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Health Reports

How healthy are Canadians?

ANNUAL REPORT



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Statistics Canada
Health Statistics Division

Health Reports

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The following standard symbols are used in Statistics Canada publications:

- not available for any reference period
- not available for specific reference period
- ... not applicable
- P preliminary figures
- † revised figures
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published

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Health at Older Ages

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This publication marks the sixth consecutive collaboration between Statistics Canada and the Canadian Institute for Health Information in a project aimed at enriching Canada's health information system. In its series entitled *How Healthy are Canadians?*, Statistics Canada focuses on the population's health. The Canadian Institute for Health Information reports on the performance of the health care system in a complementary series, *Health Care in Canada*. This latest report from Statistics Canada—*Health at Older Ages*—examines Canada's senior population.

Ever-lengthening life expectancy means that the “senior” phase of life continues to expand. During these later years, the good health and independence that were often taken for granted at younger ages can become problematic. In fact, it is often thought that health inevitably deteriorates with advancing age. Seniors, however, are a diverse group: there is no typical senior or typical experience of aging. Some Canadian seniors remain active and independent, while others may face debilitating conditions and rely on the help of others. Some continue to live in private households; others reside in long-term health care facilities. Many seniors feel positively about their health, yet others perceive a decline in their physical and psychological well-being. The in-depth analyses in this report examine a range of health issues confronting seniors.

“Healthy living among seniors” explores good health in relation to health behaviours and psychosocial factors. While some seniors experience functional decline or more negative perceptions of their health, many others either remain healthy or regain their health after such a decline. This article reveals the importance of positive health behaviours, such as exercising regularly, drinking moderately, eating fruit and vegetables, and abstaining from smoking. The analysis also finds that seniors who feel connected to their communities and those without a lot of stress in their lives are more likely to be in good health.

Many seniors are concerned not only with the development of chronic diseases, but also with the loss of independence that may ensue. These issues are addressed in “Dependency, chronic conditions and pain in seniors.” The analysis finds that depending on others for help with dressing, bathing and eating, and for managing finances and running errands, is often related to the pain that accompanies a chronic condition, rather than to the disease itself. Effective pain management can help delay or prevent debilitating effects and prolong independence.

In “Seniors’ health care use,” the impact of chronic conditions and injury on medical consultations, medication use, hospitalization and home care is explored. And it is reassuring to discover that seniors’ use of health care services is based on need, rather than on their income or education.

“Successful aging in health care institutions” concludes that many seniors who live in long-term health care facilities feel positively about their health—evidence of their adaptation to life’s circumstances and of a successful aging process. The results indicate that seniors with positive perceptions of their health, despite the presence of chronic conditions, are at lower risk of dying than are those who have a negative view of their health. As well, social interaction and close relationships with staff members in the institution are related to perceptions of health.

While many seniors age successfully, for some, the process is more difficult. Comfort in the senior years depends not only on being free of major chronic

diseases, but also on being free of stress. Psychological distress, in fact, can affect the chances of survival. “Predictors of death in seniors” reveals that women who experienced financial or psychological stress at the beginning of an eight-year period were at higher risk of death by the end of the period than were senior women without these stresses. For men, those with a low level of education or who were widowers had a higher likelihood of dying.

These analyses are based on a number of Statistics Canada sources, including the Canadian Community Health Survey, the National Population Health Survey, the Hospital Morbidity Database, and the Canadian Mortality Database. This report is the sixth in a series that covers a range of health issues. Past topics focused on mental health (2004), children (2003), health in communities (2002), differences between the sexes (2001), and health status and use of services over the life cycle (1999). These publications are available free on Statistics Canada’s Web site @ www.statcan.ca: Under “Products and Services,” select “Free,” then “Health,” and “Health Reports—Supplements.”

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

About the Canadian Institute for Health Information

The Canadian Institute for Health Information is a national, not-for-profit organization with a mandate to coordinate the development and maintenance of an integrated approach to health care information. The Institute provides information that is needed to establish health care policies and to manage the health care system effectively.

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About Health Reports

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

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Healthy living among seniors

- *The majority of Canadian seniors were in good health in 2003. Most were independent, free of functional disabilities and had positive perceptions of their mental and physical health.*
- *Exercising frequently, drinking moderately, eating fruit and vegetables often, having a normal BMI, as well as having low stress levels and feeling connected to their communities, all played important roles in seniors' overall good health.*
- *Healthy behaviour during the senior years not only helps maintain good health, but also increases the likelihood of recovering after a period of poor health.*

Abstract

Objectives

This article investigates good health among Canadian seniors in relation to health behaviours and psychosocial factors.

Data sources

Data are from the 2003 Canadian Community Health Survey and the 1994/95 through 2002/03 National Population Health Survey, household components.

Analytical techniques

Multiple logistic regression modeling was used to study associations between being in good health and behavioural risk and psychosocial factors in 2003. Proportional hazards modelling and logistic regression were used to examine health-related characteristics and psychosocial factors in relation to maintaining and recovering health.

Main results

Seniors who exercised frequently, had a body mass index in the normal range, were high consumers of fruit and vegetables and moderate consumers of alcohol were more likely to be in good health. Low levels of stress and feeling connected to the community were also associated with good health. Healthy behaviours were related to maintaining good health over time, as well as increased likelihood of recovery. These findings persisted when controlling for socio-demographic factors and chronic conditions.

Keywords

health behaviour, stress, independent living, aging, longitudinal studies, health survey

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Margot Shields and Laurent Martel

During the 20th century, life expectancy at birth in Canada increased dramatically, from less than 50 years at the beginning of the century,¹ to close to 80 years by the end.² In 1901, a 65-year-old could have expected to live an additional 11 years; by 2001, this had increased to 19 years. Now that Canadians are living more years as seniors, the quality of life for this age group is of increasing concern.

As people grow old, chronic conditions become more prevalent. For some, functional decline and reduced perceptions of health are to be expected. But poor health in the senior years is not always inevitable, and modifying certain risk factors may not only prolong life, but may also allow seniors to live more years in good health.³⁻¹⁰

Data sources and limitations

Data sources

Canadian Community Health Survey. The cross-sectional analysis of factors associated with seniors' overall good health is based on data from cycle 2.1 of the Canadian Community Health Survey (CCHS). The CCHS collects cross-sectional information about the health of Canadians every two years. The survey covers the household population aged 12 or older in the provinces and territories, except residents of institutions, regular members of the Canadian Armed Forces and residents of Indian reserves, Canadian Forces bases, and some remote areas. Cycle 2.1 began in January 2003 and ended in December that year. Most interviews were conducted by telephone. The response rate was 80.6%, yielding a sample of 135,573 respondents.

Many of the variables used to define good health were part of the Health Utility Index (HUI). In 2003, the HUI was designated a "sub-sample" module of the CCHS, meaning that it was administered to a randomly selected subset of respondents. However, Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick and Québec opted to have this module administered to all respondents in their provinces. Data from these respondents and from the subset in the remaining provinces and territories were used for this analysis. A total of 13,998 respondents aged 65 or older were used in the cross-sectional analyses for this article. A description of the CCHS methodology is available in a published report.¹¹

National Population Health Survey. The longitudinal analyses of factors associated with maintaining and recovering good health are based on data from five cycles (1994/95 through 2002/03) of the National Population Health Survey (NPHS). The NPHS, which began in 1994/95, collects information about the health of Canadians every two years. It covers household and institutional residents in all provinces, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas. The NPHS data in this article pertain to household residents aged 65 or older in the 10 provinces.

In 1994/95, 20,095 respondents were selected for the longitudinal panel. Of these, 17,276 agreed to participate, for a response rate of 86.0%. The response rates for subsequent cycles, based on these individuals, were: 92.8% for cycle 2 (1996/97); 88.2% for cycle 3 (1998/99); 84.8% for cycle 4 (2000/01); and 80.6% for cycle 5 (2002/03). More detailed descriptions of the NPHS design, sample and interview procedures can be found in published reports.^{12,13}

This analysis uses the cycle 5 (2002/03) longitudinal "square" file, which contains records for all responding members of the original panel, whether or not information about them was obtained in all subsequent cycles.

Limitations

Although the conceptual analytical framework used to examine factors associated with good health was intended to be

comprehensive, key variables may have been omitted, either because of methodological problems or because they were not collected by the CCHS or the NPHS. For example, responses to questions on family medical history could not be used because they were asked only in cycle 3 of the NPHS (1998/99) and therefore pertained only to respondents who had survived to that cycle.

Because of sample size constraints, the response categories for many of the independent variables used in the multivariate models were collapsed for the longitudinal analyses. For example, only two categories were used for alcohol consumption: weekly/occasional drinkers and non-drinkers. Such collapsing of categories may have weakened associations with maintaining/recovering health or, in some cases, made it impossible to determine if associations existed. For example, it was not possible to test for negative associations between heavy drinking and maintaining/recovering health, an association that was significant in the cross-sectional analysis.

To maximize sample size and increase precision, the sample used for longitudinal analysis comprised all NPHS cycle 1 respondents, regardless of their response status in subsequent cycles. The survey weights were based on response status in cycle 1 and were not inflated to account for subsequent non-response. This may have biased the estimates if the characteristics of continuers in the longitudinal panel differed from those of non-respondents.

The survey data were self- or proxy-reported, and the degree to which they are biased because of reporting error is unknown. Respondents may not have given accurate replies to questions about issues such as smoking, alcohol consumption and weight. As well, several studies have shown that body mass index (BMI) based on self-reported height and weight can be unreliable,¹⁴⁻¹⁶ particularly among the elderly. Inaccurate self-reporting of height is common among the elderly, who frequently experience loss of height as they age.

The use of BMI to classify "normal" body weights for seniors has been questioned. Some studies suggest that the normal range for seniors should begin above 18.5 and extend into the overweight range (somewhere between 25.0 and 29.9). Research has found that the health risks for seniors in the "overweight" range are not as high as they are for younger adults. While the exact point where health risks increase is not known, BMIs in the upper range of the overweight category are generally associated with higher risks for seniors.¹⁷

Every effort was made to collect in-depth health information directly from the randomly selected individuals, but proxy responses were accepted. This may have led to under-reporting of some characteristics and diluted associations between health and the independent variables. A person reporting on behalf of another may not be fully aware of that person's health, may not recall relevant information, or may inadvertently mislabel health problems.¹⁸

Understanding the factors associated with healthy aging among seniors is important for improving the quality of life, reducing health care costs and decreasing the caregiving burden to seniors' families. This is particularly relevant when the proportion of seniors is increasing more rapidly than ever before.

This analysis, which is based on 2003 data from the Canadian Community Health Survey (CCHS), estimates the percentage of seniors who were in good health (see *Data sources and limitations*). It also examines factors associated with seniors' good health, with emphasis on modifiable behavioural risk factors and psychosocial factors (see *Analytical techniques and Definitions*). Longitudinal data from the National Population Health Survey (NPHS) were used to study seniors who maintained their health over an eight-year period and to determine the factors that predicted this continued good health. The recovery of good health, along with the associated characteristics, was also studied. Estimates reflect the household population of men and women aged 65 or older.

What is good health?

Various definitions have been used to measure "healthy" aging. While some studies have defined "health" as the absence of disease or chronic conditions, it is more common to consider health in terms of an individual's functional impairment and positive health perceptions.^{5,9,19-23} People with chronic conditions often adapt to them and manage to live full and vital lives.

In this analysis, four criteria were required for a senior to be considered in "good health": good functional health, independence in activities of daily living, positive self-perceived general health, and positive self-perceived mental health (see *Measuring health*). This is in keeping with the World Health Organization's definition, which states that "good health is not merely the absence of illness or infirmity, but a state of complete physical, mental and social well-being."²⁴

Measuring health

Four criteria were used to define *overall good health*: two are related to physical function, one refers to self-perceived mental health, and the last, to self-perceived general health (Table 1).

A disability is a partial or total reduction in the ability to perform an activity in a way or within limits considered normal. The NPHS questions on disabilities focus on eight areas: hearing, vision, speech, mobility, dexterity, cognitive abilities, pain, and emotions. All except the last were used to measure physical health in this analysis. Respondents without disabilities or with a fully corrected disability (wearing glasses, for example) met the first criterion for overall good health, *good functional health*.

Dependency is a measure of autonomy. To meet the second criterion for good health, respondents had to have reported that they did not need assistance from others with meal preparation, shopping, everyday housework, personal care, or moving about in the home; in other words, they were *independent in activities of daily living*.

For the cross-sectional analysis, mental health was based on respondents' perceptions. Those with good/very good/excellent mental health as opposed to "fair" or "poor" met the third criterion for overall good health. The variable on *self-perceived mental health* was not available in the NPHS; therefore, for the longitudinal analysis, mental health was assessed by considering the probability of having

had a major depressive episode in the previous year.²⁵ Respondents whose replies to a series of questions put their probability of having had such an episode in the last year preceding any NPHS cycle at 0.05 or less (an indicator of good mental health) met the third criterion.

Respondents who had *good/very good/excellent self-perceived general health* met the final criterion for overall good health.

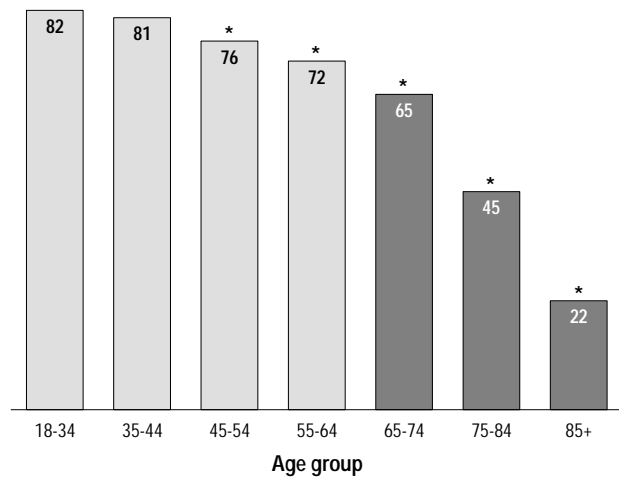
For the cross-sectional analysis, to be considered in overall good health, respondents had to be free of all problems related to these four criteria. That means they did not have a disability or dependency and reported that both their mental and general health were good, very good or excellent. If no answer had been provided for one of these measures, but the three other responses suggested the respondents were in good health, they were considered to be so. If answers were missing for two or more measures, the records for those respondents were excluded.

For the longitudinal analysis, two additional criteria were used to define overall good health. Respondents who had died or had moved to a health care institution were considered to have lost their good health or, in the analysis of recovery, not regained their good health. Of the seniors who were in good health in 1994/95, 21% had died by 2002/03 and a further 3% had moved to institutions. Of those who died, 9% had been institutionalized before death.

Majority of seniors in good health

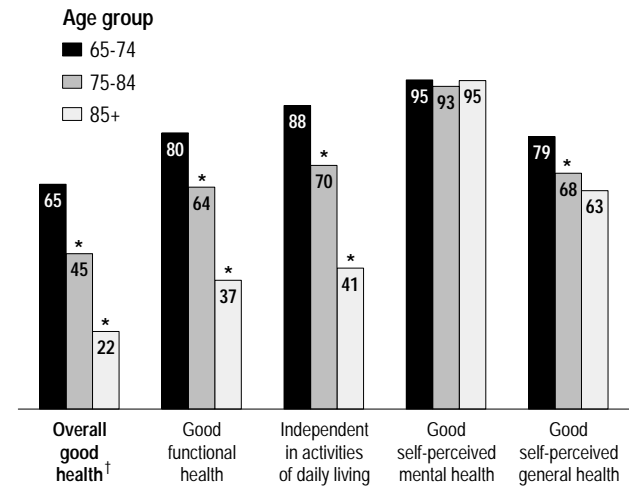
Although the percentage of people in good health drops considerably starting at age 65 (Chart 1), a substantial proportion of seniors (55%) were in good health in 2003 (Table 1). Men were more likely (59%) than women (52%) to have overall good health.

Chart 1
Percentage of people in good health, by age group, household population aged 18 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
* Significantly lower than estimate for previous age group ($p < 0.05$)

Chart 2
Percentage of people in good health, by age group, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
† Problem-free for all four components
* Significantly lower than estimate for previous age group ($p < 0.05$)

Over 7 in 10 seniors had good functional health, were independent in activities of daily living, and had positive perceptions of their general health. A large majority (95%) had a positive view of their mental health.

The percentage of seniors in good functional health declined sharply with age (Table 1, Chart 2). Among 65- to 74-year-olds, 80% either had no disabilities or had corrected disabilities (see *Measuring health*). By 85 or older, however, only 37% were in this situation.

Table 1
Percentage of household population aged 65 or older with good health, by component of good health and by sex and age group, Canada, 2003

	All seniors	Sex		Age group		
		Men	Women	65-74	75-84	85+
Overall good health†	55	59	52*	65	45*	22*
Good functional health	71	76	68*	80	64*	37*
No/Corrected disability in:						
Vision	96	97	95*	98	95*	86*
Hearing	96	96	97*	98	95*	90*
Speech	99	98	99	99	98*	97
Mobility	88	91	85*	95	82*	60*
Dexterity	99	99	99	100	99*	99
Cognition	89	90	89	93	87*	74*
Pain-free	88	91	86*	90	87*	80*
Independent in activities of daily living	78	86	72*	88	70*	41*
Good/Very good/Excellent self-perceived mental health	95	94	95	95	93*	95
Good/Very good/Excellent self-perceived general health	74	74	74	79	68*	63

Data source: 2003 Canadian Community Health Survey
† Problem-free for all four components
* For sex, significantly different from estimate for men; for age group, significantly lower than estimate for previous age group ($p < 0.05$)

Declines by age were most evident for mobility and cognition. There was also a sharp decrease in the percentage of seniors who were independent in activities of daily living: from 88% for the 65-to-74 age group down to 41% for those 85 or older. Perceptions of good general health also decreased with age, but to a lesser degree. The proportion of seniors reporting positive mental health was quite similar regardless of age.

