

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%.

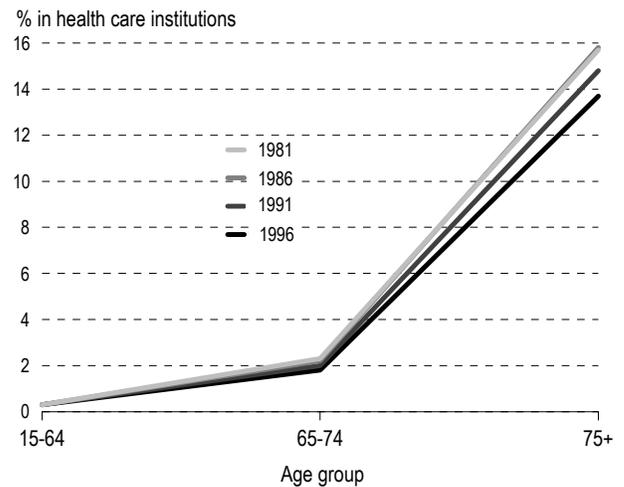
Activity limitation

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.

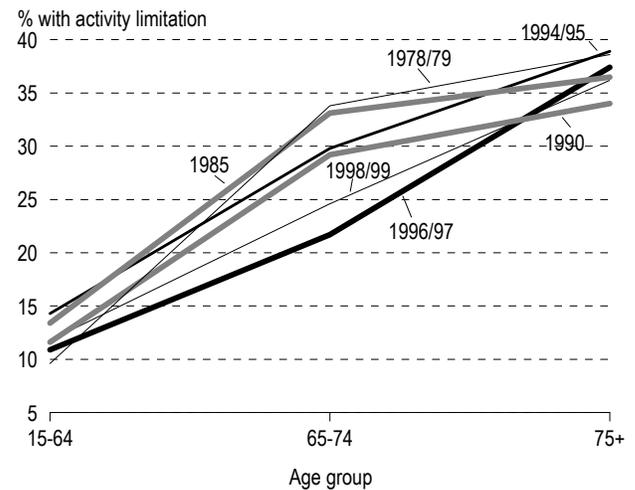
There are two factors that may account for the rate of activity limitation not having fallen among the 75-or-older group over the past 20 years. Life expectancy for seniors has increased since 1980,

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



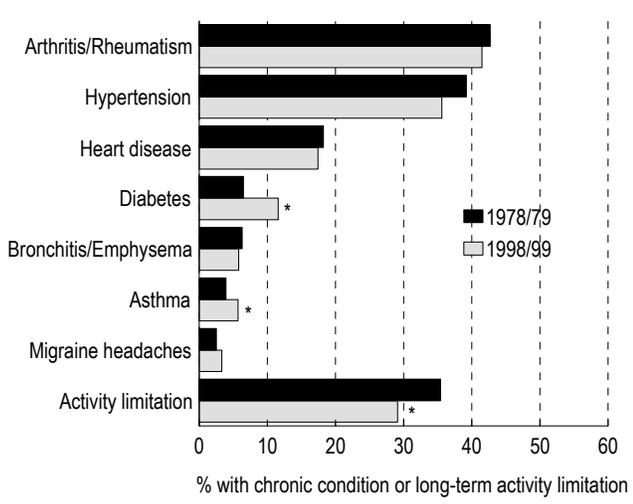
Data sources: 1981, 1986, 1991 and 1996 Census of Canada

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



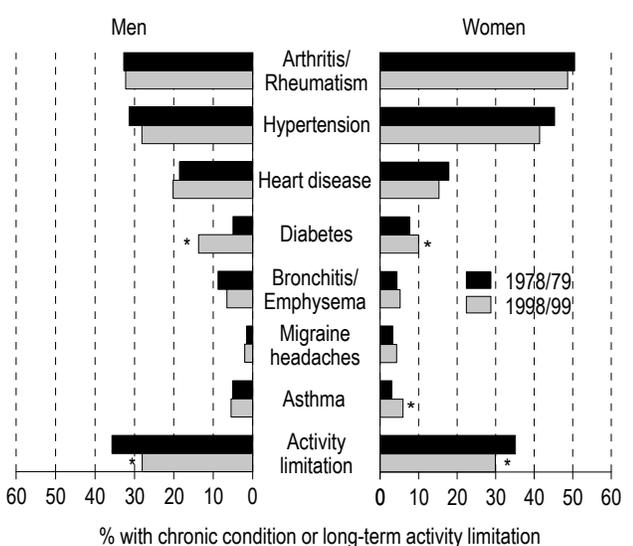
Data sources: 1978/79 Canada Health Survey; 1985 and 1990 Health Promotion Survey; 1994/95, 1996/97 and 1998/99 National Population Health Survey

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).

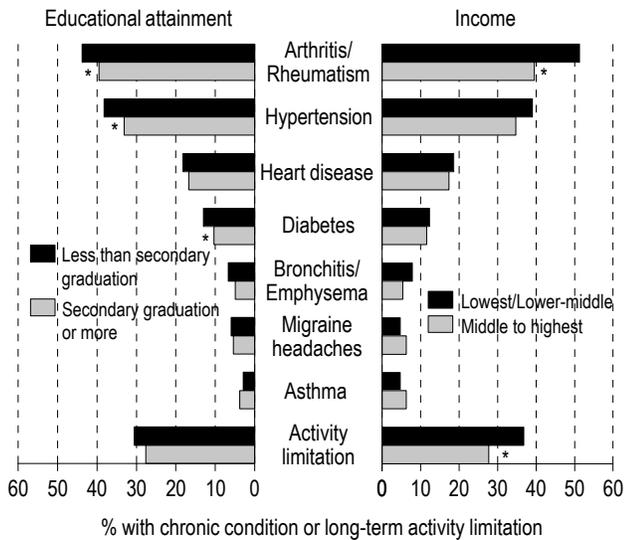
The prevalence of most chronic conditions among adults aged 65 or older did not change significantly between the 1978/79 CHS and the 1998/99 NPHS, with the exception of diabetes and asthma, which increased significantly in prevalence (Chart 3). The prevalence of diabetes increased significantly among 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	Functional status in 1998/99									
	Total		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 to 140 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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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.