Are recent cohorts healthier than their predecessors?

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Abstract

Objectives

This article examines changes in the health status of Canadian adults between 1978/79 and 1996/97.

Data sources

Data are from the the Canadian Vital Statistics Data Base, the 1991 General Social Survey, the 1978/79 Canada Health Survey (CHS), and the 1996/97 National Population Health Survey (NPHS).

Analytical techniques

Age-specific mortality rates are presented for 1978 and 1996. The cumulative incidence of heart disease is shown for 1991. Cross-sectional comparisons of prevalence rates for selected chronic conditions, activity limitation, disability days, smoking and overweight are shown for 1978/79 and 1996/97. Multiple logistic regression models were used to test differences in odds ratios for the chronic conditions and for activity limitation between the CHS and the NPHS. SUDAAN, which accounts for the complex survey design, was used to estimate standard errors of the prevalence and of the coefficients in the logistic model.

Main results

Lower mortality rates and lower prevalence of heart disease, high blood pressure, arthritis and activity limitation suggest that recent cohorts are healthier than previous cohorts. When the age effect was controlled along with education and income, the odds of having these conditions were generally lower for each successive cohort, and lower in the mid-1990s than in the late 1970s. However, the odds of having diabetes were higher in 1996/97 than in 1978/79, and higher among more recent cohorts than among earlier cohorts.

Key words

cohort studies, cardiovascular diseases, arthritis, diabetes mellitus, hypertension, limitation of activity

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In the early decades of the 21st century, baby boomers, the largest birth cohort in Canada's history, will enter their senior years. If they experience the same pattern of disease as previous cohorts, the demand for health care, and consequently, health care expenditures, could rise substantially.[1-3] But if the onset of chronic conditions could be postponed, or even prevented, the prevalence of such conditions and of disability at older ages might be reduced.[4-9] This could be accomplished through healthier lifestyles and environment, combined with regular monitoring of health made possible by accessible health care. Therefore, reductions in health care needs and expenditures are plausible.[9]

This article compares the health status and health behaviours of men and women who were aged 32 to 85 in 1996/97 with that of earlier cohorts who were in the same age range in 1978/79. The purpose is to determine if there is reason to believe that baby boomers will be healthier in old age than previous cohorts.

The term "baby boomer" is applied to the people born from 1947 to 1964, the high-fertility period following World War II. The years since the end of the war have seen

medical and technological advances, public health initiatives in disease prevention, and positive changes in health behaviours that could affect the development of chronic diseases. Recent cohorts may also have had different levels of exposure to environmental risks in early life, compared with the

Data sources

The 1978/79 Canada Health Survey (CHS), conducted by Statistics Canada and Health and Welfare Canada, and the 1996/97 National Population Health Survey (NPHS), conducted by Statistics Canada, are the sources of data on the prevalence of chronic conditions, activity limitation, overweight and smoking, and on the average number of disability days.

The CHS 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. Data were collected with interviewer- and respondent-completed questionnaires (interview component) and with instrumented measures (physical measures component).

The interview component contained three questionnaires: the Household Record Card (HRC), the Interviewer Administered Questionnaire (IAQ) and the Lifestyle and Health Questionnaire (LHQ). The HRC identified the characteristics of the households in the survey and their members. An interviewer collected the IAQ data on self-reported chronic conditions and activity limitation for the entire household from a suitable household member. The LHQ was left for respondent completion and picked up by the interviewer several days later. The LHQ was limited to respondents aged 15 or older.

A subset of households in the interview component was asked to participate in the physical measures component, which was divided into two parts. The first included measurements of blood pressure, cardiorespiratory fitness, height, weight and skinfold of people aged 2 or older. These data were recorded in the Physical Measures Questionnaire (PMQ). The second part involved taking blood samples from people aged 3 or older to determine immune status and biochemical and trace metal levels.

For the interview component, the household response rate for the IAQ was 86% (10,571 households), and 89% (23,791 respondents aged 15 or older) of the IAQ respondents (all ages) responded to the LHQ. For the physical measures component, 72% (6,131 respondents aged 2 or older) of IAQ respondents who were eligible to respond to the PMQ did so. A more detailed description of the survey is available in a published report.[10]

The National Population Health Survey (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, on Canadian Force bases, and in some remote areas. The NPHS has both longitudinal and cross-sectional components. Respondents who are part of the longitudinal component will be followed for up to 20 years.

This analysis uses cross-sectional data from cycle 2, conducted in 1996/97. The data pertain to the household population in the 10 provinces.

The 1996/97 cross-sectional sample is made up of longitudinal respondents and respondents who were selected as part of supplemental samples, or buy-ins, in three provinces. The additional respondents for the buy-ins were chosen with the random digit dialing (RDD) technique and were included for cross-sectional purposes only.

Individual data are organized into two files: General and Health. Socio-demographic and some health information (for example, chronic conditions, activity limitation and health care utilization) was obtained for each member of participating households. These data are in the General file. Additional in-depth health information was collected for one randomly selected household member. The in-depth health information, as well as the information on the General file pertaining to that individual, is 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 information about his or her own health for the Health file.

In the longitudinal component, persons who were randomly selected to provide in-depth health information about themselves for the Health file in cycle 1 tended to provide information about all other household members for the General file in cycle 2. In addition, the individuals randomly selected for cycle 1 provided follow-up information about their own health in cycle 2.

The 1996/97 cross-sectional household response rate was 83% for the General file, and the selected person response rate was 96% for the Health file. The data used for this analysis were mainly from the General file, except for smoking, height and weight, which were from the Health file. Several published reports contain more detailed descriptions of the NPHS design, sample and interview procedures.[11-13]

The sample sizes for the population analyzed in this article—32- to 85-year-olds—were 14,092 for the CHS and 112, 768 for the NPHS. In the CHS, smoking prevalence was based on a sample of 12,224, and overweight, on a sample of 2,800. The corresponding sample size in the NPHS was 51,163 for both variables.

Data about the age of onset of heart disease were obtained from Statistics Canada's 1991 General Social Survey.[14] This cross-sectional survey covered a sample of 11,924 household residents aged 15 or older. The overall response rate was 80%. The subsample for the survival analysis of the cumulative incidence of heart disease consisted of 9,187 respondents born from 1911 to 1964.

Mortality rates are from the Canadian Vital Statistics Data Base, maintained by Statistics Canada.

cohorts who preceded them. Moreover, a rising share of the Canadian population has attained a postsecondary education, a socioeconomic characteristic that has repeatedly been shown to be associated with better health.[15-18]

This analysis focuses on three age groups: 32 to 49, 50 to 67, and 68 to 85. Corresponding to the 18-year interval between the Canada Health Survey (CHS) and the National Population Health Survey (NPHS), respondents were grouped into four birth cohorts: from 1947 through 1964 (baby boom cohort); from 1929 through 1946 (Depression/ World II cohort); from 1911 through 1928 (World War I/Roaring Twenties cohort); and from 1893 through 1910 (Turn-of-the-Century cohort)[2] (Appendix Table A).