Tied to lifestyle

Not surprisingly, the percentage of seniors reporting overall good health decreased with the number of diagnosed chronic conditions reported (Table 2). But

more importantly, being in good health was associated with several behavioural risk and psychosocial factors.

The association between being in good health and the frequency of leisure-time physical activity was particularly strong. Among seniors who were active three or more times a week, 67% were in good health. As their activity level declined, so did seniors' health. Those who exercised infrequently were far less likely to be in good health (36%). This association, which has been found in other cross-sectional and longitudinal studies,^{5,7,19-22,26,27} persisted when socio-demographic factors and the number of chronic conditions were taken into account. It has been

Table 2
Percentages and adjusted odds ratios of having good health, by selected characteristics, household population aged 65 or older, Canada, 2003

	%	Adjusted odds ratio	95% confidence interval		%	Adjusted odds ratio	95% confidence interval
Total	54.9			Psychosocial			
Number of chronic conditions				Life stress			
None [†]	80.3	1.0	...	Not at all/Not very stressful	62.4*	1.5*	1.3, 1.8
1	66.6*	0.6*	0.5, 0.7	A bit stressful [†]	49.8	1.0	...
2	46.6*	0.3*	0.2, 0.3	Quite/Extremely stressful	31.7*	0.5*	0.4, 0.7
3	33.8*	0.2*	0.1, 0.2	Sense of community belonging			
4 or more	18.6*	0.1*	0.1, 0.1	Very/Somewhat strong	61.6*	1.5*	1.2, 1.8
				Somewhat/Very weak [†]	48.9	1.0	...
Behavioural risk factors				Socio-demographic			
Leisure-time physical activity				Sex			
Frequent (at least 3 times/week)	66.9*	2.2*	1.8, 2.6	Men	58.9*	1.0	0.8, 1.1
Occasional (1-2 times/week)	63.0*	2.1*	1.6, 2.7	Women [†]	51.8		
Infrequent [†] (<1/week)	36.2	1.0	...	Age (continuous)		0.94*	0.92, 0.95
Alcohol use				65-74	64.9*	...	...
Heavy weekly drinker	42.6*	0.3*	0.2, 0.5	75-84	44.9*	...	...
Weekly/Occasional drinker [†]	61.5	1.0	...	85+ [†]	22.4	...	...
Former regular drinker	41.3*	0.6*	0.4, 0.8	Living arrangement			
Former drinker (not regular)	42.3*	0.7*	0.6, 0.8	With spouse [†]	59.7	1.0	...
Never drank	43.8*	0.6*	0.5, 0.8	Alone	49.9*	1.0	0.8, 1.2
Body mass index (BMI)				With others (not spouse)	39.5*	0.8	0.6, 1.1
Underweight (≤ 18.5)	37.4*	0.7	0.4, 1.0	Residence			
Normal weight [†] (18.5-24.9)	55.4	1.0	...	Rural	54.3	1.2	1.0, 1.4
Overweight (25.0-29.9)	59.1	1.1	0.9, 1.4	Urban [†]	57.6	1.0	...
Obese (≥ 30)	46.4*	0.8*	0.6, 1.0	Education			
Daily fruit/vegetable consumption (times per day)				Less than secondary graduation [†]	46.8	1.0	...
Less than 3	51.6*	0.8	0.7, 1.0	Secondary graduation or more	62.8*	1.5*	1.2, 1.7
3-5	56.4*	0.9	0.7, 1.0	Household income			
5+ [†]	61.8	1.0	...	Low/Lower-middle [†]	40.5	1.0	...
Smoking status				Middle	51.6*	1.2	0.9, 1.5
Current daily smoker	55.0	1.0	0.8, 1.2	Upper-middle/High	61.9*	1.4*	1.1, 1.9
Quit in past 15 years	50.6*	0.9	0.7, 1.1				
Never smoked/Quit 15+ years ago [†]	56.0	1.0	...				

Data source: 2003 Canadian Community Health Survey

Notes: Because of rounding, some odds ratios with 1.0 as upper confidence limit are statistically significant. To maximize sample size, "missing" categories were included for several variables, but the odds ratios are not shown.

[†] Reference category

*Significantly different from estimate for reference category ($p < 0.05$)

... Not applicable

suggested that regular physical activity such as walking or gardening is the most important thing seniors can do to maintain mobility and prevent disability.^{7,27}

While heavy drinking is known to adversely affect health, moderate alcohol consumption may have some beneficial effects.²⁸⁻³⁰ Moderate drinking seems to have a favourable effect on lipid production, thereby reducing the risk of heart disease.³¹⁻³⁵ A recent study found that negative ratings of health were most common among heavy drinkers and abstainers and least common among moderate drinkers.³⁶ Results from the CCHS mirror these findings. Of the seniors who were weekly or occasional drinkers in 2003, 62% were in good health. Heavy weekly drinkers were far less likely (43%) to be in good health. The same was true for abstainers, whether they were former regular drinkers, former occasional drinkers, or lifetime abstainers.

Excess body weight increases the likelihood of having a number of chronic conditions, including high blood pressure, diabetes and heart disease.³⁷ Of the seniors whose weight was in the normal BMI range, 55% were in good health, compared with 46% of those who were obese. This may reflect the functional impairment associated with obesity. Seniors who were underweight were also less likely to be in good health (37%). However, this association did not persist in the multivariate model, probably because underweight reflects frailty associated with age and multiple chronic conditions.

Seniors who were overweight, but not obese, were as likely to be in good health as those with BMIs in the normal range. Research suggests that the usual BMI standards may not be as applicable to seniors and that a higher cut-off for the overweight category may be more appropriate (see *Limitations*).¹⁷

Nutrition and smoking are modifiable behaviours related to cardiovascular disease and cancer. Evidence suggests that healthy eating and refraining from smoking can prevent functional decline and lead to improved health among the elderly.^{26,38} CCHS data also reveal links between nutrition and good health. Of the seniors who consumed fruit and vegetables at least five times a day, 62% were in good health, compared with 52% of those who ate these foods less than three times a day. Seniors who had quit smoking over the past 15 years were less likely to be in good health than those who had never smoked or those who had quit for 15 years or more. Somewhat surprisingly, though, the percentage of current smokers in good health was similar to those who had never smoked or who had quit at least 15 years ago. This may, however, be due to survival rates among smokers. Smokers have higher mortality rates,³⁹ and those who smoke are

less likely to reach age 65. Longitudinal results in this study revealed that seniors who currently smoked were less likely to maintain their health (see “Maintaining health”). The time when people are the most likely to quit smoking is soon after the diagnosis of a chronic condition⁴⁰; that is, they change their behaviour after losing their health.

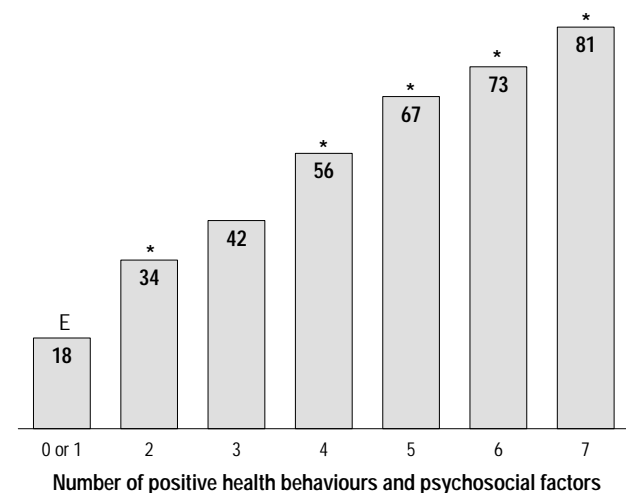
Psychosocial factors

Seniors who perceived low levels of stress in their lives were approximately twice as likely to be in good health as those who had high stress levels (62% versus 32%). As well, seniors who reported a strong sense of community belonging were more likely to be in good health (62%) than were those who felt less connected (49%). Research suggests that social relationships and affiliation have powerful effects on physical and mental health.⁴¹ It has been suggested that interaction between community members may promote health in a number of ways, such as promoting healthy behaviours and reducing stress levels.^{41,42}

The more, the better

Healthy behaviours and psychosocial well-being often co-exist and there is some evidence of a cumulative effect; that is, those with the fewest risk factors in these areas will be the most healthy.^{6,38} Findings from the CCHS reveal a clear gradient based on the seven factors considered: frequent or occasional exercise, weekly or occasional alcohol consumption, being in

Chart 3
Percentage in good health, by number of positive behavioural and psychosocial factors, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
* Significantly higher than estimate for previous group ($p < 0.05$)
E Coefficient of variation 16.6% to 33.3% (interpret with caution)

Table 3
Adjusted odds ratios[†] for being in good health, by number of positive behavioural and psychosocial factors, household population aged 65 or older, Canada, 2003

	Adjusted odds ratio	95% confidence interval
Number of positive health behaviours and psychosocial factors		
0 or 1 [‡]	1.0	...
2	2.3*	1.3, 4.0
3	3.1*	1.9, 5.1
4	5.0*	3.0, 8.1
5	7.3*	4.5, 11.8
6	8.8*	5.4, 14.2
7	13.3*	7.2, 24.6

Data source: 2003 Canadian Community Health Survey

[†] Adjusted for socio-demographic factors and number of chronic conditions

[‡] Reference category

*Significantly different from estimate for reference category ($p < 0.05$)

... Not applicable

the “normal” BMI category, consuming fruit and vegetables five or more times a day, never smoking or having quit for at least 15 years, perceiving low stress, and feeling strongly connected to the community. As the number of positive behaviours and psychosocial factors increased, so did the likelihood that a senior would have overall good health (Chart 3). Of the seniors who were positive in all seven factors, 8 in 10 were in good health, compared with less than 2 in 10 of those who were positive on none or only one of the factors. This gradient remained when examined in a multivariate model controlling for socio-demographic factors and chronic conditions (Table 3).

Psychosocial well-being and healthy behaviours

On several behavioural and psychosocial factors, seniors compared favourably with young and middle-aged adults. Seniors were almost twice as likely (58%) as adults aged 18 to 64 (30%) to perceive low stress (Table 4). Low stress levels among the elderly have been observed in other studies, and it has been suggested that experience and maturity make elderly people less likely to perceive events as stressful.⁴³ Close to 70% of seniors reported a strong sense of community belonging, significantly higher than the rate for those aged 18 to 64. Among seniors, however, rates for stress and community belonging did not differ by age.

More than three-quarters (78%) of seniors were non-smokers, meaning that they had never smoked or that they had quit at least 15 years ago. Among younger adults, the figure was 61%. Most of those aged 85 or older (93%) were non-smokers. This may reflect a survival effect; that is, smokers are less likely to live to age 85 and beyond. Close to half of seniors (48%) consumed fruit and vegetables at least five times a day, compared with 40% for those aged 18 to 64.

Seniors, however, were less likely than younger adults to have a normal body weight, to be weekly or occasional drinkers and to engage in frequent or occasional leisure-time physical activity. The percentage of seniors who were frequently or occasionally active decreased from 79% at ages 65 to 74 to 42% for the 85-or-older group. A similar decline was evident for weekly or occasional alcohol consumption: 69% versus 51% for the same age groups. These declines likely reflect deteriorating

Table 4
Percentage with positive behavioural and psychosocial factors, by age group, household population aged 18 or older, Canada, 2003

	Age group				
	18-64	65+	65-74	75-84	85+
	%		%		
Frequent/Occasional leisure-time physical activity	83*	71	79*	63*	42*
Weekly/Occasional drinker	77*	66	69*	64	51*
Normal BMI category	48*	45	40*	49*	62*
Fruit and vegetables 5 or more times per day	40*	48	47	49	49
Never smoked or quit for at least 15 years	61*	78	73*	83*	93*
Low stress	30*	58	58	60	57
Strong sense of community belonging	62*	69	69	69	67

Data source: 2003 Canadian Community Health Survey

*Significantly different from estimate for 65-or-older age group ($p < 0.05$)

Analytical techniques

Cross-sectional analysis: The percentage of seniors in good health was estimated based on data from the 2003 Canadian Community Health Survey. The data were weighted to represent the population of the provinces and territories in 2003. For the provinces and territories for which sub-sampling occurred (see *Data sources and limitations*), a special weight was used.

Cross-tabulations were used to examine associations between being in good health (see *Measuring health*) and health behaviours and psychosocial factors. A multiple logistic regression model was used to determine if the observed associations persisted when controlling for socio-demographic characteristics and chronic conditions. A total of 13,998 respondents aged 65 or older were used in this cross-sectional analysis.

Longitudinal analysis, maintaining health: Cox proportional hazards modelling was used to study health behaviours and psychosocial factors in relation to maintaining health over time. Longitudinal data from the 1994/95 through 2002/03 NPHS were used in this analysis.

The Cox model incorporates a measure of duration (the number of years respondents maintained their good health) and allows for the possibility that, for some, loss of good health did not occur over the study period (some respondents were still in good health in 2002/03). As well, it minimizes the bias associated with attrition.

Seniors living in the 10 provinces who were in good health in 1994/95 were selected for this analysis; the sample numbered 1,309. For respondents about whom data were not available in one cycle, either because they refused to participate or because they could not be traced, health status was imputed as “good” if it had been good in the preceding cycle and was good in the subsequent cycle. After this imputation, 235 records (18%) were censored because of non-response in at least one cycle (57 were censored at cycle 2, 54 at cycle 3, 55 at cycle 4, and 69 at cycle 5).

Associations between health behaviours and psychosocial factors in 1994/95 and maintaining good health over the next eight years were examined, controlling for socio-economic factors and chronic conditions (also measured in 1994/95). All analyses were weighted using the longitudinal weights constructed to represent the total household population of the provinces in 1994/95. Seniors who were living in institutions in 1994/95 were not included in the study.

Longitudinal analysis, recovering health: Factors associated with recovering health were also based on longitudinal data from the NPHS. The technique used for this analysis was pooling of repeated observations combined with logistic regression analysis. Four cohorts of pooled observations were used. The baseline years for these four cohorts were 1994/95, 1996/97, 1998/99 and 2000/01. For each baseline year, all seniors living in households who were not in good health were selected. Seniors were defined as recovering their health if they were in good health at the follow-up interview two years later. As well as those who were still in poor health, seniors

who had died by the next cycle or who were residing in institutions were classified as not recovering their health.

It is possible that some seniors could have recovered their health more than once over the study period; e.g., the same individual could have been in poor health in 1994/95 and recovered by 1996/97, then lost health by 1998/99, but regained it by 2000/01.

Sample sizes for longitudinal analysis on recovering health, by two-cycle interval, household population aged 65 or older, National Population Health Survey, 1994/95 to 2002/03

	Number of Seniors not in good health (baseline)	Number of Seniors who recovered good health (follow-up)
	1,315 (1994/95)	332 (1996/97)
	1,094 (1996/97)	193 (1998/99)
	1,096 (1998/99)	200 (2000/01)
	1,052 (2000/01)	166 (2002/03)
Total	4,557	891

Multiple regression analysis was used on this set of pooled observations to examine recovery in a two-year period in relation to health behaviours and psychosocial factors at the baseline year, controlling for socio-demographic characteristics and chronic conditions. All analyses were weighted using the longitudinal weights constructed to represent the total household population of the provinces in 1994/95. Some variables used in the regression were not collected in every NPHS cycle: sense of coherence, financial stress and family health stress. Sense of coherence was not asked in cycles 2 and 4, so the cycle 2 variable was imputed with the cycle 1 value, and the cycle 4 variable, with cycle 3. Information on stress was not collected in cycles 2 and 3. Because stress is a less stable construct, it was not imputed from previous cycles. A “missing” category was used for the stress variables for these cycles.

An additional 297 seniors who were not in good health at baseline were excluded because their health status in the follow-up period was not known.

All analyses (cross-sectional and longitudinal) were conducted on both sexes combined. Tests for interaction effects between sex and each health behaviour and psychosocial factor were carried out. The only significant interaction was for being a smoker and maintaining health. For women, being a smoker was negatively associated with maintaining health; for men, the association was not significant. This suggests that, for the most part, the magnitude of the associations between health behaviours and psychosocial factors and good health is similar for men and women.

To account for the survey design effects of the CCHS and the NPHS, coefficients of variation and p-values were estimated and significance tests were performed using the bootstrap technique.⁴⁴⁻⁴⁶ The significance level was set at $p < 0.05$.

Definitions

Unless otherwise stated, definitions apply to both the Canadian Community Health Survey (CCHS) and the National Population Health Survey (NPHS) variables.

To determine the presence of *chronic conditions*, 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.” The following conditions were considered in this analysis: asthma, arthritis, back problems, bronchitis/emphysema/chronic obstructive pulmonary disease, diabetes, heart disease, cancer, the effects of a stroke, Alzheimer’s disease, incontinence and glaucoma/cataracts.

