plan. This is a reflection of the uneven distribution of insurance for these services among the population. For example, youth, older Canadians and low-income Canadians are less likely to have coverage for dental care and prescription drugs. The high coverage among the middle age groups may reflect benefits offered through employment. These inequities persist despite the increase in coverage in most provinces for prescription drug and dental insurance.

Increases in unfulfilled health care needs may reflect growing public dissatisfaction with longer waiting times for treatment.

The use of home care is likely under-reported due to a non-standard understanding of what home care is. Increases in home care use are likely related to the trend to shift care into the community and the aging of the population. At the same time, the majority of informal care is provided by family members, friends and neighbours.[10] The aging of the population and corresponding increase in chronic illnesses that are best treated at home, and advances in drug and other therapies that have made it possible for people to leave hospital earlier, suggest that the need for effective home care services will increase in the next 20 years.

The likelihood of going to hospital increases with age, having a lower income, having less than a secondary education, believing oneself to be in poor health and being a smoker, physically inactive, overweight and a non-drinker. People with health problems including depression, high blood pressure, diabetes, heart disease, stroke and asthma are also more likely to be hospitalized.

Gender differences in hospitalization related to smoking are worthy of further study. For example, some past studies have shown smaller relative risks of hospitalization for female smokers than male smokers.[13] The smaller relative risks observed for female smokers were attributed to lower average exposure due to later age at smoking initiation and fewer packs smoked per day for females.[14]

This pattern may have held true in the past. However, differences between men's and women's smoking habits have diminished over time.[14] Teenage girls now smoke more than teenage boys—a trend that is likely to have significant long-term effects on disease, hospitalization and life expectancy patterns among women in Canada. ●

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References

1 Evans RG, Barer ML, Marmor TR, eds. *Why Are Some People Healthy and Others Not*? First edition. New York: Aldine De Gruyter, 1994.

2 Tambay JL, Catlin G. Sample design of the National Population Health Survey. *Health Reports* (Catalogue 82-003) 1995: 7(1); 29-38.

3 Yeo D, Mantel H, Liu T. Bootstrap Variance Estimation for the National Population Health Survey. *Americal Statistical Association: Proceedings of the Survey Research Methods Section*. Baltimore: August 1999.

4 Millar WJ. Multiple medication use among seniors. *Health Reports* (Statistics Canada, Catalogue 82-003) 1998; 9(4): 11-17.

5 Lexchin J. Income class and pharmaceutical expenditure in Canada: 1964-1990. *Canadian Journal of Public Health* 1996; 87(1): 46-51.

6 Millar WJ. Disparities in prescription drug insurance coverage. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 10(4): 11-31.

7 Weinkam JJ, Rosenbaum W, Sterling TD. Smoking and hospital utilization. *Social Science and Medicine* 1987; (24)11: 983-6.

8 Goetzel RZ, Anderson DR, Whitmer RW, et al. and the Health Enhancement Research Organization (HERO) Research Committee. The relationship between modifiable health risks and health care expenditures: An analysis of the Multi-Employer HERO Health Risk and Cost Database. *Journal of Occupational and Environmental Medicine* 1998; 40(10): 843-54.

9 Bertera RL. The effects of behaviour risks on absenteeism and health-care costs in the workplace. *Journal of Occupational Medicine* 1991; 33: 1119-24.

10 Miller JE, Russel LB, Davis M, et al. Biomedical risk factors for hospital admission in older adults. *Medical Care* 1998; 36(3): 411-21.

11 Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. *Archives of General Psychiatry* 1994; 51: 8-19.

12 Americal Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Third rev. ed. Washington, DC: American Psychiatric Association, 1987.

13 Hegemann KT, Fraser AM, Keaney RP, et al. The effect of age at smoking initiation on lung cancer risk. *Epidemiology* 1993; 4(5): 444-8.

14 Pierce JP, Fiore MC, Novotny TE, et al. Trends in cigarette smoking in the United States: Projections to the year 2000. *Journal of the American Medical Association* 1989; 261:61.

Annex

National Population Health Survey (NPHS)

Many analyses presented in this special issue of *Health Reports* are based on Statistics Canada's National Population Health Survey (NPHS). The NPHS, which began in 1994/95, collects information about the health of the Canadian population every two years. It covers household and institutional residents in all provinces and territories, except persons living on Indian reserves, Canadian Forces bases, and in some remote areas. The NPHS has both a longitudinal and a cross-sectional component. Respondents who are part of the longitudinal component will be followed for up to 20 years.