The indicators of health status and health behaviours are: age-specific mortality rates; the prevalence of heart disease, high blood pressure, diabetes, arthritis, activity limitation, overweight and smoking; the average number of disability days in the previous year; and the cumulative incidence of heart disease. Mortality rates among people aged 30 to 84 from the Canadian Vital Statistics Data Base are compared for 1978 and 1996. The data on health status are from the 1978/79 CHS and the 1996/97 NPHS (see *Data sources, Analytical techniques, Definitions,* and *Limitations*). The cumulative incidence of heart disease is calculated from the 1991 General Social Survey.

Mortality down

Between 1978 and 1996, all causes mortality rates for men and women aged 30 to 84 decreased (Chart 1). The decline was more pronounced among men. For instance, at ages 60 to 64, the rate fell from 21 to 14 deaths per 1,000 men in this age range, and at ages 80 to 84, from 110 to 96 deaths per 1,000. Among women, corresponding drops were from 10 to 8 and from 71 to 60 deaths per 1,000.

Much of the decline in age-specific death rates overall was attributable to lower cardiovascular

Analytical techniques

This analysis examines the prevalence of heart disease, high blood pressure, diabetes, arthritis, and activity limitation in each of three age cohorts (32 to 49, 50 to 67, and 68 to 85) in 1978/79 and in 1996/97. The percentages of people in each age cohort who were overweight and who smoked daily, and the average number of disability days they experienced in the previous 12 months are also presented.

Multiple logistic regression models were used to test differences in odds ratios for the health conditions between the Canada Health Survey (CHS) and the National Population Health Survey (NPHS), controlling for age, sex, education and household income simultaneously (see *Definitions*). In the logistic regression, age was a continous variable. The multivariate analysis was based on pooled data from both surveys. The analyses were based on weighted data. The standard errors of prevalence rates and of logistic regression coefficients were estimated with SUDAAN, which uses a Taylor series linearization method to adjust variance estimates to account for the complex survey sample design.[19]

This analysis is a sequential cross-sectional study that tracks different representative samples of a birth cohort over time. (A longitudinal study, by contrast, would follow the same individuals.) For sequential cross-sectional studies, the intervals between the points in time must correspond in years to the intervals used to delineate the birth cohorts. Because the CHS and the NPHS were 18 years apart, the age cohorts each span 18 years (32 to 49, 50 to 67, and 68 to 85).

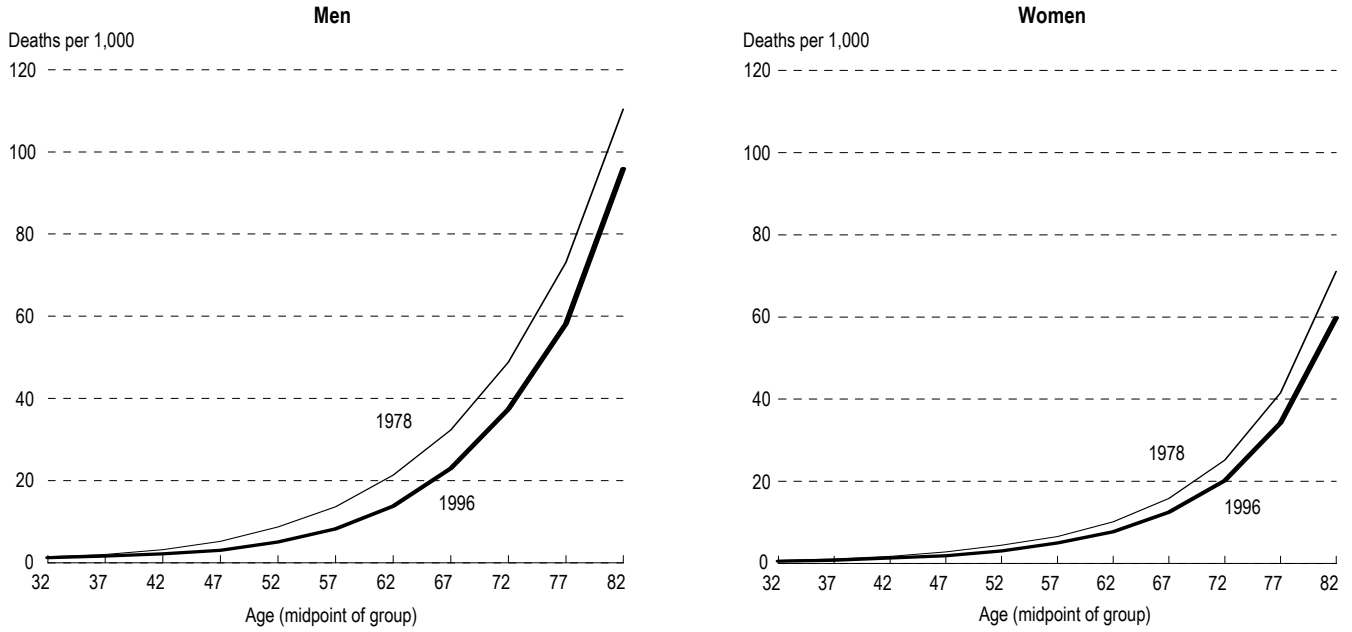
Age effects are produced by influences associated with growing older. *Cohort* effects reflect changes that have occurred and affect successive birth cohorts, such as levels of early life exposure to environmental risk factors and knowledge about health.[20-23] *Period* effects are produced by influences associated with each period of time, regardless of age.[20-24]

The multivariate analysis of the prevalence of health conditions adopted "age-cohort" and "age-period" frameworks to examine changes in cohort health.[25] The data used for this article were limited to comparisons between two points in time 18 years apart to reduce overlapping of cohorts, especially the large baby boom cohort. A shorter time interval and a longer time series would have been preferable. Because of data constraints, the analysis did not attempt to separate period and cohort effects, and interpretations of the results must be viewed as tentative.[25,26]

The cumulative incidence (the proportion of a fixed cohort that experienced the onset of a health-related event during a specified time interval) was estimated by the Kaplan-Meier method. The Lifetest procedure in SAS was used to study the difference in onset of heart disease by cohort.[27] Three cohorts were defined, based on year of birth: 1947 to 1964; 1929 to 1946; and 1911 to 1928.