Three categories of *leisure-time physical activity* were defined, based on how often the respondent was active for at least 15 minutes a day: frequent—at least three times a week; occasional—once or twice a week; and infrequent—less than once a week.

Alcohol use represents the following types of drinkers: heavy—five or more drinks on one occasion on a weekly basis; weekly/occasional—drank weekly or occasionally, but were not heavy drinkers; former regular—did not currently drink, but regularly consumed 12 or more drinks per week at some time in the past; former (not regular); and never drank (i.e., lifetime abstainers).

Weight was defined in terms of *body mass index (BMI)*, which is obtained by dividing weight in kilograms by the square of height in metres. Based on the guidelines from Health Canada, aligned with the World Health Organization standard,^{17,47} BMI was grouped into four categories: underweight (BMI less than 18.5); normal (18.5 to 24.9); overweight (25.0 to 29.9); and obese (30 or more).

Fruit and vegetable consumption was based on how often respondents said they ate these foods during the day: less than three, three or four, and five or more times. This variable was not measured in the NPHS until 2002/03 (cycle 5).

Smoking status comprises respondents who: were current daily smokers; had quit daily smoking within the past 15 years; and had quit at least 15 years ago or had never smoked every day. (The risk of mortality for former smokers who have been abstinent for 15 years approaches that of people who never smoked.³⁹)

Because of sample size constraints in the NPHS, response categories for the behavioural risk factors were collapsed for the longitudinal analysis.

Psychosocial factors were selected based on availability in the CCHS and NPHS, which differs slightly. Self-perceived *life stress* and *sense of community belonging* were used for the analysis of CCHS cross-sectional data. Three categories were used for life stress, based on how stressful respondents said they found most days: not at all/not very stressful, at bit stressful, and quite a bit/

extremely stressful. Sense of community belonging was categorized in terms of respondents’ sense of belonging to their local community: very/somewhat strong or somewhat/very weak.

Sense of coherence and *stress* were used for the longitudinal analysis. The sense of coherence scale was used to classify respondents’ perceptions of life events; specifically, did they see events as understandable, controllable and meaningful.⁴⁸ Those with a strong sense of coherence (a value of 70 or more) were distinguished from others. Various sources of stress were measured in the NPHS, and the ones considered most relevant to seniors⁴⁹ were used: *family health stress* (having a partner, parent or child in bad health who may die or having a family member with a drug or alcohol problem); and *financial stress* (not having enough money to buy the things you need).

In addition to sex and age, a number of other socio-demographic determinants were considered.

Living arrangement reflects whether respondents lived with their spouse (with or without other people in the household), alone, or with others (excluding their spouse).

Residence distinguishes respondents living in rural areas from those in urban areas (at least 1,000 inhabitants and a population density of at least 400 per square kilometre). This variable is also a proxy for differential health care access, based on the assumption that access might be more difficult in rural areas.

Education distinguishes respondents who had graduated from secondary school from those who had not.

Household income was based on the number of people in the household and total household income from all sources in the 12 months before the interview.

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

For the analysis of NPHS data, income was not included in the multivariate models. Financial stress was included; it was highly correlated with income, and considered more relevant for classifying the socio-economic status of seniors.

health among the very old. The percentage with normal body weight, though, rose as seniors aged, from 40% for those aged 65 to 74 to 62% at age 85 or older. But again, this may reflect weight loss associated with frailty and declining health among the oldest group.

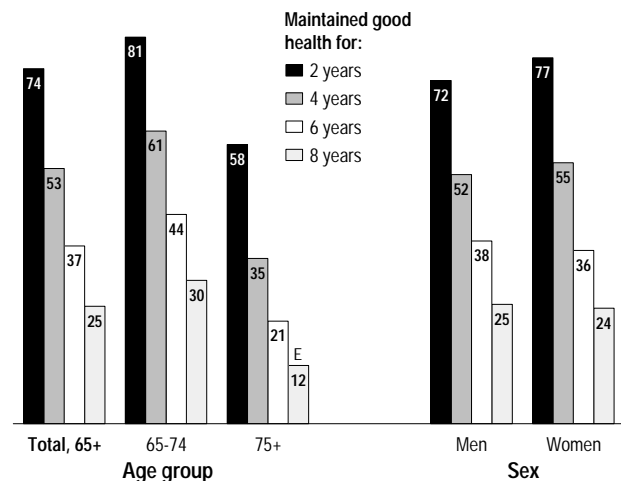
Maintaining health

The CCHS data suggest a link between behavioural risk factors, psychosocial factors and good health. However, with cross-sectional data, it is not possible to say if healthy behaviours and psychosocial well-being allow seniors to maintain their health, or if a decline in health causes a decline in these positive factors.

For example, the association with exercise may reflect the benefits of keeping fit; that is, seniors who engage in regular physical activity are more likely to maintain their health. Alternatively, a decrease in physical activity may be the result of the onset of conditions such as arthritis, heart disease or the effects of a stroke. Longitudinal data from the NPHS can be used to shed some light on the direction of these associations (see *Analytical techniques*).

Of the seniors who were in good health in 1994/95, approximately three-quarters (74%) were still in good health at the first follow-up period two years later (Chart 4). Four years later, just over half (53%) had

Chart 4
Percentage maintaining good health for 2, 4, 6 and 8 years, by age group and sex, household population aged 65 or older in good health in 1994/95, Canada excluding territories



Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal sample

Notes: Rates for 75+ are significantly lower than rates for 65-74. No significant differences between rates for men and women.

E Coefficient of variation 16.6% to 33.3% (interpret with caution)

Table 5
Adjusted proportional hazards ratios relating selected characteristics to staying healthy between 1994/95 and 2002/03, household population aged 65 or older in good health in 1994/95, Canada excluding territories

Characteristics in 1994/95	Proportional hazards ratio	95% confidence interval
Behavioural risk factors		
Leisure-time physical activity		
Frequent/Occasional	1.5*	1.1, 1.9
Infrequent†	1.0	...
Alcohol consumption		
Weekly/Occasional drinker	1.4*	1.1, 1.8
Non-drinker†	1.0	...
Body mass index		
Normal weight	1.3*	1.0, 1.6
Underweight/Overweight/Obese†	1.0	...
Smoking status		
Current smoker	0.7*	0.5, 1.0
Quit during past 15 years	0.7*	0.5, 0.9
Never smoked/Quit for 15+ years†	1.0	...
Psychosocial		
High sense of coherence		
Yes	1.4*	1.1, 1.8
No†	1.0	...
Financial stress		
Yes	0.8	0.6, 1.0
No†	1.0	...
Family health stress		
Yes	1.2	0.8, 1.6
No†	1.0	...
Socio-demographic		
Sex		
Men	1.0	0.8, 1.3
Women†	1.0	...
Age (continuous)	0.92*	0.90, 0.94
Living arrangement		
With spouse†	1.0	...
Alone	1.3*	1.0, 1.6
With others (not spouse)	0.8	0.5, 1.3
Residence		
Rural	1.1	0.8, 1.4
Urban†	1.0	...
Education		
Less than secondary graduation†	1.0	...
Secondary graduation or more	1.3*	1.0, 1.6
Number of chronic conditions		
None†	1.0	...
1	0.9	0.7, 1.2
2	0.5*	0.4, 0.7
3 or more	0.5*	0.3, 0.7

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal sample

Notes: Because of rounding, some hazards ratios with 1.0 as lower/upper confidence limit are statistically significant. To maximize sample size, "missing" categories were included for several variables, but the hazards ratios are not shown. A variable was also included to control for the effect of passage of time (i.e., the NPHS cycle), but the hazards ratios are not shown.

† Reference category

*Significantly different from estimate for reference category (p < 0.05)

... Not applicable

retained their good health. At the end of the eight years, only 25% remained in good health. Men and women were equally likely to maintain their health and, not surprisingly, younger seniors (aged 65 to 74) were more likely to stay healthy.

A Cox proportional hazards model was used to identify factors associated with seniors' maintaining their health over the eight years (see *Analytical techniques*). Even when controlling for socio-demographic factors and chronic conditions, healthy aging over the eight-year period was related to behavioural risk and psychosocial factors in 1994/95 (Table 5). Seniors who were smokers in 1994/95 or who had quit within the previous 15 years were less likely to maintain their health over the next eight years, compared with those who had never smoked or who had been non-smokers for at least 15 years. Frequent or occasional leisure-time physical activity, having a normal body weight, and being a weekly or occasional drinker were all associated with seniors' remaining healthy. A similar analysis conducted for adults aged 45 to 65 found that these four factors were not significantly related to maintaining good health.⁵⁰ It may take a while for the negative consequences of unhealthy behaviours to be fully realized, but they eventually catch up with those who adopt them.

For the longitudinal analysis, different psychosocial factors were considered based on availability in the NPHS (see *Definitions*). Having a healthy outlook on life was associated with healthy aging. Seniors who found life meaningful, manageable and comprehensible in 1994/95 were considered to have a strong "sense of coherence." Such seniors were more likely to stay healthy over the next eight years. A negative association between financial stress in 1994/95 and staying healthy emerged, but only approached statistical significance ($p = 0.07$). Stress related to concerns about family health was not linked with maintaining health.

Recovering good health

Even though loss of health among the senior population is inevitable over time, not all seniors who lose their health do so for good.⁵¹ With data from the NPHS, two-year recovery rates were estimated by considering seniors who were not in good health in one NPHS cycle, but had regained their good health by the time they were re-interviewed two years later (see *Analytical techniques*).

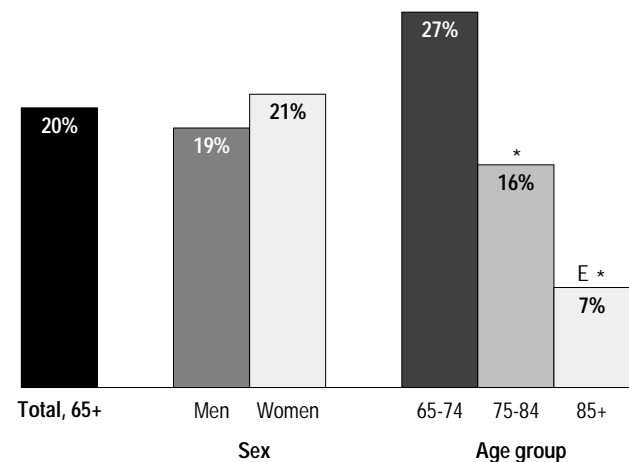
Of the seniors not in good health, approximately 20% recovered over successive two-year periods between

1994/95 and 2002/03. Men and women were equally likely to bounce back. Recovery rates declined from 27% for seniors aged 65 to 74 to 7% for those 85 or older (Chart 5).

When the effects of socio-demographic and chronic conditions were taken into account, behavioural risk factors and psychosocial well-being were related to seniors recovering their health (Table 6). The findings were very similar to those for maintaining health. Frequent or occasional leisure-time physical activity, weekly or occasional alcohol consumption, having a normal body weight and being a non-smoker (never having smoked or having quit for at least 15 years) were all associated with increased odds of recovering health in a two-year period.

Similar to the results for maintaining health, a strong sense of coherence was associated with a 50% increase in the odds of recovery. Financial stress was negatively associated with recovery, but only approached significance in the multivariate model ($p = 0.06$). Stress associated with the health of a family member was not significantly associated with recovery.

Chart 5
Two-year recovery rates among people not in good health, by age group and sex, household population aged 65 or older, Canada excluding territories, 1994/95 to 2002/03



Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal sample

* Significantly lower than estimate for previous age group ($p < 0.05$)

E Coefficient of variation 16.6% to 33.3% (interpret with caution)

Table 6
Adjusted odds ratios relating selected characteristics to recovery of health in a two-year period, household population aged 65 or older not in good health in baseline year, Canada excluding territories, 1994/95 to 2002/03

Characteristics in baseline year	Adjusted odds ratio	95% confidence interval
Behavioural risk factors		
Leisure-time physical activity		
Frequent/Occasional	1.9*	1.5, 2.4
Infrequent†	1.0	...
Alcohol consumption		
Weekly/Occasional drinker	1.4*	1.1, 1.8
Non-drinker†	1.0	...
Body mass index		
Normal weight	1.3*	1.0, 1.6
Underweight/Overweight/Obese‡	1.0	...
Smoking status		
Current smoker	0.6*	0.4, 0.8
Quit during past 15 years	0.7*	0.5, 0.9
Never smoked/Quit for 15+ years‡	1.0	...
Psychosocial		
High sense of coherence		
Yes	1.5*	1.2, 1.9
No	1.0	...
Financial stress		
Yes	0.6	0.4, 1.0
No	1.0	...
Family health stress		
Yes	0.8	0.5, 1.2
No	1.0	...
Socio-demographic		
Sex		
Men	0.8*	0.6, 1.0
Women†	1.0	...
Age (continuous)	0.92*	0.90, 0.94
Living arrangement		
With spouse†	1.0	...
Alone	1.1	0.8, 1.4
With others (not spouse)	1.5*	1.0, 2.2
Residence		
Rural	1.1	0.8, 1.4
Urban†	1.0	...
Education		
Less than secondary graduation†	1.0	...
Secondary graduation or more	1.0	0.8, 1.3
Number of chronic conditions		
None†	1.0	...
1	0.5*	0.4, 0.6
2	0.5*	0.3, 0.6
3 or more	0.3*	0.2, 0.4
NPHS cycle		
1994/95 to 1996/97 (1 to 2)†	1.0	...
1996/97 to 1998/99 (2 to 3)	1.2	0.5, 2.8
1998/99 to 2000/01 (3 to 4)	1.2	0.5, 2.6
2000/01 to 2002/03 (4 to 5)	0.6*	0.4, 0.8

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal sample

Notes: Because of rounding, some odds ratios with 1.0 as lower/upper confidence limit are statistically significant. To maximize sample size, "missing" categories were included for several variables, but the odds ratios are not shown.

† Reference category

*Significantly different from estimate for reference category ($p < 0.05$)

... Not applicable

Concluding remarks

In 2003, the majority of Canadian seniors were in good health. Most were independent, free from functional disabilities and had positive perceptions of their health.

Findings from the Canadian Community Health Survey indicate that behavioural and psychosocial factors played an important role in seniors' overall good health. Those who exercised frequently, had a normal body weight, were high consumers of fruit and vegetables and moderate consumers of alcohol were more likely to be in good health, independent of socio-demographic factors and the number of diagnosed chronic conditions. Low stress levels and feeling connected to their community were also associated with seniors' good health. These factors also had a cumulative effect; that is, the proportion of seniors in good health rose as the number of these positive factors increased. These associations are particularly relevant, given that, to some extent, they reflect modifiable characteristics.

Longitudinal results revealed that healthy behaviours in the senior years are related to maintaining good health over time, as well as to a greater likelihood of recovery when health is lost. It is always possible to change or improve behaviour, and improvements may allow people to spend their senior years without being dependent on others, and with positive perceptions of their physical and mental health. Promotion of healthy behaviours may be the key to successful aging, allowing older people to enjoy retirement and take full advantage of their senior years. ■

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Dependency, chronic conditions and pain in seniors

- *In 2003, small percentages of senior men (6%) and senior women (7%) living in private households needed help with activities of daily living (ADLs)—bathing or dressing, for example.*
- *Larger shares needed help with instrumental activities of daily living (IADLs) such as running errands and doing everyday housework: 15% of men and 29% of women.*
- *The need for assistance was closely related to chronic conditions.*
- *In some instances, the associated pain, rather than the chronic condition itself, was linked to dependency.*

Abstract

Objectives

This article presents the prevalence of dependency and selected chronic conditions among Canadians aged 65 or older living in households. Associations between chronic conditions and dependency in activities of daily living (ADL) and instrumental activities of daily living (IADL) are examined.

Data source

Estimates are based on data from the 2003 Canadian Community Health Survey.

Analytical techniques

Cross-tabulations were used to estimate the prevalence of ADL/IADL dependency and chronic conditions. Associations between chronic conditions and dependency were studied using multiple logistic regression models.

Main results

The prevalence of ADL/IADL dependency and chronic conditions increased with age. IADL dependency was more common than ADL dependency. When chronic pain was taken into account, associations between ADL dependency and arthritis/rheumatism, diabetes and urinary incontinence were no longer significant, and the association between IADL dependency and diabetes lost significance. Regardless of chronic pain, Alzheimer's disease or other dementia and the effects of stroke were significantly related to dependency.

Keywords

activities of daily living (ADL), aging, chronic illness, elderly, health behaviour, independent living, instrumental activities of daily living (IADL)

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As the very words imply, "chronic conditions" cannot be cured;¹ however, they can be treated and managed. The burden associated with chronic illness increases as people age, and may be especially challenging for seniors. The effects of some chronic conditions may even threaten seniors' ability to carry out normal activities and to continue living independently.

With today's long and increasing life expectancy, Canadian seniors may live many years with the effects of one or more chronic conditions. For example, estimates based on 2002 mortality rates indicate that a 65-year-old man will live an additional 17.2 years on average; a woman, another 20.6 years.² But at age 65, 77% of men and 85% of women have at least one chronic condition (data not shown).

This analysis uses national data from the 2003 Canadian Community Health Survey (CCHS) to estimate the prevalence of dependency and selected chronic conditions among men and women aged 65 or older living in private households. The study focuses on the relationship between chronic conditions

and dependency; specifically, needing assistance with activities of daily living (ADL) and with instrumental activities of daily living (IADL). Dependency, as defined in this analysis, is measured by the self-reported inability to perform ADL or IADL tasks without the help of another person (see *Definitions*).