Cross-sectional sample

The 1994/95 and 1996/97 (cycle 1 and cycle 2) cross-sectional samples are made up of longitudinal respondents and their household members and individuals who were selected as part of supplemental samples, or buy-ins, in some provinces. In 1994/95, the large majority of interviews were conducted in person. Most of the 1996/97 interviews were conducted by telephone, and additional respondents for the buy-ins were chosen using the random digit dialling (RDD) technique. The 1998/99 (cycle 3) cross-sectional sample is made up mostly of longitudinal respondents and their cohabitants. Most of the interviews were conducted by telephone. No buy-ins were added to the cycle 3 sample. However, to keep the sample representative, infants born in 1995 and thereafter and immigrants who entered Canada since the beginning of 1995 were randomly selected and added to the NPHS sample. As well, to replace the sample that was lost to attrition, individuals in dwellings that were part of the original sampling frame but whose household members did not respond in 1994/95 were contacted and asked to participate.

NPHS data consisting of socio-demographic and some health information obtained for each member of participating households are found in the General file. In-depth health information, which was collected for one randomly selected household member, as well as the information in the General file pertaining to that individual, is found in the Health file.

In households belonging to the cross-sectional buy-in component, one knowledgeable person provided the socio-demographic and health information about all household members for the General file. As well, one household member, not necessarily the same person, was randomly selected to provide in-depth health information about himself or herself for the Health file.

Among individuals in the longitudinal component in 1996/97 and in 1998/99, the person providing in-depth health information about himself or herself for the Health file was the randomly selected person for the household in cycle 1 (1994/95), and was usually the person who provided information on all household members for the General file in cycles 2 and 3. In households that were added to the 1998/99 cross-sectional sample (immigrants, infants and individuals in dwellings who did not participate in cycle 1), the randomly selected respondent was also the person who provided information for the General file.

The 1994/95 provincial, non-institutional sample consisted of 27,263 households, of which 88.7% agreed to participate in the survey. After the application of a screening rule to maintain the representativeness of the sample, 20,725 households remained in scope. In 18,342 of these households, the selected person was aged 12 or older. Their response rate to the in-depth health questions was 96.1%, or 17,626 respondents.

In 1996/97, the overall response rate at the household level was 82.6%. The response rate for the randomly selected individuals aged 2 or older in these households was 95.6%. In 1998/99, the overall response rate was 88.2% at the household level. The response rate for the randomly selected respondents 0 or older in these households was 98.5%.

Longitudinal sample

Of the 17,626 randomly selected respondents in 1994/95, 14,786 were eligible members of the NPHS longitudinal panel, along with 468 persons for whom only general information was collected. An additional 2,022 of the 2,383 randomly selected respondents under age 12 were also eligible for the longitudinal panel. Thus, 17,276 respondents were eligible for re-interview in 1996/97, and 16,677 were still alive in 1998/99. A response rate of 93.6% was achieved for the longitudinal panel in 1996/97, and a response rate of 88.9%, based on the entire panel, was achieved in 1998/99. Of the 16,168 participants in 1996/97, full information (that is, general and in-depth health information for the first two cycles of the survey or an outcome of death or institutionalization) was available for 15,670. The corresponding number for 1998/99 was 14,619 respondents. More detailed descriptions of the NPHS design, sample, and interview procedures can be found in published reports.[1,2]

National Population Health Survey cross-sectional and longitudinal response rates, Canada excluding territories, 1994/95, 1996/97 and 1998/99