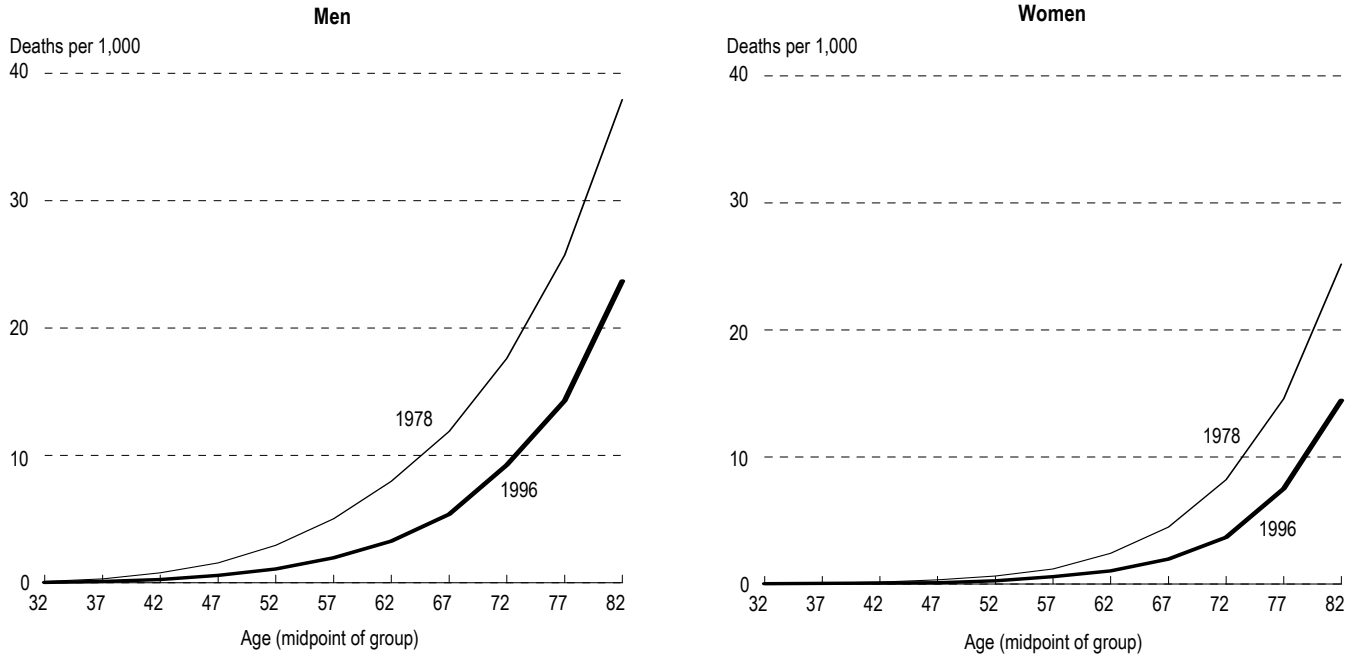
Age-specific mortality rates in 1978 and 1996 were compared for the population aged 30 to 84.

Chart 1
All causes mortality rate, by sex and age, population aged 30 to 84, Canada, 1978 and 1996



Data source: *Canadian Vital Statistics Data Base*

Chart 2
Ischaemic heart disease mortality rate, by sex and age, population aged 30 to 84, Canada, 1978 and 1996



Data source: *Canadian Vital Statistics Data Base*

Table 1
Prevalence of chronic conditions and activity limitation, by sex and age group, household population aged 32 to 85, Canada excluding territories, 1978/79 and 1996/97

	1978/79		1996/97		Difference		
	%	95% CI limits	%	95% CI limits	% point change	95% CI limits	t-value
Men							
Heart disease							
32-49	1.4	±0.6	1.1	±0.2	-0.3	±0.7	-0.85
50-67	10.5	±2.4	8.1	±0.7	-2.5	±2.5	-1.89
68-85	20.4	±3.7	19.8	±1.9	-0.6	±4.1	-0.30
High blood pressure							
32-49	9.7	±2.4	5.0	±0.5	-4.7	±2.4	-3.81*
50-67	21.7	±2.7	18.6	±1.3	-3.2	±3.0	-2.08*
68-85	32.2	±5.9	26.0	±2.1	-6.1	±6.3	-1.92
Diabetes							
32-49	1.1	± 0.5	1.7	±0.3	0.6	±0.5	2.16*
50-67	4.5	±1.2	7.2	±0.8	2.7	±1.4	3.63*
68-85	4.6	±1.7	12.1	±1.6	7.5	±2.4	6.16*
Arthritis							
32-49	6.1	±1.0	5.3	±0.5	-0.8	±1.1	-1.40
50-67	23.6	±2.0	17.3	±1.2	-6.3	±2.3	-5.25*
68-85	32.3	±4.7	30.9	±2.2	-1.3	±5.2	-0.50
Activity limitation							
32-49	8.5	±1.4	8.7	±0.6	0.2	±1.6	0.30
50-67	23.5	±2.6	16.9	±1.0	-6.6	±2.8	-4.64*
68-85	35.6	±3.9	25.2	±1.8	-10.4	±4.3	-4.76*
Women							
Heart disease							
32-49	1.7	±0.5	1.2	±0.2	-0.5	±0.6	-1.84
50-67	8.1	±1.3	5.1	±0.7	-3.0	±1.5	-3.95*
68-85	19.7	±3.7	15.7	±1.4	-4.0	±3.9	-1.98*
High blood pressure							
32-49	8.9	±2.3	4.4	±0.4	-4.4	±2.3	-3.73*
50-67	30.0	±4.2	21.6	±1.4	-8.4	±4.4	-3.73*
68-85	46.3	±4.5	37.2	±2.3	-9.2	±5.0	-3.57*
Diabetes							
32-49	1.1	±0.4	1.9	±0.3	0.8	±0.5	3.07*
50-67	5.0	±1.5	5.4	±0.6	0.4	±1.6	0.48
68-85	8.6	±1.6	9.4	±1.3	0.8	±2.1	0.75
Arthritis							
32-49	13.2	±1.3	9.3	±0.6	-3.9	±1.4	-5.21*
50-67	36.3	±2.2	30.5	±1.4	-5.8	±2.6	-4.42*
68-85	50.9	±4.9	47.2	±2.2	-3.8	±5.3	-1.38
Activity limitation							
32-49	10.5	±1.3	10.6	±0.7	0.0	±1.4	0.03
50-67	22.5	±2.9	17.4	±1.4	-5.1	±3.2	-3.09*
68-85	35.3	±5.1	27.0	±1.9	-8.3	±5.5	-2.97*

Data sources: *1978/79 Canada Health Survey and 1996/97 National Population Health Survey, cross-sectional sample, General file*
Note: *Because of rounding, the percentage-point change may differ slightly from the result that would be obtained using the figures shown in the table.*
** Significantly different from 1978/79, p < 0.05*
CI - confidence interval

disease mortality (data not shown). For one category of cardiovascular disease—ischaemic heart disease—the male mortality rate at ages 60 to 64 fell from 8 to 3 deaths per 1,000, and at ages 80 to 84, from 38 to 24 deaths per 1,000 (Chart 2). Mortality rates were lower among women, but these also declined, from 2 deaths to 1 per 1,000 at ages 60 to 64, and from 25 to 14 deaths per 1,000 at ages 80 to 84.