Separate analyses are presented for male and female seniors. In addition to chronic conditions, each

analysis takes socio-demographic characteristics, lifestyle characteristics and chronic pain into account (see *Methods*).

Few seniors in community dependent

In the CCHS, *dependency* was identified by asking respondents if, “because of any physical condition or mental condition or health problem,” they needed

Methods

Data source

The 2003 estimates of the prevalence of chronic conditions and dependency, as well as the multivariate analyses, are based on data from cycle 2.1 of Statistics Canada's Canadian Community Health Survey (CCHS), which was conducted between January and December 2003. The CCHS collects cross-sectional information about the health of Canadians every two years. It covers the household population aged 12 or older in all provinces and territories, except regular members of the Canadian Armed Forces and residents of Indian reserves, Canadian Forces bases, and some remote areas. The sample size in 2003 was 135,573; the response rate was 80.6%. Most interviews were conducted by telephone. Data for the population aged 65 or older were used in this report: 28,617 respondents (11,412 men and 17,205 women).

Questions on chronic pain are part of the Health Utility Index (HUI). In the 2003 CCHS, the HUI was a “sub-sample” module; at the national level, it was administered to a randomly selected subset of respondents. Health regions in Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick and Québec opted to have this module administered to all respondents in their provinces. Thus, for the regression model including chronic pain, records from both the subsample and full sample were used. For the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick and Québec, all records for those aged 65 or older were used; for the remaining provinces and territories, only records for seniors from the subsample were used. This combination of subsample and full sample yielded a total sample size of 14,027 seniors (5,499 men and 8,528 women). More detail about the sample design of the CCHS is available in a previously published report.³

Analytical techniques

Cross-tabulations were used to estimate the prevalence of and the characteristics associated with dependency and chronic conditions in the household population aged 65 or older.

Two sets of multivariate logistic regression models were used to assess the associations between ADL and IADL dependency and

chronic conditions. The first set introduced socio-demographic and lifestyle variables. These variables were retained in the second set, to which chronic pain was added to examine the effect on the associations.

All analyses are based on weighted 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 confidence intervals for the odds ratios in the logistic regression models.^{4,5} This procedure fully accounts for the design effects of the CCHS. Results at the $p < 0.05$ level were considered significant.

Limitations

The analysis is based on cross-sectional data; therefore, associations between variables at only one point in time can be examined; neither causality nor the temporal ordering of events can be inferred.

ADL/IADL dependency, chronic conditions, and chronic pain were self-reported, and no other sources were available to verify their presence. Although the list of chronic conditions used in the CCHS is extensive, respondents may have had other diagnosed conditions. High blood pressure is common among seniors, but it was excluded from this analysis. While high blood pressure may be associated with other chronic conditions that lead to ADL/IADL dependency, it was not considered to be a potential cause of dependency.

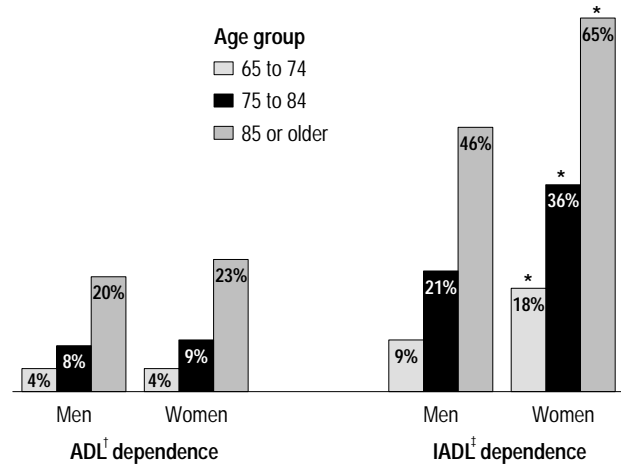
The CCHS does not measure the severity of chronic conditions, although severity would likely affect the relationship between a condition and dependency. For example, previous research has shown that ADL and IADL dependency were prevalent among people with arthritis, but the duration and severity of their disability were less, compared with people whose disability was attributed to other conditions.⁶ As well, the disabilities of those with arthritis tended to accumulate gradually rather than to occur all at once.⁶ Similarly, the degree of difficulty performing the ADL and IADL tasks is not measured, and may vary by chronic condition.

assistance performing two types of tasks: activities of daily living and instrumental activities of daily living.

Activities of daily living (ADLs) are the tasks considered vital to retaining personal independence: bathing, dressing, eating, taking medication, and moving about inside the house. People who needed assistance with any of these personal care activities were considered to be ADL-dependent.

In 2003, only 6% of senior men and 7% of senior women in the household population reported needing help to carry out any of these basic activities of daily living (Table 1). ADL dependency rises with age (Chart 1), but even at age 85 or older, the majority of household-dwelling seniors were still able to perform ADL tasks without another person's help. Just 20% of men and 23% of women in this age range were ADL-dependent. By contrast, in 1996/97 (the most recent estimates available), the majority of seniors living in institutions reported ADL dependency (80% of women; 76% of men—Health Institutions component, National Population Health Survey).

Chart 1
Prevalence of ADL and IADL dependency, by sex and age group, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
Note: Within each category, rates for age groups are significantly different from each other.

† Activities of daily living (e.g., bathing, taking medication)

‡ Instrumental activities of daily living (e.g., running errands, preparing meals)

* Significantly different from estimate for men ($p < 0.05$)

Table 1
Prevalence of ADL and IADL dependency, by sex and by age group and selected chronic conditions, household population aged 65 or older, Canada, 2003

	ADL† dependency				IADL‡ dependency			
	Men		Women		Men		Women	
	'000	%	'000	%	'000	%	'000	%
All seniors	99	6	156	7*	246	15	605	29*
65-74	38	4 [§]	45	4 [§]	90	9 [§]	201	18 ^{§*}
75-84	44	8 [§]	67	9 [§]	115	21 [§]	275	36 ^{§*}
85+	18	20 [§]	45	23 [§]	41	46 [§]	128	65 ^{§*}
Chronic conditions								
Arthritis/Rheumatism	49	8	110	9*	125	20	404	35*
Cataracts/Glaucoma	28	9	58	10	67	21	227	38*
Back problems	31	9	53	10	75	21	223	41*
Heart disease	33	9	50	13*	88	24	183	48*
Diabetes	23	9	29	12	50	20	106	42*
Thyroid condition	10 ^E	11 ^E	32	8	18	21	118	30*
Urinary incontinence	26	18	42	17	51	35	127	50*
Asthma	9 ^E	8 ^E	18	10	26	23	73	42*
Bronchitis/Emphysema/Chronic obstructive pulmonary disease	18	14	19	13	41	33	70	46*
Mental illness	16 ^E	22	26	16	34	47	78	49
Cancer	15	13	10 ^E	11 ^E	31	26	36	41*
Migraine	6 ^E	10 ^E	17 ^E	12	17	28	53	37*
Effects of stroke	25	29	24	28	45	52	57	69*
Stomach/Intestinal ulcers	8 ^E	12 ^E	12	13	19	28	45	47*
Bowel disorder/Crohn's disease/Colitis	9 ^E	21 ^E	14	14	15 ^E	32	44	43
Chemical sensitivities	F	F	6 ^E	7 ^E	7 ^E	30 ^E	31	37
Alzheimer's disease/Other dementia	20 ^E	51	20	57	30	77	29	81
Fibromyalgia	F	F	7 ^E	13 ^E	5 ^E	27 ^E	25	46*
Chronic fatigue syndrome	F	29 ^E	9 ^E	18 ^E	10 ^E	46	30	63*
Epilepsy	F	F	F	F	4 ^E	31 ^E	7 ^E	54 ^E

Data source: 2003 Canadian Community Health Survey

† Activities of daily living (e.g., bathing, taking medication)

‡ Instrumental activities of daily living (e.g., running errands, preparing meals)

§ Significantly different from overall estimate for that sex ($p < 0.05$)

* Significantly different from estimate for men ($p < 0.05$)

^E Coefficient of variation 16.6% to 33.3% (interpret with caution)

^F Coefficient of variation greater than 33.3% (suppressed because of extreme sampling variability)

Preparing meals, doing everyday housework, getting to appointments, running errands such as grocery shopping, banking and paying bills are the *instrumental activities of daily living (IADLs)* identified by the CCHS. People who needed assistance with any of these tasks were defined as IADL-dependent. While almost everyone who is ADL-dependent is also IADL-dependent (92%; data not shown), many who need help with IADLs do not need assistance with ADLs. The need for help with IADL tasks is much less of a threat to remaining independent.

In 2003, IADL dependency affected 15% of senior men and 29% of senior women living in private households (Table 1). The proportions increased sharply with age. By age 85 or older, 46% of men and 65% of women still living in private households needed assistance with IADLs.

The tasks with which household seniors most frequently reported needing help were running errands and doing housework—both IADLs (Chart 2). The

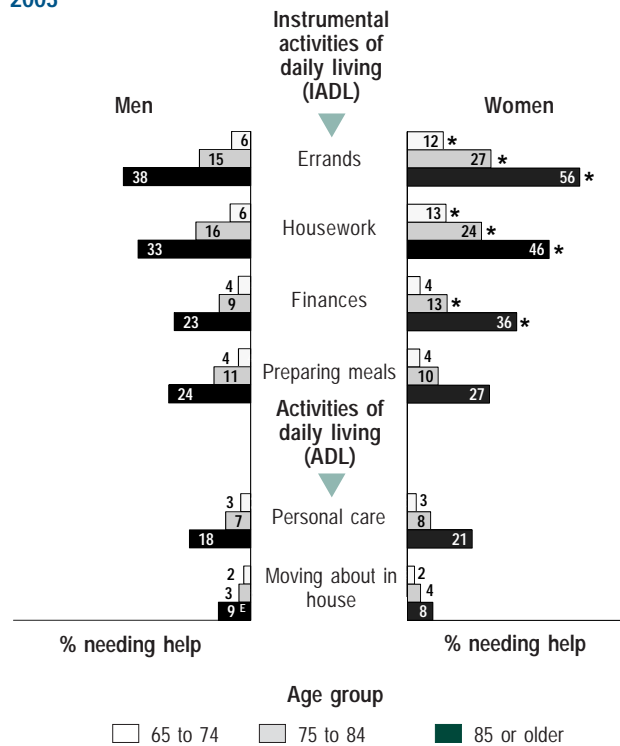
need for assistance with specific IADL and ADL tasks rose markedly with age for both men and women: in each successive age group, the proportion of seniors who needed help with any of the ADL/IADL tasks approximately doubled. Although many factors may be related to this increase in dependency, the presence of chronic conditions plays a major role.

Chronic conditions

The prevalence of most chronic conditions in the household population is generally higher for seniors than for younger adults. Of the 20 conditions covered in this analysis (see *Definitions*), 13 were more common among people aged 65 or older than among those aged 30 to 64 (Table 2). Mental disorders and migraine, however, affected higher proportions of younger adults.

The majority (81%) of seniors in the household population had at least one diagnosed chronic condition

Chart 2
Percentage who were ADL-/IADL-dependent, by sex, task and age group, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
Note: Within each category, rates for age groups are significantly different from each other.
 * Significantly different from estimate for men ($p < 0.05$)
 E Coefficient of variation 16.6% to 33.3% (interpret with caution)

Table 2
Prevalence of chronic conditions, by age group, household population aged 30 or older, Canada, 2003

	65+	30-64
	%	%
Arthritis/Rheumatism	47.3*	16.6
Cataracts/Glaucoma	24.7*	2.4
Back problems	24.1*	22.7
Heart disease	19.8*	3.5
Diabetes	13.5*	4.4
Thyroid condition	12.9*	5.9
Urinary incontinence	10.7*	2.3
Asthma	7.6	7.3
Bronchitis/Emphysema/ Chronic obstructive pulmonary disease	7.4*	3.1
Mental illness	6.1	8.8*
Cancer	5.5*	1.4
Migraine	5.4	11.9*
Effects of stroke	4.5*	0.6
Stomach/Intestinal ulcers	4.4*	3.2
Bowel disorder/Crohn's disease/Colitis	3.9*	2.6
Chemical sensitivities	2.9	2.9
Alzheimer's disease/Other dementia	2.0*	0.1 ^E
Fibromyalgia	1.9	1.9
Chronic fatigue syndrome	1.9	1.6
Epilepsy	0.6	0.6

Data source: 2003 Canadian Community Health Survey
Note: Based on self-reports from a checklist of diagnosed conditions.
 * Significantly higher than estimate for other age group ($p < 0.05$)
 E Coefficient of variation 16.6% to 33.3% (interpret with caution)
 F Coefficient of variation greater than 33.3% (suppressed because of extreme sampling variability)

in 2003 (Chart 3), whereas this was the case for about half (54%) of people aged 30 to 64.

Many chronic conditions are associated with aging, so it is not surprising that comorbidity is also more common among seniors. For example, 33% of seniors had three or more chronic conditions, compared with 12% of younger adults. Moreover, the average number of conditions increased at older ages, rising from 1.9 for 65- to 74-year-olds to 2.5 for those 85 or older ($p < 0.05$; data not shown).

Arthritis/Rheumatism was the chronic condition most often reported by seniors (47%) (Table 2). Almost 25% reported cataracts or glaucoma and back problems, and 20% said they had been diagnosed with heart disease. Diabetes, a thyroid condition and urinary incontinence were also relatively common, with each affecting at least 1 senior in 10.

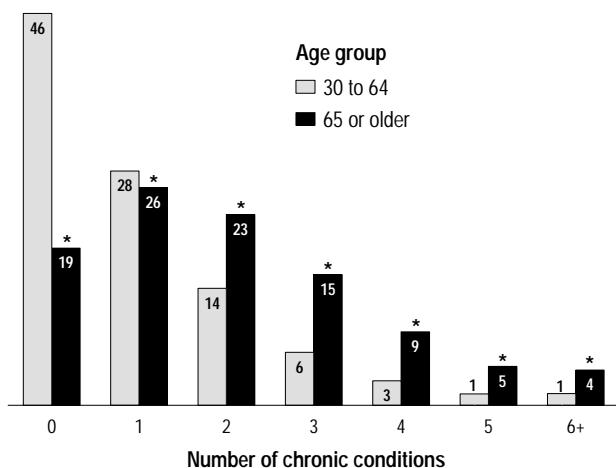
The prevalence of specific chronic conditions varied by sex (Table 3), as found in other research.⁷ For example, senior women were more likely than men to have arthritis/rheumatism, cataracts/glaucoma and back problems. But the prevalence of heart disease, diabetes, cancer, the effects of stroke, and Alzheimer's disease/other dementia was higher among senior men.

Links to dependency

The relatively high prevalence of chronic conditions at older ages and the debilitating effects of many of these conditions seem an obvious link to dependency. However, being dependent involves many factors in addition to chronic diseases. To control for the effects of possibly confounding influences, associations between chronic conditions and ADL or IADL dependency were examined using multivariate models (see *Methods*). Age, living arrangements, main source of income, among other socio-demographic and economic characteristics, were taken into account. Also considered were lifestyle and behavioural risk factors such as smoking, alcohol use, body mass index and physical activity level (Table 4, Appendix Tables A and B).

ADL dependency does, of course, have a more devastating impact than does IADL dependency because the tasks involve basic personal care, and the inability to perform them often results in a move into long-term care.⁸ Even when socio-demographic, economic and

Chart 3
Percentage distribution of household population aged 30 or older, by number of chronic conditions and age group, Canada, 2003



Data source: 2003 Canadian Community Health Survey
Note: Based on self-reports from a checklist of diagnosed conditions.
* Significantly different from estimate for 30-to-64 age group ($p < 0.05$)

Table 3
Prevalence of chronic conditions, by sex, household population aged 65 or older, Canada, 2003

	Men %	Women %
Arthritis/Rheumatism	37.7	54.7*
Cataracts/Glaucoma	19.6	28.7*
Back problems	21.6	26.1*
Heart disease	21.8*	18.1
Diabetes	15.6*	11.9
Thyroid condition	5.3	18.7*
Urinary incontinence	8.9	12.0*
Asthma	6.9	8.1*
Bronchitis/Emphysema/ Chronic obstructive pulmonary disease	7.6	7.3
Mental illness	4.4	7.5*
Cancer	7.1*	4.2
Migraine	3.6	6.8*
Effects of stroke	5.2*	3.9
Stomach/Intestinal ulcers	4.2	4.5
Bowel disorder/Crohn's disease/Colitis	2.8	4.9*
Chemical sensitivities	1.5	4.0*
Alzheimer's disease/Other dementia	2.4*	1.7
Fibromyalgia	1.1 ^E	2.6*
Chronic fatigue syndrome	1.3	2.3*
Epilepsy	0.7 ^E	0.6 ^E

Data source: 2003 Canadian Community Health Survey
Note: Based on self-reports from a checklist of diagnosed conditions.
* Significantly higher than estimate for opposite sex ($p < 0.05$)
E Coefficient of variation 16.6% to 33.3% (interpret with caution)

Definitions

The prevalence of *chronic conditions* was based on self-reports of diagnosed illness. The Canadian Community Health Survey (CCHS) used a checklist of conditions. Respondents were asked about 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.” This analysis considered 20 chronic conditions: arthritis or rheumatism, asthma, Alzheimer’s disease or other dementia, back problems, bowel disorder/Crohn’s disease/colitis, cancer, cataracts or glaucoma, chemical sensitivities, bronchitis/emphysema/chronic obstructive pulmonary disease, chronic fatigue syndrome, diabetes, effects of stroke, epilepsy, fibromyalgia, heart disease, mental illness, migraine, thyroid condition, stomach/intestinal ulcers, and urinary incontinence. Chemical sensitivities (men only), chronic fatigue syndrome (men only), and epilepsy were excluded from multivariate analysis because of small sample sizes.