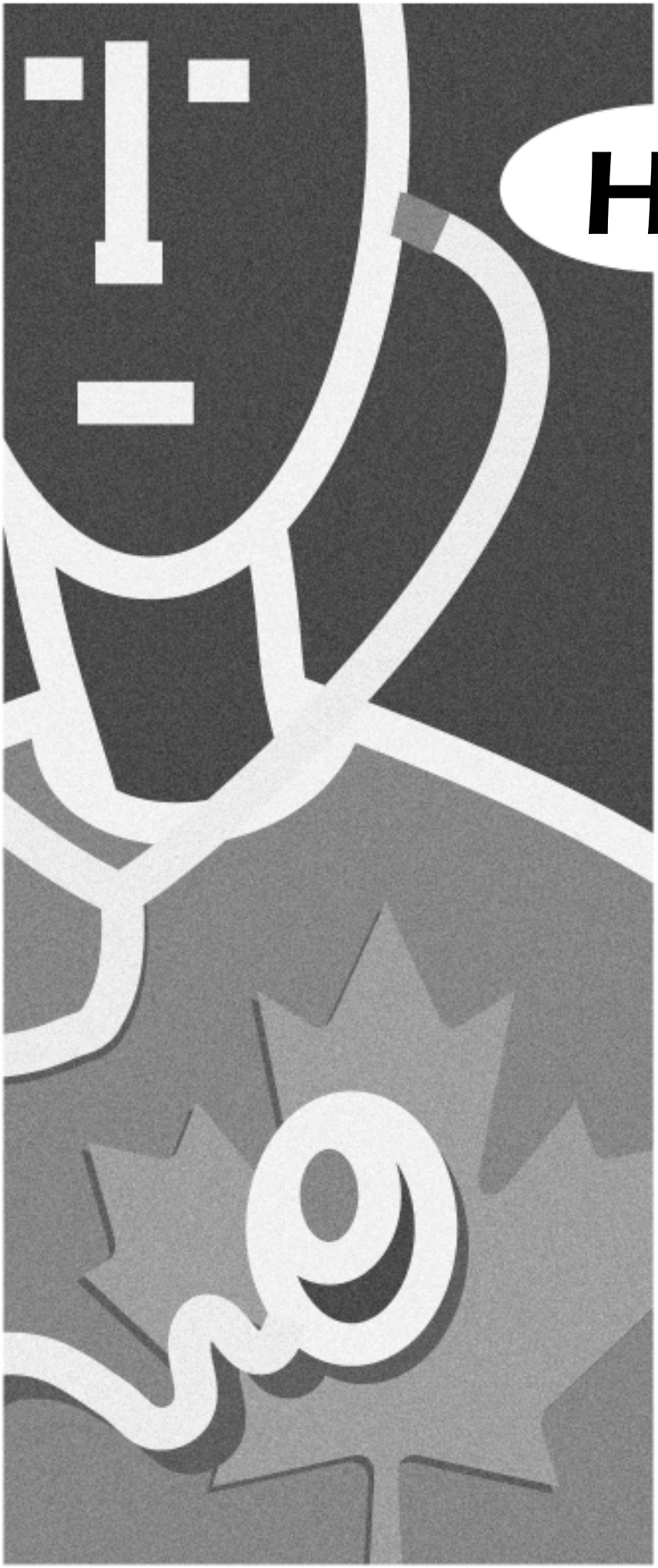
Level of response	1994/95	1996/97	1998/99
		%	
Cross-sectional			
Household	88.7	82.6	88.2
Randomly selected respondent†	96.1	95.6‡	98.5
Longitudinal respondents	...	93.6	88.9

† *12 or older in 1994/95; 2 or older in 1996/97; 0 or older in 1998/99*
‡ *Excludes children in Manitoba and Alberta who were part of the random digit dialling (RDD) sample.*
... *Not applicable*

References

1 Tambay J-L, Catlin G. Sample design of the National Population Health Survey. *Health Reports* (Statistics Canada, Catalogue 82-003) 1995; 7(1): 29-38.

2 Swain L, Catlin G, Beaudet MP. The National Population Health Survey—its longitudinal nature. *Health Reports* (Statistics Canada, Catalogue 82-003) 1999; 10(4): 69-82.



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Health Statistics Division
Statistics Canada
Ottawa, Ontario
K1A 0T6
Telephone: (613) 951-1746
Fax: (613) 951-0792
Email: HD-DS@statcan.ca

National Population Health Survey public-use microdata files		Product number	Format	Price† Canada	Price† Other countries (US$)
Cycle 1, 1994/95					
Household	Data, Beyond 20/20 Browser Flat ASCII Files	82F0001XCB 82F0001XDB	CD-ROM Diskette	$800 $650	$800 $650
Health care institutions	Flat ASCII Files	82M0010XDB	Diskette	$250	$250
Custom tables	Household Institutions	82C0013 82C0015	Price varies with information requirements		
Cycle 2, 1996/97					
Household	Cross-sectional Household Beyond 20/20 Browser for Health File and Flat ASCII Files	82M0009XCB	CD-ROM	$2,000	$2,000
Health care institutions‡	Cross-sectional health care institutions Flat ASCII File	82M0010XCB	CD-ROM	$295	$295
			Clients who purchase the 1996/97 Household file will receive Institutions file free of charge		
Custom tables	Household Institutions	82C0013 82C0015	Price varies with information requirements		
Special package NPHS 1994/95 and 1996/97		***2 CD-ROMs 82F0001XCB 82M0009XCB***	***$2,500***	***$2,500***	***$2,500***

† All prices exclude sales tax.
‡ Forthcoming end of April.

Canadian Community Health Survey (CCHS)

A proposed new survey, the Canadian Community Health Survey (CCHS), is being developed by Statistics Canada for the purpose of providing regular and timely cross-sectional estimates of health determinants, health status and health system utilization for 132 health regions across the country.

For more information about this survey, visit our web site at www. statcan.ca, under Concepts, definitions and methods, followed by Discussion papers or new surveys.