Decline in heart disease

The drop in cardiovascular disease mortality rates between 1978 and 1996 paralleled a decline in the prevalence of heart disease over the same period (Table 1). At ages 32 to 49, heart disease is relatively uncommon, and the declines in prevalence were not statistically significant. At older ages, declines were more apparent, especially among women. In 1996/97, 5% of women of the Depression/World War II cohort, who were then aged 50 to 67, had heart disease, a substantial and statistically significant drop from 8% for women of the World War I/ Roaring Twenties cohort, who had been in the same age range 18 years earlier. And in 1996/97, when

Table 2
Cumulative incidence of heart disease, by sex and birth cohort, household population, Canada excluding territories, 1991

Age of onset	Males born: 1947-1964	1929-1946	1911-1928	Females born: 1947-1964	1929-1946	1911-1928
	% diagnosed with heart disease					
0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.1	0.1	0.1	0.1	0.0	0.3
10	0.3	0.1	0.3	0.4	0.1	0.3
15	0.3	0.2	0.3	0.7	0.4	0.4
20	0.7	0.6	1.1	0.9	0.5	0.7
25	0.9	0.6	1.1	1.0	0.6	0.8
30	1.4	0.6	1.2	1.8	0.8	1.0
35	2.6	0.8	1.3	2.7	1.0	1.0
40	4.3	1.5	1.5	4.3	1.7	1.3
45	···	3.0	2.2	···	3.0	2.0
50	···	4.9	4.3	···	4.7	3.4
55	···	6.9	7.1	···	7.7	5.0
60	···	11.8	11.3	···	13.6	8.3
65	···	···	17.4	···	···	13.1
70	···	···	21.1	···	···	19.7
75	···	···	28.1	···	···	26.9

Data source: *1991 General Social Survey*
··· Not applicable

they were aged 68 to 85, 16% of women of the World War I/Roaring Twenties cohort had heart disease, significantly below the prevalence of 20% for women of the Turn-of-the-Century cohort in 1978/79.

However, the cumulative probability of being diagnosed with heart disease was slightly higher in more recent cohorts (Table 2). This seeming contradiction—a lower prevalence of heart disease, but a higher cumulative probability of having been diagnosed—may be partially attributable to a health selection effect (see *Limitations*). That is, the most seriously ill members of earlier cohorts may have been more likely to die or to be institutionalized, and thus would not have been included among respondents to the CHS and the NPHS. As well, improvements in diagnostic techniques may have resulted in earlier detection and better treatment, allowing recent cohorts to continue to live with heart disease.

High blood pressure less prevalent

High blood pressure, a cardiovascular risk factor, was also less prevalent in 1996/97 than in 1978/79 (Table 1). In 1996/97, at ages 32 to 49, 5% of male baby boomers reported having high blood pressure, down from 10% for the Depression/World War II cohort in 1978/79. And by 1996/97, when they were aged 50 to 67, 19% of the latter group had high blood pressure, compared with 22% of the

Limitations

Most of the National Population Health Survey (NPHS) and Canada Health Survey (CHS) data used in this analysis were collected from a randomly selected household member who provided information not only about him- or herself, but also about each member of his or her household. The information about smoking and weight, however, pertains only to the selected individual.

The prevalence of chronic conditions may be affected by the use of proxy responses. Some studies have documented under-reporting of some chronic conditions by proxies, while other have reported no under-reporting.[28-33] Nonetheless, changes in health status over time could be partially attributable to proxy response in the two surveys. But because the exact proxy response rate for the CHS cannot be determined, it is not possible to assess the potential influence of proxy reporting.

The survey data are independent cross-sectional samples of different cohorts, rather than a longitudinal sample of the same cohort over time. Consequently, differences in cohort health may also be partially attributable to changes in population composition resulting from, for example, immigration. However, excluding respondents who immigrated to Canada after 1979 did not substantially alter the results (data not shown).

Although a study of cohort health, especially that of seniors, should ideally include people living in institutions, the estimates of the prevalence and cumulative incidence of chronic conditions exclude residents of long-term health care facilities. Consequently, the prevalence of chronic conditions tends to be underestimated.

The analysis of age of onset of heart disease used data from the General Social Survey, a retrospective rather than prospective survey. As cohorts age, they suffer attrition not only through institutionalization, but also from the death of some members. In both cases, those members of the cohort most likely to have been taken ill are excluded. The cumulative incidence of heart disease is therefore likely to be underestimated among older cohorts because of this "health selection effect." The least healthy members of older cohorts are no longer part of the population under study, and the survivors are often healthier, with a later age of onset of disease. In addition, the results are subject to possible measurement errors due to incorrect reporting of the age at which respondents were first diagnosed with heart disease.

The CHS asked all household members if they had high blood pressure. As well, some members of the household sample participated in the physical measures component. Those who reported having high blood pressure in the Interviewer Administered Questionnaire or whose blood pressure was determined to be high in the Physical Measures Questionnaire were considered to have high blood pressure. Height and weight were based on actual physical measurements in the CHS. By contrast, the NPHS data on blood pressure, height and weight were self-reported. When such information is self-reported, high blood pressure tends to be underreported,[34,35] and the prevalence of overweight tends to be underestimated.[36]

Income distribution by quintile, along with education, was used in this analysis to control for possible confounding effects, although the income variable was defined somewhat differently in the CHS (for economic families) and the NPHS (for households).

World War I/Roaring Twenties cohort when they had been aged 50 to 67 in 1978/79. Similarly, at ages 68 to 85 in 1996/97, 26% of male members of the World War I/Roaring Twenties cohort reported high blood pressure, compared with 32% of the Turn-of-the-Century cohort in 1978/79. Except among 68- to 85-year-old men, these declines in the prevalence of high blood pressure were statistically significant.

Declines in the prevalence of high blood pressure among women over this period were all statistically significant, with particularly large differences at older ages. For instance, in 1996/97, 22% of women aged 50 to 67 had high blood pressure, down from 30% for women in this age range in 1978/79.

Larger proportion report diabetes

By contrast, diabetes, another major risk factor for cardiovascular disease, was more prevalent in 1996/97 than in 1978/79 (Table 1). Among men, the percentage with diabetes increased significantly at all ages. For example, in 1996/97, at ages 50 to 67, 7% of male members of the Depression/World War II cohort reported that they had been diagnosed with diabetes; the corresponding figure for the World War I/Roaring Twenties cohort in 1978/79 had been 5%. And in 1996/97, when they were aged 68 to 85, 12% of men of the World War I/ Roaring Twenties cohort had diabetes, up sharply from 5% for men of the Turn-of-the-Century cohort in 1978/79. The proportions of women with diabetes rose slightly between 1978/79 and 1996/97, but the only significant increase was for those aged 32 to 49.

To some extent, the higher prevalence of diabetes among men and younger women may reflect improved sensitivity of biochemical measures for detecting the disease.[37] In addition, a change in diagnostic criteria that was recommended in 1992 (lowering of fasting plasma glucose diagnostic criteria from 7.8 to 7.0 mmol/L) may have contributed to the higher prevalence in 1996/97. This higher prevalence of diabetes is consistent with recent trends in the United States, based on the same diagnostic criteria.[38]

Arthritis less prevalent

Arthritis, while not life-threatening, is a major cause of disability.[32] This disease was less prevalent in 1996/97 than in 1978/79, especially among younger women. In 1996/97, the percentages of women aged 32 to 49 and 50 to 67 who reported having been diagnosed with arthritis were significantly lower than the percentages that had been reported by women in these age groups in 1978/79. The decline among women aged 68 to 85 was not statistically significant.