Respondents who answered “no” to “Are you usually free of pain or discomfort?” were defined as having *chronic pain*. Pain was further classified as mild, moderate or severe.

Three senior *age groups* were established: 65 to 74, 75 to 84, and 85 or older.

Education was grouped as: less than secondary graduation, secondary graduation, some postsecondary, and postsecondary graduation.

Main source of income comprises:

- employment or investment income—wages and salaries, income from self-employment, and dividends and interest
- government transfers, public pensions and public insurance—Employment Insurance, Worker’s Compensation, benefits from the Canada or Québec pension plans, Old Age Security and Guaranteed Income Supplement, Child Tax Benefit, and provincial/municipal social assistance/welfare
- private pension—retirement pensions, etc.
- other/none—child support, alimony, other (e.g., rental income) and no independent income.

Living arrangements were based on the relationship between the respondent and other household members: living alone; living with spouse or partner; and living with others (family or non-family).

Residence was either urban or rural. Respondents living in a census metropolitan area (CMA) or a census agglomeration (CA) were classified as urban, and those living outside such areas, rural. Generally, a CMA is a geographic area with a population of at least 100,000 and a CA is a geographic area of at least 10,000 people. (See the 1996 *Census Dictionary* for complete definitions.⁹)

Smoking status was grouped into four categories based on current and former smoking habits: never smokers; daily/occasional smokers; quit less than 10 years ago; and quit 10 or more years ago. “Never smokers” are those who have never smoked an entire cigarette, or former occasional smokers who have smoked less than 100 cigarettes in their life. The two “quit” categories refer to former occasional or daily smokers.

Alcohol use was determined by asking:

- During the past 12 months, have you had a drink of beer, wine, liquor or any other alcoholic beverage?
- Have you ever had a drink?
- During the past 12 months, how often did you drink alcoholic beverages?
- How often in the past 12 months have you had five or more drinks on one occasion?

Five categories of *alcohol use* were established: never in lifetime; never in past 12 months; occasional—drank less than once a week and had five or more drinks on one occasion less than monthly; weekly—drank once a week or more frequently and had five or more drinks on one occasion less than monthly; and heavy—drank once a week or more and had five or more drinks on one occasion more frequently than once a month.

Body mass index (BMI) is calculated by dividing self-reported weight in kilograms by the square of self-reported height in metres. Cut-offs from the International BMI guidelines for adults aged 18 or older were used to classify respondents into four groups¹⁰: underweight (BMI less than 18.5), normal (18.5 to 24.9), overweight (25.0 to 29.9) and obese (30 or more).

Leisure-time physical activity is based on total accumulated energy expenditure (EE) during leisure time. EE was calculated by multiplying the number of times a respondent engaged in an activity over a 12-month period by the average duration in hours and by the energy cost of the activity (kilocalories expended per kilogram of bodyweight per hour of activity). To calculate an average daily EE for an activity, the estimate was divided by 365. This calculation was repeated for all leisure-time activities reported, and the resulting estimates were summed to provide an aggregate average daily EE. Respondents with an EE of 1.5 or more kcal/kg/day were considered active. Respondents whose leisure-time EE was below 1.5 kcal/kg/day were considered inactive.

lifestyle characteristics were taken into account (Table 4), ADL dependency in both sexes was related to the presence of arthritis/rheumatism, diabetes, urinary incontinence, bronchitis/emphysema/chronic obstructive pulmonary disease (COPD), the effects of stroke, and Alzheimer’s disease. For men, back problems, cancer and bowel disorders were also important, and for women, mental illness.

Most individuals who are ADL-dependent are also IADL-dependent; therefore, conditions related to ADL dependency also tended to be associated with IADL dependency. In addition, IADL dependency was related to heart disease for both sexes, to mental illness and migraine for men, and to cataracts/glaucoma, back problems, asthma, cancer, chronic fatigue syndrome and fibromyalgia for women.

As might be expected, having more than one chronic condition increases the likelihood of dependency. The effect of comorbidity on dependency was examined

with a multivariate model controlling for socio-demographic, lifestyle and behavioural risk factors. The results showed that the odds of ADL or IADL dependency among seniors increased significantly with each additional chronic condition (data not shown).

Some conditions that were strongly associated with dependency, notably Alzheimer’s disease/other dementia and the effects of stroke, are relatively rare among seniors still living in the community. Again, this reflects the high proportion of people with these conditions who require institutional care. Thus, although such conditions have a major impact on the individuals involved, they affect a small percentage of seniors living in private households (Table 2). By contrast, several other conditions that were consistently associated with dependency were among the most prevalent among household-dwelling seniors: arthritis/rheumatism, diabetes, urinary incontinence, and bronchitis/emphysema/COPD, for example.

Table 4
Adjusted odds ratios relating selected chronic conditions to ADL and IADL dependency, without and with controlling for chronic pain, household population aged 65 or older, Canada, 2003

Chronic conditions†	Men				Women			
	ADL dependency		IADL dependency		ADL dependency		IADL dependency	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	Adjusted odds ratio	Adjusted Odds ratio	Adjusted Odds ratio	Adjusted Odds ratio	Adjusted Odds ratio	Adjusted Odds ratio	Adjusted Odds ratio	Adjusted Odds ratio
Arthritis/Rheumatism	1.50*	1.09	1.56*	1.15	1.69*	1.06	1.62*	1.33*
Cataracts/Glaucoma	1.02	1.00	0.99	0.69	0.93	0.87	1.17*	1.29*
Back problems	1.41*	1.19	1.46*	1.44*	1.21	1.06	1.77*	1.40*
Heart disease	1.16	1.43	1.62*	1.88*	1.11	1.03	1.55*	1.54*
Diabetes	1.52*	1.01	1.34*	1.12	1.35*	0.88	1.64*	1.17
Thyroid condition	1.25	0.72	1.01	0.74	1.04	0.92	0.96	0.91
Urinary incontinence	1.81*	1.72	1.81*	2.00*	1.65*	1.13	1.70*	1.36*
Asthma	0.91	0.68	1.15	0.90	1.30	1.55	1.70*	1.49
Bronchitis/Emphysema/Chronic obstructive pulmonary disease	2.22*	2.34*	2.06*	2.38*	1.51*	1.58	1.34*	1.28
Mental illness	1.56	1.20	3.16*	2.16*	1.78*	2.09*	2.05*	2.58*
Cancer	1.97*	2.39	1.75*	2.15*	1.25	1.28	1.50*	0.97
Migraine	1.25	0.74	1.73*	1.76	1.34	1.10	1.15	0.91
Effects of stroke	3.49*	4.38*	3.59*	4.69*	3.04*	2.08*	3.21*	3.38*
Stomach/Intestinal ulcers	1.23	1.03	1.22	0.65	1.02	0.64	1.33	1.18
Bowel disorder/Crohn's disease/Colitis	1.82*	0.56	1.01	1.91	1.28	1.54	1.17	1.31
Chemical sensitivities	...	...	1.20	0.37	0.67	1.63	1.11	1.06
Alzheimer's disease/Other dementia	5.25*	5.88*	6.29*	17.64*	5.45*	6.02*	4.08*	5.23*
Fibromyalgia	0.44	0.17	0.51	0.75	1.65	0.96	1.93*	1.66
Chronic fatigue syndrome	...	...	1.10	1.07	1.74	0.95	2.86*	1.18
Chronic pain								
None†	...	1.00	...	1.00	...	1.00	...	1.00
Mild	...	3.27*	...	1.62	...	4.15*	...	1.65*
Moderate	...	2.01*	...	3.75*	...	3.68*	...	3.46*
Severe	...	3.54*	...	4.49*	...	6.68*	...	4.64*

Data source: 2003 Canadian Community Health Survey

Notes: Both models controlled for age, education, main source of income, living arrangements, urban/rural residence, smoking status, alcohol use, body mass index and leisure-time physical activity (see Appendix Tables A and B for complete results). In addition, model 2 controlled for chronic pain. Epilepsy was excluded from all models because of small sample sizes.

† Reference category (for chronic conditions, absence of the condition is the reference category)

* Significantly different from estimate for reference category (p < 0.05)

... Not applicable

Chronic pain and dependency

Many chronic conditions associated with high odds of dependency are accompanied by chronic pain. In fact, chronic pain itself was significantly associated with both ADL and IADL dependency in 2003, independent of chronic conditions (Table 4). Even mild pain increased the odds that seniors would be dependent.

Controlling for chronic pain attenuated the relationship between ADL dependency and arthritis/rheumatism, diabetes, and urinary incontinence for both sexes. Among men, this was also the case for back problems, cancer and bowel disorders, and among women, for bronchitis/emphysema/COPD. These results indicate that, for some illnesses, chronic pain is the most important feature in their relationship with ADL dependency.

The nature of IADLs (for example, running errands, managing finances) is much different from that of ADLs. Consequently, whether or not they are in pain, many community-dwelling seniors may still need help with IADLs. In fact, even when pain was taken into account, several conditions that were no longer associated with ADL dependency were still associated with IADL dependency. For instance, in the absence of pain, men with back problems or cancer did not have significantly high odds of ADL dependency, but their odds of IADL dependency remained high. The same was true for women with arthritis/rheumatism, and for both sexes with urinary incontinence.

Nonetheless, when pain was controlled for, the association between several chronic conditions and IADL dependency was no longer statistically significant. Among men, this was the case for arthritis/rheumatism, diabetes and migraine. Among women, the association disappeared for diabetes, asthma, bronchitis/emphysema/chronic obstructive pulmonary disease, cancer, chronic fatigue syndrome and fibromyalgia.

Beyond pain

For extremely debilitating conditions, the association with dependency persisted when controlling for pain (Table 4). Regardless of the presence of pain, men and women with Alzheimer's disease or other dementia, or with the effects of stroke, had high odds of needing help with ADL tasks. However, although these conditions severely compromise an individual's independence, they affect a relatively small share of the household population of seniors. Women, but not men, with mental illness also had high odds of being ADL-dependent, as did men with bronchitis/emphysema/COPD.

The effects of Alzheimer's disease/other dementia, stroke and mental illness are also evident for IADL dependency for both sexes, even when controlling for pain. Similarly, for both men and women, back problems, heart disease and urinary incontinence remained associated with IADL dependency. As well, women with cataracts/glaucoma or arthritis/rheumatism had high odds of IADL dependence, as did men with cancer or bronchitis/emphysema/COPD.

Concluding remarks

Many seniors depend on others for help with tasks such as housework, meal preparation and financial management and, in more serious circumstances, with basic functions such as personal care and moving around in their homes. Such dependency may threaten their ability to live independently in the community.

In this study, a substantial number of chronic conditions were shown to be associated with dependency among Canadian seniors. In some instances, being dependent was related to the pain accompanying a condition, not the condition itself. That is, statistically significant relationships between many chronic conditions and dependency disappeared when chronic pain was considered. The results of this analysis suggest that effective pain management may reduce the amount of dependency associated with chronic conditions among Canadian seniors, and ultimately, enhance their ability to continue living in the community. ■

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Table A
Adjusted odds ratios relating selected chronic conditions to ADL or IADL dependency, without and with controlling for chronic pain, male household population aged 65 or older, Canada, 2003

	ADL dependency		ADL dependency controlling for chronic pain		IADL dependency		IADL dependency controlling for chronic pain	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Chronic conditions[†]								
Arthritis/Rheumatism	1.5*	1.1, 2.0	1.1	0.6, 1.9	1.6*	1.3, 1.9	1.1	0.8, 1.6
Cataracts/Glaucoma	1.0	0.7, 1.4	1.0	0.6, 1.6	1.0	0.8, 1.3	0.7	0.5, 1.0
Back problems	1.4*	1.0, 1.9	1.2	0.7, 2.1	1.5*	1.2, 1.8	1.4*	1.1, 2.0
Heart disease	1.2	0.9, 1.6	1.4	0.9, 2.3	1.6*	1.3, 2.0	1.9*	1.4, 2.5
Diabetes	1.5*	1.0, 2.3	1.0	0.5, 1.9	1.3*	1.0, 1.7	1.1	0.8, 1.7
Thyroid condition	1.3	0.8, 2.0	0.7	0.4, 1.4	1.0	0.7, 1.4	0.7	0.5, 1.2
Urinary incontinence	1.8*	1.3, 2.5	1.7	0.9, 3.2	1.8*	1.4, 2.4	2.0*	1.3, 3.0
Asthma	0.9	0.6, 1.5	0.7	0.3, 1.6	1.2	0.8, 1.6	0.9	0.6, 1.5
Bronchitis/Emphysema/Chronic obstructive pulmonary disease	2.2*	1.5, 3.2	2.3*	1.2, 4.5	2.1*	1.6, 2.6	2.4*	1.6, 3.6
Mental illness	1.6	1.0, 2.6	1.2	0.5, 3.0	3.2*	2.3, 4.4	2.2*	1.2, 4.0
Cancer	2.0*	1.3, 3.0	2.4	0.8, 7.2	1.8*	1.3, 2.4	2.1*	1.1, 4.3
Migraine	1.3	0.6, 2.5	0.7	0.2, 2.4	1.7*	1.1, 2.8	1.8	0.9, 3.5
Effects of stroke	3.5*	2.3, 5.3	4.4*	2.3, 8.3	3.6*	2.6, 4.9	4.7*	2.7, 8.0
Stomach/Intestinal ulcers	1.2	0.7, 2.1	1.0	0.5, 2.0	1.2	0.8, 1.9	0.6	0.3, 1.2
Bowel disorder/Crohn's disease/Colitis	1.8*	1.1, 3.2	0.6	0.1, 2.2	1.0	0.6, 1.7	1.9	1.0, 3.7
Chemical sensitivities	...	...	...	...	1.2	0.7, 2.2	0.4	0.1, 1.4
Alzheimer's/Other dementia	5.3*	2.9, 9.4	5.9*	2.5, 13.7	6.3*	3.5, 11.2	17.6*	7.9, 39.4
Fibromyalgia	0.4	0.1, 1.8	0.2	0.0, 6.7	0.5	0.1, 1.8	0.8	0.2, 2.8
Chronic fatigue syndrome	...	...	...	...	1.1	0.6, 2.2	1.1	0.2, 4.6
Chronic pain								
None [‡]	1.0	...	...	...	1.0	...
Mild	...	...	3.3*	1.5, 7.0	...	...	1.6	1.0, 2.7
Moderate	...	...	2.0*	1.1, 3.8	...	...	3.8*	2.5, 5.7
Severe	...	...	3.5*	1.3, 9.7	...	...	4.5*	2.2, 9.3
Age (continuous variable)	1.0*	1.0, 1.1	1.0	1.0, 1.1	1.1*	1.1, 1.1	1.1*	1.1, 1.1
Education[‡]								
Less than secondary graduation	1.3	0.9, 1.8	1.4	0.8, 2.6	1.2	1.0, 1.5	1.4	0.9, 2.0
Secondary graduation	1.4	1.0, 2.1	3.0*	1.4, 6.6	1.2	0.9, 1.6	1.4	0.9, 2.4
Some postsecondary	0.9	0.5, 1.6	0.3	0.1, 1.5	1.0	0.7, 1.5	0.4	0.2, 1.1
Postsecondary graduation [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Main source of income								
Employment/Investment	1.1	0.7, 1.7	1.3	0.5, 3.1	1.0	0.7, 1.3	1.5	0.9, 2.7
Government transfers, public pensions, public insurance	1.2	0.8, 1.7	1.1	0.6, 2.1	1.5*	1.2, 1.8	1.7*	1.2, 2.5
Private pension [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Other/None	0.8	0.3, 2.1	0.4	0.1, 2.3	1.7	0.9, 3.2	3.0*	1.3, 6.9
Living arrangements								
Alone	0.8	0.6, 1.2	1.1	0.7, 1.8	1.6*	1.3, 1.9	2.1*	1.6, 3.0
With spouse/partner [‡]	1.0	...	1.0	...	1.0	...	1.0	...
With others	1.7*	1.2, 2.3	2.8*	1.5, 5.1	1.7*	1.3, 2.1	1.5	1.0, 2.4
Residence								
Urban	1.4*	1.0, 1.9	0.8	0.5, 1.5	1.2*	1.0, 1.5	1.1	0.8, 1.6
Rural [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Smoking status[‡]								
Never [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Daily/Occasional	0.9	0.6, 1.4	1.5	0.8, 2.9	1.4*	1.0, 1.9	2.1*	1.3, 3.6
Quit < 10 years	0.9	0.5, 1.7	0.9	0.4, 2.2	1.5*	1.1, 2.2	2.1*	1.1, 3.9
Quit ≥ 10 years	1.2	0.8, 1.7	1.4	0.8, 2.5	1.4*	1.1, 1.7	2.0*	1.3, 3.0
Alcohol use[‡]								
Never, lifetime	1.7	0.9, 3.4	3.8*	1.3, 11.8	2.3*	1.4, 3.9	3.2*	1.6, 6.4
Never, past 12 months	1.4	1.0, 2.1	2.2*	1.1, 4.6	1.6*	1.3, 2.1	1.8*	1.1, 2.8
Occasional	1.1	0.7, 1.6	1.6	0.7, 3.7	1.4*	1.1, 1.9	1.6*	1.0, 2.5
Weekly [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Heavy	0.9	0.4, 2.0	0.4	0.1, 1.5	1.0	0.7, 1.5	0.8	0.4, 1.5
Body mass index (BMI)[‡]								
Underweight (< 18.5)	3.9*	2.1, 7.4	5.4*	1.9, 15.3	1.8*	1.1, 3.0	1.8	0.7, 4.4
Acceptable weight (18.5-24.9) [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Overweight (25.0-29.9)	0.9	0.7, 1.2	2.4*	1.3, 4.5	0.8	0.7, 1.0	1.3	0.9, 1.9
Obese (≥ 30.0)	1.0	0.6, 1.5	1.5	0.7, 3.2	1.1	0.8, 1.5	1.3	0.8, 1.9
Leisure-time physical activity								
Active [‡]	1.0	...	1.0	...	1.0	...	1.0	...
Inactive	6.1*	4.1, 9.1	5.4*	2.8, 10.2	2.8*	2.2, 3.6	2.0*	1.3, 2.9