Among men, the only statistically significant decline in the prevalence of arthritis was at ages 50 to 67.

Drop in activity limitation

Long-term activity limitation is a broad measure of individual health.[39] In 1996/97, when they were aged 32 to 49, the percentage of male and female baby boomers reporting an activity limitation was virtually the same as for the Depression/World War II cohort when they had been in the same age range in 1978/79 (Table 1). On the other hand, by the time they were aged 50 to 67 in 1996/97, men and women of the Depression/World War II cohort had a significantly lower prevalence of activity limitation than had the World War I/Roaring Twenties cohort in 1978/79: approximately 17% versus 23%. And at ages 68 to 85, the latter cohort had a significantly lower prevalence of activity limitation than the Turn-of-the-Century cohort in 1978/79: about 26% versus 35%.

Disability days

At ages 32 to 49, the average number of short-term disability days was higher in 1996/97 than in 1978/79 (Table 3). The increases were almost entirely attributable to less serious "reduced-activity" days, rather than to days of confinement to bed. At ages 50 to 67, the number of bed-days fell among both sexes, while there was no significant change in reduced-activity days. And at ages 68 to 85, bed-days dropped significantly among women.

Definitions

The analysis focuses on three age groups: 32 to 49, 50 to 67, and 68 to 85. Corresponding to the 18-year interval between the Canada Health Survey (CHS) and the National Population Health Survey (NPHS), respondents were grouped into four birth cohorts: from 1947 through 1964 (baby boom cohort); from 1929 through 1946 (Depression/World II cohort); from 1911 through 1928 (World War I/ Roaring Twenties cohort); and from 1893 through 1910 (Turn-of-the-Century cohort)[2] (Appendix Table A).

Because both the CHS and the NPHS were conducted over a two-year period, the corresponding birth years of each 18-year age group were centred around the above-mentioned birth years. As a result, there is a slight overlap. For example, approximately 99% of respondents aged 32 to 49 in 1978/79 were born from 1929 to 1946, but about 1% of them were born in 1928 or 1947.

Both surveys asked respondents about chronic health conditions, which included the four examined in this article: *heart disease, high blood pressure, diabetes* and *arthritis.* In the CHS, respondents were asked if they had any "long-term health problems." In the NPHS, respondents were asked if they had any "long-term health conditions that had been diagnosed by a health professional." For the most part, the data on chronic conditions are self-reported. However, additional information from the CHS on actual blood pressure measurements was used to determine the prevalence of high blood pressure. The following criteria were used: systolic BP $\geq$ 140 mm Hg; diastolic BP $\geq$ 90 mm Hg.[35,40]

In both surveys, respondents were considered to have an *activity limitation* if they or the person answering for them replied "yes" to any of the questions asking if they were limited at home, at school, at work, or in other situations because of health problems. The questions, however, were not identical. In the CHS, long-term activity limitation refers to an individual's limitation in normal activities for most of the past 12 months because of health.[10] In the NPHS, long-term activity limitation refers to limitations in the kind or amount of activity because of a long-term physical or mental condition or a health problem that had lasted or was expected to last six months or more.

Short-term disability refers to the total number of days spent in bed plus days when activities were reduced because of ill health in the past two weeks: bed-days and reduced-activity days, respectively.

Respondents were asked if, at the time of the interview, they smoked cigarettes daily, occasionally, or not at all. *Daily smokers* were those who currently smoked cigarettes daily.

The *Canadian Guidelines for Healthy Weights*[41] use body mass index (BMI) to determine an acceptable range of healthy weights and to identify conditions of excess weight and underweight. BMI is calculated by dividing weight in kilograms by height in metres squared. Four weight categories are identified based on BMI:

- Underweight (BMI less than 20)
- Acceptable weight (BMI 20 to 24.9)
- Some excess weight (BMI 25 to 27)
- Overweight (BMI greater than 27)

In accordance with these guidelines, people aged 32 to 85 whose BMI was greater than 27 were classified as being *overweight* for this analysis. These guidelines, however, are recommended for people aged 20 to 64, excluding pregnant women. The use of such calculations for people older than 65 is not universally recommended because of the tendency for people to overstate their height, especially as they get older. Therefore, the prevalence of overweight may be underestimated.[42]

Education was classified into three groups: low for less than high school graduation; middle for high school graduation or some postsecondary; and high for postsecondary graduation.

Income was based on a derived income quintile variable, and two categories were established: low (quintiles 1 and 2) and middle-to-high (quintiles 3 to 5). A "missing" category was created for cases in which income was not reported. The data are not strictly comparable, as the CHS variable was based on economic families, whereas the NPHS variable was based on households. An economic family is a group of two or more persons who live in the same dwelling and are related by blood, marriage, adoption or common-law.[14,43] A household is a person or group of persons who occupy the same dwelling and do not have a usual place of residence elsewhere in Canada.[14,43]

In the 1991 General Social Survey, the *age of onset* of heart disease was based on respondents' recall of the age at which they were first diagnosed with heart problems, such as a heart attack, angina, heart failure, or rheumatic heart disease.[18]

All causes contributing to a death are entered on the death certificate in accordance with the *International Classification of Diseases*.[44,45] A single underlying cause of death is coded. The following ICD-8 (for 1978) and ICD-9 (for 1996) codes were used for this article: ischaemic heart disease (ICD-8 and ICD-9 codes 410-414) and cardiovascular disease (ICD-8 codes 390-458 and ICD-9 codes 390-459).

For the analysis of mortality rates, the populations were grouped by five-year age intervals. However, there may be a slight overlap between cohorts in 1978 and 1996. For instance, in 1996, baby boomers were in the 30-to-49 age group. In 1978 (the central year), most people aged 30 to 49 were members of the Depression/World War II cohort, although a few of them could have been born in 1947/48.

Table 3
Average number of short-term disability days in previous year, by sex and age group, household population aged 32 to 85, Canada excluding territories, 1978/79 and 1996/97

	1978/79		1996/97		Difference		
	Days	95% CI limits	Days	95% CI limits	% point change	95% CI limits	t-value
	Average number of days						
Men							
Disability days							
32-49	8.6	±1.8	14.6	±1.4	6.0	±2.2	5.23*
50-67	24.7	±5.5	18.3	±1.9	-6.4	±5.9	-2.14*
68-85	29.2	±5.8	32.3	±4.3	3.1	±7.2	0.83
Bed-days							
32-49	2.5	±0.7	3.8	±0.4	1.2	±0.9	2.80*
50-67	8.3	±3.1	5.0	±0.9	-3.2	±3.2	-1.98*
68-85	11.1	±4.2	10.1	±2.0	-1.0	±4.6	-0.43
Reduced-activity days							
32-49	6.0	±1.6	10.8	±1.2	4.8	±2.0	4.67*
50-67	16.4	±4.7	13.2	±1.6	-3.2	±5.0	-1.24
68-85	18.1	±6.4	22.2	±4.0	4.1	±7.5	1.07
Women							
Disability days							
32-49	14.0	±2.1	19.3	±1.2	5.3	±2.4	4.25*
50-67	25.5	±4.5	25.6	±2.9	0.1	±5.3	0.03
68-85	35.1	±7.3	36.6	±5.3	1.5	±9.0	0.34
Bed-days							
32-49	4.7	±1.1	5.3	±0.4	0.6	±1.1	1.05
50-67	10.0	±2.1	7.0	±1.3	-2.9	±2.5	-2.33*
68-85	14.8	±5.2	9.1	±2.1	-5.7	±5.6	-2.00*
Reduced-activity days							
32-49	9.3	±2.2	14.0	±1.1	4.7	±2.4	3.78*
50-67	15.6	±4.2	18.6	±2.1	3.0	±4.7	1.26
68-85	20.2	±5.4	27.5	±5.0	7.3	±7.3	1.94

Data sources: *1978/79 Canada Health Survey and 1996/97 National Population Health Survey, cross-sectional sample, General file*
Note: *Because of rounding, the percentage-point change may differ slightly from the result that would be obtained using the figures shown in the table.*
** Significantly different from 1978/79, p < 0.05*
CI - confidence interval

Healthy habits

Growing awareness of the role lifestyle plays in health has marked the last two decades. Smoking and excess weight, in particular, have been identified as major preventable causes of disease and death, and have been targeted for health promotion efforts.

To a great degree, the dangers of smoking seem to have been recognized, although some of the decline in older age groups may reflect a higher attrition rate (deaths) among smokers. In 1996/97, 32% of male baby boomers were daily smokers, well below the 48% of men of the Depression/World War II cohort who reported daily smoking when they had been aged 32 to 49 in 1978/79 (Table 4). Moreover, by 1996/97, at ages 50 to 67, just 25% of men of the Depression/World War II cohort were daily smokers, compared with 43% of men of the World War I/Roaring Twenties cohort in 1978/79. The figures for 68- to 85-year-olds were 14% in 1996/97 and 30% in 1978/79. The pattern for women was similar, with much lower smoking rates in 1996/97 than in 1978/79.

During the same period, the proportion of women who were overweight fell significantly at ages 50 to 67 and 68 to 85. Among men, there were no significant changes in the percentages who were overweight.

Table 4
Daily smoking and overweight, by sex and age group, household population aged 32 to 85, Canada excluding territories, 1978/79 and 1996/97

	1978/79		1996/97		Difference		
	%	95% CI limits	%	95% CI limits	% point change	95% CI limits	t-value
Men							
Daily smoking							
32-49	47.6	±3.7	31.8	±1.9	-15.8	±4.2	-7.34*
50-67	42.6	±3.7	24.7	±2.4	-17.9	±4.4	-7.99*
68-85	29.6	±4.7	13.9	±2.1	-15.6	±5.1	-6.00*
Overweight							
32-49	32.8	±5.9	36.0	±1.9	3.2	±6.2	1.01
50-67	43.8	±6.1	42.3	±2.5	-1.5	±6.6	-0.46
68-85	32.0	±8.7	31.6	±2.9	-0.4	±9.1	-0.09
Women							
Daily smoking							
32-49	39.5	±2.8	26.4	±1.7	-13.1	±3.3	-7.86*
50-67	31.2	±2.7	19.2	±2.0	-12.0	±3.3	-7.03*
68-85	14.7	±2.6	9.7	±1.4	-5.0	±2.9	-3.39*
Overweight							
32-49	27.5	±5.9	22.0	±1.6	-5.5	±6.1	-1.76
50-67	47.0	±3.6	34.7	±2.5	-12.4	±4.4	-5.51*
68-85	38.9	±6.6	30.8	±3.1	-8.1	±7.3	-2.17*

Data sources: *1978/79 Canada Health Survey and 1996/97 National Population Health Survey, cross-sectional sample, General file*
Note: *Because of rounding, the percentage-point change may differ slightly from the result that would be obtained using the figures shown in the table.*
** Significantly different from 1978/79, p < 0.05*
CI - confidence interval

Period and cohort effects

Differences in the prevalence of chronic conditions in 1978/79 and in 1996/97 suggest that period shifts occurred during these 18 years. Indeed, even when the strong effect of age is controlled, statistically significantly period effects emerge. For both sexes, the odds of having been diagnosed with heart disease, high blood pressure or arthritis and of having an activity limitation were higher in 1978/79 than in 1996/97 (Table 5). However, for men, the odds of diabetes were significantly lower in the earlier period than in 1996/97.

Similarly, in an age-cohort model, the odds of having heart disease, high blood pressure and arthritis were significantly higher for men and women of earlier cohorts than for baby boomers. As well, compared with baby boomers, members of the Turn-of-the-Century and World War I/ Roaring Twenties cohorts had significantly high odds of reporting an activity limition. On the other hand, in comparison with male baby boomers, the odds of diabetes were low for men of the Turn-of-the-Century cohort.

Socioeconomic characteristics

Education and income have repeatedly been shown to be positively associated with health.[16,17] Both are also inversely related to smoking[46-51] and obesity,[52]

Table 5
Adjusted odds ratios for chronic conditions and activity limitation, by age and period or cohort, household population aged 32 to 85, Canada excluding territories, 1978/79 and 1996/97

	Heart disease		High blood pressure		Diabetes		Arthritis		Activity limitation	
	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
Men										
Age-period model										
Age	1.08*	1.08, 1.09	1.05*	1.05, 1.06	1.06*	1.05, 1.06	1.06*	1.06, 1.07	1.05*	1.04, 1.05
Period										
1978/79	1.26*	1.02, 1.54	1.49*	1.24, 1.80	0.55*	0.43, 0.71	1.31*	1.19, 1.45	1.34*	1.20, 1.50
1996/97†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Age-cohort model										
Age	1.07*	1.06, 1.08	1.04*	1.03, 1.05	1.07*	1.06, 1.09	1.04*	1.05, 1.06	1.03*	1.03, 1.04
Cohort										
Born 1947-1964†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Born 1929-1946	2.11*	1.63, 2.72	2.20*	1.78, 2.72	1.13	0.87, 1.48	1.44*	1.24, 1.66	1.10	0.96, 1.27
Born 1911-1928	2.68*	1.76, 4.08	2.39*	1.73, 3.31	0.74	0.50, 1.09	1.93*	1.58, 2.35	1.48*	1.21, 1.82
Born 1893-1910	2.45*	1.53, 3.91	2.67*	1.64, 4.33	0.26*	0.15, 0.45	1.64*	1.22, 2.20	1.89*	1.45, 2.47
Women										
Age-period model										
Age	1.08*	1.07, 1.08	1.07*	1.07, 1.08	1.05*	1.05, 1.06	1.06*	106, 1.07	1.04*	1.04, 1.04
Period										
1978/79	1.47*	1.27, 1.70	1.70*	1.43, 2.03	0.86	0.72, 1.02	1.35*	1.24, 1.47	1.26*	1.12, 1.41
1996/97†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Age-cohort model										
Age	1.06*	1.05, 1.06	1.05*	1.04, 1.06	1.06*	1.05, 1.07	1.05*	1.05, 1.06	1.03*	1.02, 1.04
Cohort										
Born 1947-1964†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Born 1929-1946	1.61*	1.25, 2.08	2.42*	1.98, 2.95	0.95	0.75, 1.22	1.65*	1.49, 1.82	1.02	0.90, 1.16
Born 1911-1928	2.54*	1.84, 3.50	3.24*	2.37, 4.43	0.88	0.56, 1.38	1.89*	1.65, 2.16	1.26*	1.01, 1.58
Born 1893-1910	3.18*	2.17, 4.67	3.76*	2.57, 5.52	0.73	0.48, 1.12	1.79*	1.41, 2.28	1.63*	1.19, 2.22