Date source: 2003 Canadian Community Health Survey
Notes: Analysis based on 11,072 men for ADL dependency model; 11,042 men for IADL dependency model. When controlling for chronic pain, analysis based on 5,487 men for ADL model; 5,482 men for IADL model. 340 respondents were dropped from ADL model because of missing values; 370 from IADL model; 154 from ADL model controlling chronic pain; 159 from IADL model controlling chronic pain.
[†] Reference category (for chronic conditions, "none" is reference category)
[‡] Missing category included in models to maximize sample size, but odds ratios not shown.
* Significantly different from estimate for reference category ($p < 0.05$)
... Not applicable

Table B
Adjusted odds ratios relating selected chronic conditions to ADL or IADL dependency, without and with controlling for chronic pain, female household population aged 65 or older, Canada, 2003

	ADL dependency		ADL dependency controlling for chronic pain		IADL dependency		IADL dependency controlling for chronic pain	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Chronic conditions[†]								
Arthritis/Rheumatism	1.7*	1.3, 2.2	1.1	0.7, 1.6	1.6*	1.4, 1.9	1.3*	1.1, 1.7
Cataracts/Glaucoma	0.9	0.7, 1.2	0.9	0.6, 1.3	1.2*	1.0, 1.4	1.3*	1.0, 1.7
Back problems	1.2	1.0, 1.5	1.1	0.7, 1.6	1.8*	1.5, 2.0	1.4*	1.1, 1.8
Heart disease	1.1	0.9, 1.4	1.0	0.7, 1.5	1.6*	1.3, 1.8	1.5*	1.2, 2.0
Diabetes	1.4*	1.0, 1.7	0.9	0.5, 1.5	1.6*	1.4, 2.0	1.2	0.8, 1.7
Thyroid condition	1.0	0.8, 1.4	0.9	0.6, 1.4	1.0	0.8, 1.1	0.9	0.7, 1.2
Urinary incontinence	1.7*	1.3, 2.1	1.1	0.8, 1.7	1.7*	1.4, 2.0	1.4*	1.0, 1.8
Asthma	1.3	0.9, 1.9	1.5	0.9, 2.8	1.7*	1.4, 2.1	1.5	1.0, 2.3
Bronchitis/Emphysema/Chronic obstructive pulmonary disease	1.5*	1.1, 2.0	1.6	0.9, 2.6	1.3*	1.1, 1.7	1.3	0.9, 1.8
Mental illness	1.8*	1.3, 2.4	2.1*	1.1, 3.8	2.1*	1.7, 2.5	2.6*	1.8, 3.7
Cancer	1.3	0.8, 2.0	1.3	0.6, 2.7	1.5*	1.1, 2.0	1.0	0.6, 1.7
Migraine	1.3	0.9, 2.0	1.1	0.5, 2.4	1.2	0.9, 1.5	0.9	0.6, 1.4
Effects of stroke	3.0*	2.2, 4.1	2.1*	1.0, 4.1	3.2*	2.3, 4.4	3.4*	2.1, 5.5
Stomach/Intestinal ulcers	1.0	0.7, 1.5	0.6	0.3, 1.2	1.3	1.0, 1.8	1.2	0.8, 1.8
Bowel disorder/Crohn's Disease/Colitis	1.3	0.9, 1.7	1.5	0.9, 2.7	1.2	0.9, 1.5	1.3	0.8, 2.1
Chemical sensitivities	0.7	0.4, 1.1	1.6	0.7, 4.0	1.1	0.8, 1.5	1.1	0.7, 1.7
Alzheimer's disease/Other dementia	5.5*	3.0, 9.8	6.0*	2.5, 14.5	4.1*	2.0, 8.3	5.2*	1.9, 14.3
Fibromyalgia	1.7	0.8, 3.5	1.0	0.4, 2.4	1.9*	1.3, 3.0	1.7	0.8, 3.6
Chronic fatigue syndrome	1.7	0.9, 3.4	0.9	0.3, 2.8	2.9*	1.6, 5.3	1.2	0.5, 2.6
Chronic pain								
None [‡]	1.0	...	...	...	1.0	...
Mild	...	...	4.2*	2.5, 7.0	...	...	1.7*	1.2, 2.4
Moderate	...	...	3.7*	2.3, 5.8	...	...	3.5*	2.5, 4.8
Severe	...	...	6.7*	3.7, 12.2	...	...	4.6*	3.0, 7.1
Age (continuous variable)	1.1*	1.1, 1.1	1.1*	1.1, 1.1	1.1*	1.1, 1.1	1.1*	1.1, 1.1
Education[†]								
Less than secondary graduation	1.0	0.8, 1.3	1.2	0.7, 1.9	0.9	0.7, 1.0	0.9	0.7, 1.2
Secondary graduation	1.0	0.7, 1.3	1.2	0.6, 2.1	0.8*	0.7, 0.9	0.7*	0.5, 1.0
Some postsecondary	1.4	0.9, 2.2	0.9	0.4, 2.1	1.0	0.8, 1.3	0.9	0.4, 2.1
Postsecondary graduation [†]	1.0	...	1.0	...	1.0	...	1.0	...
Main source of income								
Employment/Investment	1.3	0.9, 1.9	0.6	0.3, 1.1	1.1	0.9, 1.4	1.1	0.7, 1.7
Government transfers, public pensions, public insurance	1.0	0.7, 1.3	0.5*	0.3, 0.7	1.0	0.9, 1.2	0.8	0.6, 1.0
Private pension [†]	1.0	...	1.0	...	1.0	...	1.0	...
Other/None	0.6	0.2, 2.6	1.3	0.4, 4.0	1.3	0.7, 2.3	1.5	0.6, 3.5
Living arrangements								
Alone	0.9	0.7, 1.2	1.1	0.7, 1.7	1.0	0.9, 1.2	1.1	0.8, 1.4
With spouse/partner [†]	1.0	...	1.0	...	1.0	...	1.0	...
With others	1.1	0.8, 1.5	1.1	0.7, 1.8	1.4*	1.2, 1.7	1.2	0.9, 1.7
Residence								
Urban	1.0	0.8, 1.3	1.2	0.8, 1.7	1.1	1.0, 1.3	1.1	0.9, 1.5
Rural [†]	1.0	...	1.0	...	1.0	...	1.0	...
Smoking status								
Never [†]	1.0	...	1.0	...	1.0	...	1.0	...
Daily/Occasional	0.8	0.5, 1.2	0.9	0.5, 1.6	1.4*	1.1, 1.8	1.1	0.8, 1.6
Quit < 10 years	1.3	0.9, 1.9	1.4	0.7, 2.8	1.6*	1.2, 2.0	1.8*	1.2, 2.6
Quit ≥ 10 years	0.8	0.7, 1.1	0.7	0.4, 1.0	1.1	0.9, 1.2	1.1	0.9, 1.5
Alcohol use								
Never, lifetime	1.6*	1.1, 2.5	3.4*	1.9, 6.1	1.7*	1.3, 2.1	1.5*	1.0, 2.3
Never, past 12 months	1.7*	1.2, 2.4	4.5*	2.7, 7.6	1.8*	1.5, 2.2	1.9*	1.3, 2.7
Occasional	1.1	0.8, 1.5	1.5	0.9, 2.4	1.2*	1.0, 1.4	1.2	0.8, 1.7
Weekly [†]	1.0	...	1.0	...	1.0	...	1.0	...
Heavy	1.4	0.5, 4.1	0.0	0.0, 0.0	1.1	0.6, 2.0	1.2	0.3, 4.6
Body mass index (BMI)								
Underweight (< 18.5)	1.2	0.8, 1.9	1.8	0.9, 3.5	1.5*	1.0, 2.2	1.1	0.7, 1.7
Acceptable weight (18.5-24.9) [†]	1.0	...	1.0	...	1.0	...	1.0	...
Overweight (25.0-29.9)	1.0	0.8, 1.3	0.9	0.6, 1.4	1.0	0.8, 1.1	0.8*	0.6, 1.0
Obese (≥ 30.0)	1.6*	1.2, 2.2	1.8*	1.1, 3.0	1.5*	1.2, 1.8	1.4	1.0, 2.0
Leisure-time physical activity								
Active [†]	1.0	...	1.0	...	1.0	...	1.0	...
Inactive	2.1*	1.5, 2.8	1.8*	1.1, 3.0	2.1*	1.8, 2.4	2.4*	1.8, 3.3

Data source: 2003 Canadian Community Health Survey

Notes: Analysis based on 16,651 women for ADL dependency model; 16,638 women for IADL dependency model. When controlling for chronic pain, analysis based on 8,510 women for ADL model; 8,496 women for IADL model. 554 respondents were dropped from ADL model because of missing values; 594 from IADL model; 259 from ADL model controlling chronic pain; 252 from IADL model controlling chronic pain.

† Reference category (for chronic conditions, "none" is reference category)

‡ Missing category included in models to maximize sample size, but odds ratios not shown.

** Significantly different from estimate for reference category (p < 0.05)*

... Not applicable

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Seniors' health care use

- Over the course of a year, nearly 90% of seniors consult a general practitioner or family doctor, 14% are hospitalized, and 15% receive home care. As well, 92% of seniors report taking at least one type of medication in the past month.
- The number of chronic conditions is the strongest determinant of the frequency with which seniors use health care.
- Once health status and factors such as age and health behaviours are taken into account, differences in education and source of income generally do not affect how often seniors use health care.

Abstract

Objectives

This article describes the use of health care by Canada's senior population: consultations with selected health care providers, medication use, hospitalization and home care.

Data sources

Data are from the 2003 Canadian Community Health Survey and the 2002/03 Hospital Morbidity Database.

Analytical techniques

Cross-tabulations were used to estimate the proportion of seniors who consulted health care professionals, took medications, were hospitalized, and used home care. Linear and multivariate logistic regression models were used to examine associations between health and the number of physician consultations in the past year, the number of medications taken in the past month, and hospitalization and home care use in the past year.

Main results

In 2003, nearly 90% of seniors reported that they had consulted a general practitioner or family doctor in the past year, 92% reported taking at least one type of medication in the past month, 14% had been hospitalized in the past year and 15% had received home care in the past year. Chronic conditions, poor health and severe injury were strongly associated with health care use. In multivariate analysis, socio-economic status was generally not related to seniors' use of health care services.

Keywords

physician consultations, medication use, hospitalization, home care

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While seniors today are generally healthier than those of previous generations, they remain more likely than younger people to have chronic conditions and to suffer from poor health.¹ Not surprisingly then, seniors also require and use more health care services.²⁻⁴

An extensive body of literature focuses on the determinants of health services use. Early research was based on the hypothesis that using such services depends on a combination of the need for care, an individual's predisposition to seek care, and extrinsic factors that facilitate or impede use.⁵⁻¹³ More recent studies have found that seniors' use of health care is correlated most strongly with illness;^{3,14-19} results of research on the contribution and relative importance of other variables such as socio-economic status and health behaviour have been inconsistent.^{7,9,14,15,20-25}

Methods

Data sources

The data are from Statistics Canada's 2003 Canadian Community Health Survey (CCHS) cycle 2.1 and the 2002/03 Hospital Morbidity Database (HMD).

The CCHS covers the household population aged 12 or older in all provinces and territories, except residents of institutions, regular members of the Canadian Armed Forces, and residents of Indian reserves, Canadian Forces bases and some remote areas. The overall response rate was 80.6%; the total sample was 135,573. Data collection began in January 2003 and ended in December of that year. Most interviews were conducted by telephone. A description of the CCHS methodology is available in a published report.²⁶

The CCHS sample used for most of the analyses in this article consists of 11,441 men and 17,231 women aged 65 or older. Comparisons with people aged 12 to 64 are based on data collected from 50,759 males and 56,142 females.

Selection of control variables was guided by the literature and the availability of data in the CCHS. The variables selected for the multivariate analyses of factors related to consultations with family doctors/general practitioners (GPs), use of medications, hospitalization and home care included number of chronic illnesses, self-perceived health, activity-limiting injury, age, education, main source of income, body mass index, leisure-time physical activity, smoking, rural/urban residence, and province/territory of residence (see *Definitions*). Not all independent variables were used in every model.

In 2003, information about medication use was collected as a subsample module of the CCHS, meaning that it was administered to a randomly selected subset of the 135,753 CCHS respondents. British Columbia opted to have this module administered to all respondents in that province. A total of 10,353 respondents aged 65 or older were used in the analyses of medication use.

Information about the number of discharges from acute care hospitals in 2002/03, the number of days stayed, and average length of stay is from the Hospital Morbidity Database. The HMD captures administrative, clinical and demographic information about hospital in-patient separations (discharges and deaths) from all acute care and selected chronic care and rehabilitation facilities across Canada, but has only limited information about the personal characteristics and health history of patients. In fiscal year 2002/03, there were 3,099,250 acute care hospital discharge records pertaining to hospitalizations occurring in the patient's province of residence; one-third of them (1,014,666) were hospitalizations of seniors. Less than 2% of HMD records were excluded because they pertained to hospitalizations occurring in non-acute care hospitals and/or outside the patient's province of residence. More detail about the HMD is available in a previously published report.²⁷

Analytical techniques

Weighted frequencies and cross-tabulations were used to estimate the proportion of people who: reported that they consulted (in person or over the telephone) selected types of health care providers; had a regular medical doctor; took medications; were hospitalized; and received home care. Averages were calculated for the number of

consultations with selected health care providers, medications used, and lengths of hospital stays.

Multivariate linear regression models for each sex were used to assess associations between health and the log number of consultations with family doctors/GPs in the past year and the log number of medications taken in the past month, while controlling for socio-demographic factors and health-related behaviours. The $\exp(B)$ is the inverse of the natural log and is the value described in the analysis. The log transformation was done to correct the non-normal distribution.²⁸ Also, standardized regression coefficients (beta) were used to determine the relative importance of the independent variables to the number of physician consultations and number of medications. Number of consultations with a family doctor/GP and number of medications were log transformed using the natural log. Multivariate logistic regression models for each sex were used to assess the associations between health and hospitalization and receipt of home care, while controlling for socio-demographic factors and health-related behaviours. Results at the $p < 0.05$ level were considered significant. To account for survey design effects, standard errors and coefficients of variation were estimated using the bootstrap technique.²⁹⁻³¹

To calculate the proportion of seniors by number of hospital stays, linkable hospital discharge records were sorted by valid health insurance number and then assigned a counter to indicate the number of separations per patient. The proportion of people hospitalized was calculated by dividing the number who had been hospitalized by the number of people in the corresponding age group in the population.

Limitations

The analyses are based on cross-sectional data, which permit the observation of associations between variables at one point in time. Neither causality nor the temporal ordering of events can be inferred. The data were collected by self- or proxy-report and are subject to reporting error. To minimize this error in data on chronic conditions, respondents were asked to report only conditions that had been "diagnosed by a health professional." However, no independent source was available to verify if people who reported that they had a chronic condition actually did have the condition. Also, no information was available on the severity of the chronic conditions reported.

The CCHS does not collect information on why respondents consulted health professionals, so it is not possible, for example, to differentiate between treatments, preventive health care visits and prescription renewals.

Self-reports of medication use require accurate recall. Some respondents may have trouble remembering. Because the question asked about classes of drugs (for example, pain relievers), no information is available about the different medications within a particular drug class, and respondents were not asked to distinguish prescription from non-prescription drugs. The frequency with which drugs were taken is not known.

CCHS respondents were not asked why they had been hospitalized, or how many times.

The CCHS does not measure the frequency or duration of home care.

This article, based on data from the Canadian Community Health Survey (CCHS) and the Hospital Morbidity Database (HMD), examines indicators of health in relation to seniors' use of various types of care: consultations with health care professionals, medications, hospitalization and home care (see *Methods*). The analysis also investigates potential associations with two socio-economic variables—education and main source of income—while controlling for the effects of other risk factors that influence health care use: body mass index, physical activity and smoking. Such information is important in the context of a universal health care system that seeks to provide access to care on the basis of health, rather than financial means.

Contact with health professionals

According to the results of the CCHS, in 2003, nearly all seniors (96%) had a regular doctor (data not shown), and most—88%—had consulted a family doctor/general practitioner (GP) at least once in the past year (Table 1). This figure was significantly above that for people aged 12 to 64, 76% of whom had consulted a doctor in the same period. Seniors were also more likely than younger people to have had contact with other medical doctors, eye specialists or speech/audiology/occupational therapists. Comparatively small proportions of seniors had seen social workers/

counsellors, psychologists, chiropractors or alternative health care providers.