Data sources: *1978/79 Canada Health Survey and 1996/97 National Population Health Survey, cross-sectional sample, General file*
† Reference category for which odds ratio is always 1.00
··· Not applicable
** $p < 0.05$*

perhaps in part because health promotion efforts tend to be most successful among people with higher socioeconomic status.[51] As well, socioeconomic status influences population health through differential exposure to physical and social environments.[16,17] Consequently, some of the improvement in health and health behaviours among more recent cohorts may reflect generally higher levels of education and income.

In 1996/97, 43% of baby boom men and 40% of baby boom women had a postsecondary diploma or degree, up from 25% and 19%, respectively, for the Depression/World War II cohort when they were aged 32 to 49 in 1978/79 (Table 6). As well, by the time they were aged 50 to 67 in 1996/97, 33% of men and 28% of women in the latter cohort had obtained postsecondary credentials, which was more than twice the figure for the World War I/ Roaring Twenties cohort in 1978/79. Similarly, in 1996/97, 20% of men and 17% of women aged 68 to 85 were postsecondary graduates, compared with 9% for both sexes in 1978/79.

The rise in educational attainment was accompanied by an increase in the proportion of people in each of these age groups whose income was in the middle-to-high range. With the exception of women aged 32 to 49, these increases were statistically significant.

As previously noted, the odds of heart disease, high blood pressure, arthritis and activity limitation were higher in the late 1970s than in the mid-1990s, and higher among earlier than recent cohorts, even when the effect of age was taken into account. These period and cohort effects were attenuated when educational attainment and income were controlled, but for both sexes, the odds of having high blood pressure were still higher in 1978/79 than in 1996/97 (Table 7). And for women, the odds of having arthritis were higher in 1978/79 than in 1996/97.

Similarly, when education and income were taken into account, cohort effects in the prevalence of disease were still apparent. The odds of having heart disease, high blood pressure and arthritis were significantly higher among earlier cohorts than among baby boomers, while the odds of having diabetes were lower.

Table 6
Percentage with postsecondary graduation and in middle-to-high income quintiles, by sex and age group, household population aged 32 to 85, Canada excluding territories, 1978/79 and 1996/97

	1978/79		1996/97		Difference		
	%	95% CI limits	%	95% CI limits	% point change	95% CI limits	t-value
Men							
Postsecondary graduation							
32-49	25.1	±3.6	43.2	±1.0	18.1	±3.8	9.34*
50-67	14.3	±3.1	33.1	±1.4	18.8	±3.4	10.92*
68-85	9.3	±2.8	20.0	±1.6	10.7	±3.3	6.42*
Middle-to-high income quintile							
32-49	63.2	±2.5	75.0	±0.8	11.8	±2.6	8.76*
50-67	65.7	±3.4	72.8	±1.2	7.1	±3.6	3.84*
68-85	38.4	±5.0	67.4	±2.0	28.9	±5.4	10.57*
Women							
Postsecondary graduation							
32-49	19.1	±3.7	40.3	±1.0	21.2	±3.8	10.92*
50-67	11.9	±2.3	28.0	±1.5	16.1	±2.7	11.59*
68-85	9.3	±2.9	16.5	±1.4	7.2	±3.2	4.45*
Middle-to-high income quintile							
32-49	58.6	±3.4	72.0	±1.0	13.4	±3.6	7.38
50-67	59.6	±3.4	68.3	±1.5	8.7	±3.8	4.50*
68-85	33.8	±4.1	55.5	±2.2	21.7	±4.6	9.19*

Data sources: *1978/79 Canada Health Survey and 1996/97 National Population Health Survey, cross-sectional sample, General file*
Note: *Because of rounding, the percentage-point change may differ slightly from the result that would be obtained using the figures shown in the table.*
† Respondents with missing income were included in denominator for each age group. Data for 1978/79 refer to economic families; data for 1996/97 refer to households.
** Significantly different from 1978/79, $p < 0.05$*

Concluding remarks

Lower mortality rates overall, and for cardiovascular disease in particular, as well as lower odds of heart disease, high blood pressure, arthritis and activity limitation suggest that recent cohorts are healthier than the cohorts who preceded them. In the United States, declines in deaths from ischaemic heart disease and stroke have been largely attributed to better diagnosis and control of hypertension.[53]

To some extent, the declines in heart disease, high blood pressure and arthritis are associated with rising levels of education and income. Yet even when education and income were taken into account, the

Table 7
Adjusted odds ratios for chronic conditions and activity limitation, by age, period or cohort, education and income, household population aged 32 to 85, Canada excluding territories, 1978/79 and 1996/97