Illness has long been shown to be the most important determinant of seniors' doctor visits.^{7,9,14,16,17,32-34} And indeed, three measures of health from the CCHS—the presence of chronic conditions, a recent activity-limiting injury and self-reported health—were related to the frequency of physician consultations among community-dwelling seniors (the institutionalized population was not covered by the CCHS).

The more chronic conditions seniors had, the more consultations with a family doctor/general practitioner (GP) they reported. Seniors with at least five chronic conditions averaged more than seven consultations in the previous year; those with no chronic conditions averaged two (Table 2).

Injuries, of course, also play a role in older people's need to consult doctors.^{35,36} Seniors who had sustained an activity-limiting injury averaged significantly more consultations with their family doctor/GP than did those who had not been injured.

Self-perceived health is a widely used measure that reflects not only physical health, but also an individual's general sense of well-being.^{5,37-39} Seniors who perceived their health as "fair" or "poor" averaged close to seven consultations in the previous year, compared with less than three for those who rated their health as "very good" or "excellent."

At first glance, education and main source of income seemed to be related to the frequency with which seniors contacted doctors. Seniors who had not completed high school averaged more consultations than did those with at least secondary graduation, and men whose income came primarily from social assistance or Old Age Security/ Guaranteed Income Supplement reported more consultations than did senior men who relied on some other income source.

Poor health and socio-economic characteristics, however, are not independent of each other, as socio-economic status is related to health. Yet even when the effects of age, education, main source of income, weight, physical activity, smoking status and geography were taken into account in multivariate analyses, chronic conditions, injury, and self-perceived health were each independently associated with the frequency of doctor consultations (Table 2). By contrast, differences in socio-economic status were no longer statistically significant, supporting the assumption that the higher number of consultations reported by less educated or lower-income individuals reflects poorer health.

Table 1

Percentage who consulted selected health care professionals in past year, by age group and sex, household population aged 12 or older, Canada, 2003

	65+			12-64		
	Total	Men	Women	Total	Men	Women
	%	%	%	%	%	%
Family doctor/General practitioner	88.1*	86.8*	89.2*†	75.5	69.3	81.7
Other medical doctor	33.4*	34.0*	32.9	25.7	19.6	31.8
Eye specialist	56.7*	54.0*	58.8*†	36.2	32.5	39.9
Nurse	11.1	10.9*	11.3*	10.9	8.4	13.3
Chiropractor	8.2*	7.6*	8.6*†	11.8	11.5	12.2
Physiotherapist	8.3	6.9*	9.4†	8.6	7.9	9.3
Alternative health care provider	6.1*	4.2*	7.6*†	13.4	9.3	17.6
Social worker/Counsellor	2.7*	2.2*	3.1*†	5.0	4.1	5.9
Speech/Audiology/Occupational therapist	2.6*	3.0*	2.4*	1.4	1.5	1.4
Psychologist	0.8*	0.6* ^E	1.0*	3.3	2.7	3.9

Data source: 2003 Canadian Community Health Survey

Note: Differences between sexes for people aged 12-64 not tested for statistical significance.

† Significantly different from estimate for men aged 65+ ($p < 0.05$)

* Significantly different from corresponding estimate for people aged 12-64 ($p < 0.05$)

^E Coefficient of variation 16.6% to 33.3% (interpret with caution)

Table 2

Average number of consultations with family doctor/general practitioner in past year and multiple linear regression coefficients relating selected characteristics to number of consultations, by sex, household population aged 65 and older, Canada, 2003

	Men					Women				
	Average number	Multiple linear regression				Average number	Multiple linear regression			
		b	exp(b)	se	beta		b	exp(b)	se	beta
Number of chronic conditions										
None [†]	1.9	...	...	...	...	2.2	...	...	...	...
1	3.1*	0.29*	1.34	0.030	0.16	3.0*	0.26*	1.30	0.036	0.13
2	4.5*	0.49*	1.63	0.033	0.26	4.0*	0.40*	1.49	0.037	0.21
3	5.3*	0.61*	1.84	0.036	0.28	4.9*	0.51*	1.66	0.038	0.26
4	6.7*	0.74*	2.10	0.045	0.27	5.8*	0.63*	1.87	0.041	0.28
5 or more	7.6*	0.82*	2.28	0.048	0.29	7.0*	0.71*	2.03	0.042	0.33
Activity-limiting injury										
No [†]	4.3	...	...	...	...	4.5	...	...	...	...
Yes	5.1*	0.12*	1.13	0.038	0.04	5.5*	0.08*	1.08	0.027	0.03
Self-perceived health										
Fair/Poor	6.8*	0.26*	1.29	0.031	0.14	6.9*	0.38*	1.46	0.025	0.21
Good	4.3*	0.16*	1.17	0.023	0.10	4.3*	0.15*	1.16	0.021	0.10
Very good/Excellent [†]	2.8	...	...	...	...	3.1	...	...	...	...
Age group										
65-74 [†]	3.9	...	...	...	...	4.2	...	...	...	...
75-84	4.9*	0.08*	1.09	0.022	0.05	4.9*	0.02	1.02	0.018	0.01
85+	5.9*	0.21*	1.23	0.046	0.06	5.1*	0.04	1.04	0.032	0.01
Education										
Less than secondary graduation	4.7*	-0.01	0.99	0.021	-0.01	4.7*	-0.03	0.97	0.018	-0.02
Secondary graduation or more [†]	3.9	...	...	...	...	4.3	...	...	...	...
Main source of income										
Social assistance or Old Age Security and Guaranteed Income Supplement	5.1*	0.04	1.04	0.030	0.02	4.8	0.00	1.00	0.020	0.00
Other [†]	4.2	...	...	...	...	4.5	...	...	...	...
Body mass index (BMI)										
Underweight (< 18.5)	6.9*	0.19	1.21	0.110	0.03	4.9*	0.05	1.05	0.045	0.01
Normal (18.5-24.9) [†]	4.0	...	...	...	...	4.3	...	...	...	...
Overweight (25.0-29.9)	4.3	0.03	1.03	0.022	0.02	4.6*	0.03	1.03	0.021	0.02
Obese class I (30.0-34.9)	5.0*	0.10*	1.10	0.037	0.04	5.1*	0.02	1.02	0.029	0.01
Obese class II or III (≥ 35.0)	5.6*	0.12	1.13	0.068	0.02	5.8*	0.06	1.07	0.051	0.01
Leisure-time physical activity										
Active [†]	3.7	...	...	...	...	3.8	...	...	...	...
Inactive	4.6*	0.05*	1.05	0.022	0.03	4.7*	0.05*	1.06	0.018	0.03
Smoking status										
Never daily smoker [†]	4.2	...	...	...	...	4.5	...	...	...	...
Former daily smoker (10+ years)	4.5	-0.01	0.99	0.026	-0.01	4.6	0.01	1.01	0.021	0.01
Former daily smoker (< 10 years)	4.5	-0.02	0.98	0.035	-0.01	4.8	-0.01	0.99	0.030	0.00
Current daily smoker	4.1	-0.11*	0.90	0.037	-0.04	4.2	-0.09*	0.92	0.036	-0.03
Province/Territory										
Newfoundland and Labrador	5.4*	0.19*	1.21	0.053	0.02	5.4*	0.23*	1.26	0.038	0.03
Prince Edward Island	4.6	0.09	1.09	0.063	0.01	4.1	0.01	1.01	0.046	0.00
Nova Scotia	5.9*	0.19*	1.21	0.045	0.03	5.3*	0.14*	1.14	0.030	0.02
New Brunswick	5.9 ^E	0.00	1.00	0.056	0.00	4.6	0.04	1.04	0.039	0.01
Québec	2.8*	-0.25*	0.78	0.018	-0.10	3.4*	-0.21*	0.81	0.016	-0.09
Ontario	4.8*	0.07*	1.08	0.014	0.04	5.0*	0.07*	1.07	0.011	0.03
Manitoba	3.8*	-0.08*	1.03	0.035	-0.01	4.5	-0.02	0.98	0.037	0.00
Saskatchewan	4.6	0.03	1.07	0.030	0.00	4.9	0.06*	1.06	0.026	0.01
Alberta	5.4*	0.06	1.07	0.037	0.02	4.3	0.02	1.02	0.026	0.01
British Columbia	4.6	0.12*	1.13	0.020	0.04	5.1*	0.10*	1.11	0.021	0.03
Yukon, Nunavut, Northwest Territories	3.4*	-0.20	0.82	0.126	-0.01	4.2 ^E	-0.17	0.85	0.134	0.00
Intercept		0.69					0.77			
Model information										
r ²		0.21					0.18			
Sample size		10,968					16,439			
Dropped because of missing values		473					792			

Date source: 2003 Canadian Community Health Survey

Notes: "Missing" categories for education, main source of income, BMI, physical activity and smoking were included in models to maximize sample size, but coefficients are not shown.

† Reference category; reference category for province/territory is Canada (average number of consultations for men was 4.4 and for women, 4.5).

* Significantly different from estimate for reference category ($p < 0.05$)

^E Coefficient of variation 16.6% to 33.3% (interpret with caution)

... Not applicable

Medication use

In 2003, 9 in 10 non-institutionalized seniors had taken at least one type of medication in the past month (Chart 1). On average, they took three different types of medication (data not shown).

Senior women tended to take a wider variety of medications than did senior men. Fully 27% of elderly women reported at least five types of medication, compared with 16% of elderly men.

Drugs commonly used by seniors included non-narcotic pain relievers, blood pressure medication, heart medication, diuretics, and stomach remedies (Table 3). The likelihood of medication use was generally higher for women than for men, although heart medication and drugs to manage diabetes were used by larger shares of men, reflecting the higher prevalence of these diseases in men (data not shown).

The variety of medications taken was, of course, strongly related to illness (Table 4). Seniors with at least five chronic conditions reported having taken an average of five types of medication in the past month, while those with no chronic illnesses averaged one. Similarly, seniors who rated their health as "fair," "poor" or "good" took a broader range of medications than did those in "very good" or "excellent" health. As well,

Table 3
Percentage who took medication in past month, by type of medication and sex, household population aged 65 or older, Canada, 2003

	Both sexes	Men	Women
	%	%	%
Pain relievers (non-narcotic)	66.7	62.3	70.1*
Blood pressure medication	46.3	41.8	49.9*
Heart medication	22.1	25.1	19.8*
Diuretics	19.5	16.5	21.8*
Stomach remedies	18.8	15.6	21.3*
Thyroid medication	12.8	5.1	18.8*
Cough/Cold remedies	11.6	11.9	11.3
Laxatives	10.6	8.1	12.6*
Sleeping pills	9.1	7.9	10.1*
Diabetes pills	9.1	11.0	7.7*
Asthma medication	7.8	8.2	7.6
Tranquillizers	7.2	4.2	9.6*
Penicillin/Antibiotics	7.1	6.8	7.4
Antidepressants	5.9	5.3	6.3
Allergy medication	5.3	3.5	6.8*
Codeine/Morphine/Demerol (narcotic)	4.5	4.3	4.7
Insulin	2.1	2.6 ^E	1.7
Steroids	1.7	1.4 ^E	1.9
Hormone replacement therapy (female)	...	...	10.8

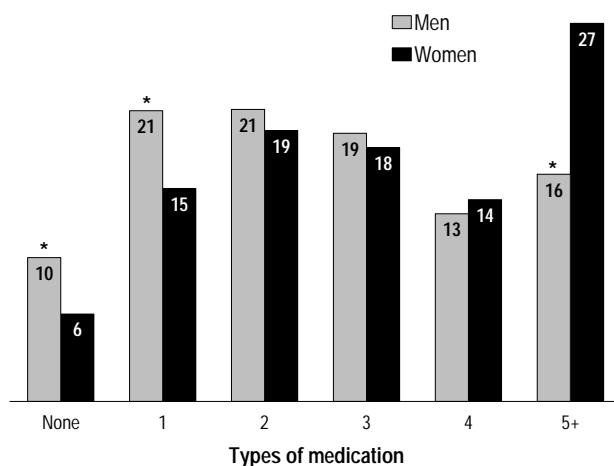
Data source: 2003 Canadian Community Health Survey

* Significantly different from estimate for men ($p < 0.05$)

^E Coefficient of variation 16.6% to 33.3% (interpret with caution)

... Not applicable

Chart 1
Percentage distribution of seniors, by number of types of medication taken in past month and sex, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey

Note: Because of rounding, detail may not add to totals.

* Significantly different from estimate for women ($p < 0.05$)

senior women who had sustained an activity-limiting injury in the past year took more types of medication than did women who had not suffered such an injury. When the effects of demographic, socio-economic and health-related risk factors were taken into account, the number of different medications seniors reported taking remained strongly associated with chronic conditions and self-perceived health. Injury, however, was no longer significantly associated with medication use for either sex.

The number of different drugs seniors reported was generally not related to their education or source of income, except that in multivariate analysis, men with less than secondary graduation took significantly fewer types of medication than did men with more education.

Table 4

Average number of types of medication taken in past month and multiple linear regression coefficients relating selected characteristics to number of types of medication taken, by sex, household population aged 65 or older, Canada, 2003

	Men					Women				
	Average number	Multiple linear regression				Average number	Multiple linear regression			
		b	exp(b)	se	beta		b	exp(b)	se	beta
Number of chronic conditions										
None [†]	1.3	...	...	...	...	1.3	...	...	...	...
1	1.9*	0.24*	1.28	0.055	0.19	2.2*	0.34*	1.40	0.053	0.25
2	2.6*	0.44*	1.56	0.055	0.34	2.8*	0.49*	1.63	0.052	0.38
3	3.3*	0.61*	1.84	0.061	0.40	3.5*	0.64*	1.90	0.051	0.45
4	3.6*	0.71*	2.03	0.062	0.38	4.4*	0.81*	2.25	0.054	0.50
5 or more	4.8*	0.86*	2.37	0.061	0.44	5.3*	0.95*	2.59	0.054	0.63
Activity-limiting injury										
Yes	2.8	-0.04	0.96	0.045	-0.02	3.9*	0.05	1.05	0.040	0.03
No [†]	2.7	...	...	...	...	3.2	...	...	...	...
Self-perceived health										
Fair/Poor	3.6*	0.17*	1.19	0.037	0.14	4.5*	0.17*	1.19	0.033	0.14
Good	2.7*	0.07	1.07	0.037	0.06	3.3*	0.07*	1.07	0.031	0.06
Very good/Excellent [†]	2.0	...	...	...	...	2.5	...	...	...	...
Age group										
65-74 [†]	2.5	...	...	...	...	3.1	...	...	...	...
75-84	2.9*	0.04	1.04	0.029	0.04	3.5*	0.01	1.01	0.025	0.01
85+	3.1*	0.00	1.00	0.057	0.00	3.5*	-0.02	0.98	0.032	-0.01
Education										
Less than secondary graduation	2.7	-0.12*	0.89	0.029	-0.11	3.4	-0.01	0.99	0.026	-0.01
Secondary graduation or more [†]	2.7	...	...	...	...	3.1	...	...	...	...
Main source of income										
Social assistance or Old Age Security and Guaranteed Income Supplement	2.8	-0.01	0.99	0.035	-0.01	3.6*	0.03	1.03	0.023	0.02
Other [†]	2.7	...	...	...	...	3.2	...	...	...	...
Body mass index										
Underweight (< 18.5)	2.8 ^E	0.02	1.02	0.151	0.00	3.3	-0.03	0.97	0.058	-0.01
Normal (18.5-24.9) [†]	2.5	...	...	...	...	3.0	...	...	...	...
Overweight (25.0-29.9)	2.7	0.00	1.00	0.031	0.00	3.3*	0.05	1.05	0.028	0.04
Obese class I (30.0-34.9)	3.0*	0.07	1.07	0.046	0.04	4.2*	0.12*	1.13	0.031	0.07
Obese class II or III (≥ 35.0)	3.6*	0.12*	1.13	0.056	0.03	4.2*	0.06	1.06	0.067	0.02
Leisure-time physical activity										
Active [†]	2.4	...	...	...	...	2.8	...	...	...	...
Inactive	2.9*	0.06*	1.06	0.029	0.05	3.5*	0.02	1.02	0.025	0.02
Smoking status										
Never daily smoker [†]	2.4	...	...	...	...	3.1	...	...	...	...
Former daily smoker (10+ years)	2.9*	0.06	1.06	0.032	0.05	3.7*	0.08*	1.08	0.023	0.06
Former daily smoker (< 10 years)	3.0*	0.03	1.03	0.043	0.02	3.7*	0.06	1.06	0.036	0.03
Current daily smoker	2.3	-0.10	0.90	0.062	-0.05	3.2	-0.02	0.98	0.043	-0.01
Province/Territory										
Newfoundland and Labrador	2.5	-0.03	0.97	0.049	0.00	3.3	0.02	1.02	0.051	0.00
Prince Edward Island	2.7	0.00	1.00	0.055	0.00	3.2	0.05	1.05	0.038	0.00
Nova Scotia	2.9	0.00	1.00	0.045	0.00	3.6*	0.02	1.02	0.032	0.00
New Brunswick	3.0	0.12*	1.13	0.039	0.02	3.4	0.06	1.06	0.038	0.01
Québec	2.5	-0.02	0.98	0.026	-0.01	3.2	-0.02	0.98	0.020	-0.01
Ontario	2.8	0.02	1.02	0.017	0.01	3.4	0.02	1.02	0.016	0.01
Manitoba	2.4	-0.07	0.93	0.049	-0.02	3.0*	-0.08*	0.92	0.037	-0.02
Saskatchewan	2.6	-0.02	0.98	0.046	0.00	3.2	-0.02	0.98	0.034	-0.01
Alberta	2.6	-0.04	0.96	0.037	-0.01	3.0*	0.00	1.00	0.031	0.00
British Columbia	2.6	0.01	1.01	0.019	0.00	3.2	0.00	1.00	0.017	0.00
Yukon, Nunavut, Northwest Territories	2.7	0.07	1.07	0.063	0.00	2.8*	-0.10	0.90	0.063	0.00
Intercept		0.68					0.64			
Model information										
<i>r</i> ²		0.32					0.37			
Sample size		3,857					5,794			
Dropped because of missing values		282					420			

Data source: 2003 Canadian Community Health Survey

Notes: "Missing" categories for education, main source of income, BMI, physical activity and smoking were included in model, but coefficients are not shown.