	Heart disease		High blood pressure		Diabetes		Arthritis		Activity limitation	
	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
Men										
Age-period model										
Age	1.08*	1.08,1.09	1.05*	1.05, 1.06	1.05*	1.05, 1.06	1.06*	1.05, 1.06	1.04*	1.04, 1.04
Period										
1978/79	1.15	0.93, 1.42	1.43*	1.18, 1.74	0.51*	0.39, 0.66	1.09	0.98, 1.21	0.94	0.83, 1.07
1996/97†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Education										
Low	1.17	0.96, 1.42	1.16	0.99, 1.37	1.43*	1.19, 1.73	1.64*	1.45, 1.84	1.62*	1.43, 1.82
Middle	1.08	0.87, 1.33	1.13	0.99, 1.29	1.22*	1.03, 1.45	1.17*	1.04, 1.32	1.10	0.97, 1.25
High†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Income‡										
Low	1.13	0.88, 1.45	1.02	0.87, 1.20	0.90	0.73, 1.12	1.18*	1.03, 1.34	2.05*	1.80, 2.34
Middle-to-high†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Missing	0.89	0.76, 1.04	0.94	0.81, 1.08	0.78*	0.65, 0.93	0.89*	0.80, 0.99	0.82*	0.73, 0.93
Age-cohort model										
Age	1.07*	1.06, 1.08	1.04*	1.03, 1.05	1.08*	1.06, 1.09	1.05*	1.05, 1.06	1.04*	1.04, 1.05
Cohort										
Born 1947-1964†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Born 1929-1946	1.99*	1.55, 2.55	2.11*	1.70, 2.60	1.07	0.82, 1.38	1.23*	1.06, 1.44	0.85*	0.73, 0.99
Born 1911-1928	2.39*	1.61, 3.56	2.20*	1.60, 3.03	0.66*	0.45, 0.97	1.45*	1.18, 1.79	0.93	0.75, 1.15
Born 1893-1910	1.93*	1.21, 3.07	2.29*	1.42, 3.70	0.22*	0.13, 0.38	1.00	0.73, 1.38	0.77	0.57, 1.04
Education										
Low	1.13	0.93, 1.37	1.17	0.99, 1.38	1.32*	1.10, 1.60	1.61*	1.43, 1.81	1.62*	1.43, 1.82
Middle	1.06	0.86, 1.31	1.13	0.99, 1.29	1.19*	1.00, 1.42	1.16*	1.03, 1.30	1.10	0.97, 1.25
High†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Income‡										
Low	1.22	0.94, 1.57	1.09	0.92, 1.29	0.93	0.77, 1.13	1.26*	1.11, 1.43	2.08*	1.82, 2.36
Middle-to-high†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Missing	0.88	0.75, 1.03	0.92	0.79, 1.06	0.78*	0.65, 0.93	0.88*	0.78, 0.98	0.82*	0.73, 0.93
Women										
Age-period model										
Age	1.07*	1.07, 1.08	1.07*	1.06, 1.07	1.04*	1.04, 1.05	1.06*	106, 1.07	1.04*	1.03, 1.04
Period										
1978/79	1.13	0.97, 1.33	1.54*	1.28, 1.85	0.65*	0.55, 0.78	1.22*	1.12, 1.34	1.05	0.91, 1.20
1996/97†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Education										
Low	1.89*	1.57, 2.28	1.36*	1.19, 1.56	1.99*	1.61, 2.47	1.25*	1.13, 1.38	1.23*	1.10, 1.37
Middle	1.19	0.96, 1.47	1.16*	1.02, 1.32	1.23	0.99, 1.52	1.08	0.96, 1.20	1.05	0.93, 1.20
High†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Income‡										
Low	1.45*	1.19, 1.77	1.08	0.97, 1.22	1.47*	1.18, 1.81	1.16*	1.08, 1.25	1.52*	1.32, 1.76
Middle-to-high†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Missing	1.00	0.83, 1.19	0.93	0.82, 1.05	1.04	0.84, 1.28	0.98	0.88, 1.08	0.89*	0.80, 1.00
Age-cohort model										
Age	1.06*	1.05, 1.07	1.05*	1.04, 1.06	1.06*	1.05, 1.07	1.05*	1.05, 1.06	1.03*	1.03, 1.04
Cohort										
Born 1947-1964†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Born 1929-1946	1.27	0.98, 1.65	2.18*	1.80, 2.64	0.75*	0.59, 0.96	1.50*	1.35, 1.67	0.89	0.78, 1.00
Born 1911-1928	1.69*	1.23, 2.34	2.69*	1.99, 3.65	0.59*	0.38, 0.91	1.61*	1.39, 1.85	0.97	0.77, 1.22
Born 1893-1910	1.70*	1.14, 2.53	2.81*	1.90, 4.16	0.39*	0.25, 0.61	1.36*	1.07, 1.74	1.02	0.71, 1.46
Education										
Low	1.84*	1.53, 2.22	1.35*	1.18, 1.54	1.93*	1.55, 2.41	1.23*	1.11, 1.37	1.26*	1.13, 1.40
Middle	1.17	0.95, 1.45	1.15*	1.01, 1.31	1.22	0.99, 1.52	1.07	0.95, 1.20	1.06	0.93, 1.20
High†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Income‡										
Low	1.46*	1.21, 1.77	1.16*	1.03, 1.29	1.44*	1.16, 1.78	1.22*	1.14, 1.31	1.53*	1.32, 1.76
Middle-to-high†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Missing	1.00	0.84, 1.20	0.90	0.80, 1.01	1.06	0.86, 1.30	0.95	0.86, 1.06	0.89*	0.79, 0.99

Data sources: *1978/79 Canada Health Survey and 1996/97 National Population Health Survey, cross-sectional sample, General file*
† Reference category for which odds ratio is always 1.00
‡ Data for 1978/79 refer to economic families; data for 1996/97 refer to households.
** $p < 0.05$*

odds of having diabetes, a major risk factor for cardiovascular disease, were higher in 1996/97 than in 1978/79, and tended to be higher for baby boomers than for older cohorts. An increased prevalence of diabetes has also been reported in the United States.[37,38] There, while the increase has been partially attributed to "improved sensitivity of biochemical measures for detecting diabetes and accelerated efforts in screening"[37] that have resulted in earlier detection among more recent cohorts, the rising prevalence of diabetes is viewed as real, and may also reflect increased obesity and a more sedentary lifestyle.[37,38]

The 50-to-67 age group is of particular interest, as this is the age range in which health problems typically begin to increase. It is also the age range that baby boomers will continue to enter over the next two decades. However, a comparison of the results of the 1996/97 National Population Health Survey with those of the 1978/79 Canada Health Survey shows that in 1996/97, people in their fifties and sixties were in better health than had been the case two decades earlier. Such substantial improvements suggest that there may be reason to speculate that the health of baby boomers will be as good, or even better, as they enter this age range. As well, the evidence of considerably improved health among seniors bodes well for baby boomers, who will constitute the senior population in the first half of the 21st century.

Seniors' future need for health care is a function of two factors: the growing population of elderly people multiplied by a possibly modifiable average health.[54] While reductions in the need for health care due to improvements in the average health of seniors through prevention and intervention seem plausible, further improvements in many other dimensions of health are also urgently needed.[9,54-57] And "even if we are optimistic about future events, the sheer growth in the absolute number of elderly people" in the coming decades will present a major challenge for the provisions of health care.[58] ●

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Appendix

Table A
Ages of birth cohorts in 1978/79 and 1996/97

	Age in:	
Birth year	**1978/79**	**1996/97**
1947-1964 (baby boom cohort)	···	32-49
1929-1946 (Depression/World War II cohort)	32-49 ——>	50-67
1911-1928 (World War I/Roaring Twenties cohort)	50-67 ——>	68-85
1893-1910 (Turn-of-the-Century cohort)	68-85	···

Notes: *Because the surveys were conducted over about two years, the corresponding years of birth for each 18-year age group were centred* ***around*** *the birth years as labelled. For example, 99% of respondents aged 32 to 49 in 1978/79 were born in 1929 through 1946, and fewer than 1% were born in the years slightly outside this range, 1928 or 1947. The arrow (——>) indicates the change in the ages of a birth cohort from 1978/79 to 1996/97.*
··· Not applicable