[†] Reference category; reference category for province/territory is Canada (average number of types of medication taken by men was 2.7, and by women, 3.3).

* Significantly different from estimate for reference category ($p < 0.05$)

... Not applicable

Definitions

Respondents to the Canadian Community Health Survey (CCHS) were asked about their contacts with *health care professionals* during the past 12 months: "Not counting when you were an overnight patient, in the past 12 months, how many times have you seen, or talked on the telephone, about your physical, emotional or mental health with: a family doctor or general practitioner (GP), an eye specialist, any other medical doctor (such as a surgeon, allergist, orthopedist, gynecologist or psychiatrist), a nurse for care or advice, a chiropractor, a physiotherapist, a social worker or counsellor, a psychologist or a speech, audiology or occupational therapist?"

Respondents were asked if they had "a regular medical doctor."

Respondents were asked about their use of the following types of *medication* in the month before the interview: pain relievers (non-narcotic); tranquilizers; diet pills, antidepressants; codeine, Demerol or morphine (narcotic); allergy medications; asthma medications; cough or cold remedies; penicillin or other antibiotics; medicine for the heart; medicine for high blood pressure; medication for thyroid; diuretics or water pills; steroids; insulin; pills to control diabetes; sleeping pills; stomach remedies; laxatives; hormones for menopause or aging symptoms; and any other prescription or over-the-counter medication. Respondents were not asked to identify their medications as prescription or non-prescription. For the bivariate and multivariate analyses, the number of types of medication used was treated as a continuous variable.

CCHS data on *hospitalization* were collected by a yes/no question: "In the past 12 months, have you been a patient overnight in a hospital, nursing home or convalescent home?" For ease of reference, hospitals, nursing homes, or convalescent homes are referred to collectively as "hospitals" in this analysis; however, it is not possible to determine which type of institution was actually used. CCHS data on hospitalization were used in bivariate tabulations and multivariate models.

The Hospital Morbidity Database (HMD) was used to calculate the proportion of people hospitalized. As well, *average length of hospital stay* was calculated from the HMD. The number of days of hospitalization was divided by the number of patient records in each age group.

CCHS respondents were asked about *home care*: "Have you received any home care services in the past 12 months, with the cost being entirely or partially covered by government?" and "Have you received any other home care services in the past 12 months, with the cost not covered by government (for example, care provided by a spouse or friends)?" Three sources of home care were identified: informal, formal and mixed (a combination of both). Informal assistance is performed by family, friends and neighbours. Formal help is provided by employees of profit or not-for-profit organizations, government, and volunteers. When both types of assistance were received, the senior was considered to have "mixed" help. An "other" category was used for the 1% of cases that could not be classified.

To determine the presence of *chronic conditions*, respondents were asked if they had "any long-term health conditions that had lasted or were expected to last six months or more that had been diagnosed by a health professional." A checklist of the following conditions was read: Alzheimer's disease or other dementia, arthritis or rheumatism, back problems (excluding arthritis), bowel disorders, cancer, cataracts, chemical sensitivities, diabetes, fibromyalgia, heart disease, high blood pressure, migraine, chronic obstructive pulmonary disorder (COPD) or emphysema, asthma, chronic bronchitis, effects of stroke, stomach or intestinal ulcers, thyroid condition, and urinary incontinence. To examine doctor consultations, medication use, hospitalization, and home care in relation to the number of chronic conditions present, respondents were categorized as having 0, 1, 2, 3, 4, or 5 or more of these conditions.

To measure the occurrence of *activity-limiting injuries*, respondents were asked: "In the past 12 months, did you have any injuries that were serious enough to limit your normal activities?"

Self-perceived health was based on the question: "In general, would you say your health is excellent, very good, good, fair or poor?" The five response categories were combined into three: very good/excellent, good, and fair/poor.

Three senior *age groups* were used in this analysis: 65 to 74, 75 to 84, and 85 or older. The age ranges for non-seniors were 12 to 64 when CCHS data were used, and 0 to 64 when the Hospital Morbidity Database was used.

Respondents were grouped into two *education* categories based on the highest level attained: less than secondary graduation and secondary graduation or more. A "missing" category was used in the multivariate analyses to retain as many cases as possible.

In older people, many of whom are retired, current income may not be a reliable indicator of socio-economic status. To identify people of limited means, respondents were asked about their main source of income: wages and salaries; income from self-employment; dividends and interest (for example, on bonds or savings); Employment Insurance; Worker's Compensation; Canada or Québec Pension Plan benefits; retirement pension, superannuation and annuities; Old Age Security and Guaranteed Income Supplement; Child Tax Benefit; provincial or municipal social assistance or welfare; child support; alimony; other (rental income or scholarships, for example); or none. Respondents who cited Old Age Security and Guaranteed Income Supplement or provincial/municipal social assistance or welfare were grouped and compared with an "other" category containing those relying on other income sources.

Living arrangements were defined to reflect two situations: living alone and living with others, including a spouse.

Body mass index (BMI), which was calculated by dividing weight in kilograms by the square of height in metres, was grouped into six categories: underweight (BMI less than 18.5), normal (18.5 to 24.9), overweight (25.0 to 29.9), obese class I (30.0 to 34.9), obese class II and III combined (35.0 or more), and missing. The "missing" category was necessary to retain as many cases as possible in the multivariate analysis.

Physical activity refers to activity during leisure time. Respondents were classified into three groups based on total energy expenditure during leisure time: active (average daily energy expenditure of at least 1.5 kilocalories/kilogram/day); inactive (less than 1.5 kcal/kg/day); and missing. Again, a "missing" category was necessary to retain as many cases as possible for the multivariate analysis. Total energy expenditure during leisure time was calculated from the reported frequency and duration of all of a respondent's leisure-time physical activities in the three months before the 2003 CCHS interview and the metabolic energy demand of each activity, which was independently established.⁴⁰

Smoking was based on responses to the following questions: "Have you ever smoked a whole cigarette?", "In your lifetime, have you smoked a total of 100 or more cigarettes (about four packs)?", "At the present time, do you smoke cigarettes daily, occasionally or not at all?", and "At what age did you stop smoking (cigarettes) daily?" For this analysis, respondents were divided into five categories: current daily smoker, former daily smoker who quit 10 or more years ago, former daily smoker who quit less than 10 years ago, never daily smoker, and missing.

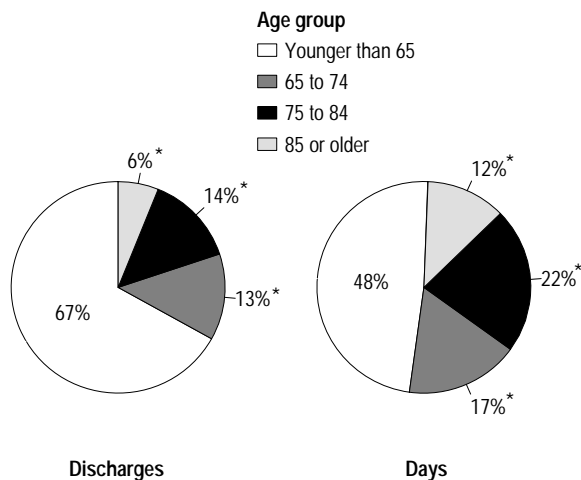
Residence was defined as rural or urban. Urban areas are built-up areas with a population concentration of 1,000 or more and a population density of 400 or more per square kilometre, based on 2001 Census population counts.

Province/Territory consists of a separate variable for each province and a combined variable representing residence in any of the three territories.

Hospital admission

Seniors make up just 13% of the Canadian population, but account for a third of all acute-care hospitalizations and almost half of all hospital days (Chart 2).

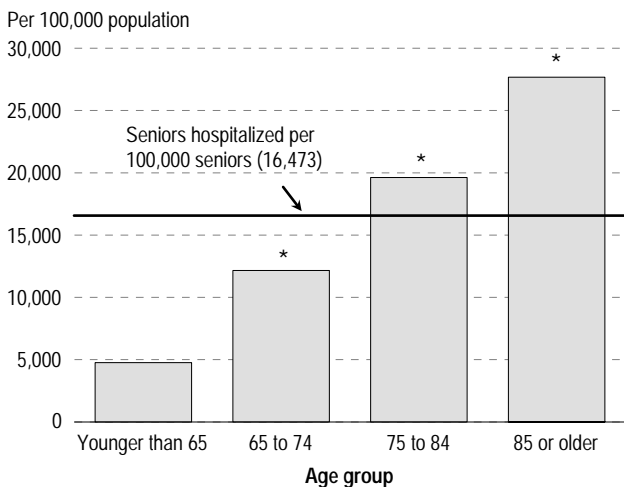
Chart 2
Percentage distribution of hospital discharges and days, by age group, Canada, 2002/03



Data source: 2002/03 Hospital Morbidity Database
* Significantly different from estimate for younger-than-65 age group ($p < 0.05$).

Information from the Hospital Morbidity Database (HMD) shows that in 2002/03, the hospitalization rate of seniors was close to 16,500 per 100,000 population aged 65 or older, compared with about 5,000 per 100,000 for people younger than 65 (Chart 3). Among seniors, the likelihood of hospitalization rose with age

Chart 3
Proportion of people hospitalized, by age group, Canada, 2002/03



Data source: 2002/03 Hospital Morbidity Database
Note: Based on linkable records for 1,962,409 uniquely identified patients.
* Significantly different from estimate for younger-than-65 age group ($p < 0.05$)

from 12,000 per 100,000 aged 65 to 74 to about 28,000 per 100,000 aged 85 or older.

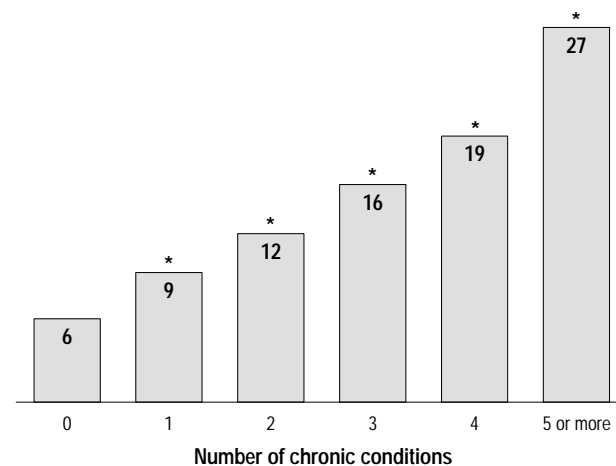
Repeat admissions are also more common among seniors than among younger people. About a third of senior men and women who were hospitalized in 2002/03 were admitted more than once that year: nearly 20% were admitted twice, and 12% at least three times (data not shown).

Once seniors are in hospital, they typically spend more time there than do younger people. In 2002/03, seniors' average length of stay was nearly 11 days, compared with 5 days for patients younger than 65 (data not shown). And the older seniors were, the longer their hospital stays: at ages 65 to 74, the average stay was about 9 days; at age 85 or older, around two weeks (data not shown).

Detailed information about health, socio-economic and health-related risk factors associated with hospitalization is not available from the HMD. Such data are collected by the Canadian Community Health Survey (CCHS), but pertain only to seniors living in the community; the institutionalized population is excluded.

As might be expected, the CCHS data show that seniors' likelihood of being hospitalized was closely tied to chronic conditions, injury and self-perceived health. In 2003, 27% of community-dwelling seniors with five or more chronic conditions reported that they had been hospitalized in the previous year, whereas the figure was 6% among those with no conditions (Chart 4). As well, about 25% of seniors who had suffered an activity-limiting injury in the previous year

Chart 4
Percentage hospitalized in past year, by number of chronic conditions, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
* Significantly higher than estimate for preceding category ($p < 0.05$)

Table 5
Percentages and adjusted odds ratios for hospitalization in past 12 months, by sex and selected characteristics, household population aged 65 or older, Canada, 2003

	Men			Women		
	%	Adjusted odds ratio	95% confidence interval	%	Adjusted odds ratio	95% confidence interval
Number of chronic conditions						
None [†]	6.8	1.0	...	5.1 ^E	1.0	...
1	9.9*	1.3	0.9, 1.9	8.9*	1.7*	1.1, 2.5
2	13.9*	1.6*	1.2, 2.3	10.9*	1.8*	1.2, 2.6
3	18.4*	2.1*	1.5, 2.9	14.1*	2.1*	1.4, 3.1
4	23.2*	2.6*	1.8, 3.7	17.3*	2.3*	1.6, 3.4
5 or more	30.7*	3.2*	2.3, 4.6	25.7*	3.2*	2.1, 4.9
Activity-limiting injury						
No [†]	14.3	1.0	...	12.6	1.0	...
Yes	24.3*	1.8*	1.3, 2.3	25.9*	2.1*	1.7, 2.5
Self-perceived health						
Fair/Poor	27.1*	2.4*	1.9, 3.0	24.2*	2.3*	1.9, 2.8
Good	13.7*	1.5*	1.2, 1.8	12.2*	1.3*	1.1, 1.6
Very good/Excellent [†]	8.2	1.0	...	7.7	1.0	...
Has regular doctor						
Yes [†]	15.3	1.0	...	14.0	1.0	...
No	9.2 ^E	0.6*	0.4, 0.9	10.4*	0.8	0.6, 1.1
Age group						
65-74 [†]	13.6	1.0	...	10.8	1.0	...
75-84	16.5*	1.0	0.8, 1.2	17.1*	1.4*	1.2, 1.6
85+	23.3*	1.3	0.9, 1.8	18.9*	1.4*	1.1, 1.7
Education						
Less than secondary graduation	16.0*	0.9	0.8, 1.1	15.0*	1.0	0.8, 1.1
Secondary graduation or more [†]	13.8	1.0	...	12.5	1.0	...
Main source of income						
Social assistance or Old Age Security and Guaranteed Income Supplement	18.9*	1.2	1.0, 1.5	15.5*	1.1	1.0, 1.3
Other [†]	14.1	1.0	...	12.9	1.0	...
Living arrangements						
Alone	16.9*	1.2*	1.0, 1.4	15.1*	1.1	1.0, 1.3
With others [†]	14.7	1.0	...	13.1	1.0	...
Body mass index (BMI)						
Underweight (< 18.5)	30.3 ^E	1.5	0.9, 2.8	22.0*	1.3	0.9, 1.8
Normal (18.5-24.9) [†]	15.5	1.0	...	12.8	1.0	...
Overweight (25.0-29.9)	14.0	0.9	0.7, 1.1	13.0	1.0	0.8, 1.1
Obese (class I) (30.0-34.9)	15.0	0.8	0.6, 1.0	16.7*	1.1	0.9, 1.4
Obese (class II or III) (≥ 35.0)	18.4	0.9	0.6, 1.3	19.4*	1.5*	1.0, 2.2
Leisure-time physical activity						
Active [†]	10.5	1.0	...	9.3	1.0	...
Inactive	17.5*	1.5*	1.2, 1.8	14.8*	1.2*	1.0, 1.5
Smoking status						
Never daily smoker [†]	13.2	1.0	...	12.8	1.0	...
Former daily smoker (10+ years)	14.8	1.0	0.8, 1.3	14.4	1.1	0.9, 1.3
Former daily smoker (< 10 years)	21.0*	1.4*	1.1, 1.9	20.3*	1.6*	1.3, 2.1
Current daily smoker	14.8	0.9	0.7, 1.2	12.5	1.0	0.7, 1.3
Area of residence						
Urban [†]	15.0	1.0	...	13.9	1.0	...
Rural	15.4	1.0	0.8, 1.2	13.6	1.0	0.8, 1.1
Province/Territory						
Newfoundland and Labrador	17.5	1.2	0.8, 1.7	14.2	1.0	0.7, 1.6
Prince Edward Island	19.6 ^E	1.3	0.8, 2.1	14.3 ^E	1.0	0.7, 1.6
Nova Scotia	15.3	0.9	0.6, 1.2	14.6	1.0	0.8, 1.3
New Brunswick	22.8*	1.4*	1.1, 1.9	18.6*	1.5*	1.2, 2.0
Québec	15.8	1.1	1.0, 1.3	15.4*	1.2*	1.0, 1.3
Ontario	14.0	0.9*	0.8, 1.0	12.3*	0.9*	0.8, 0.9
Manitoba	15.8	1.0	0.8, 1.4	13.7	1.0	0.8, 1.3
Saskatchewan	15.9	1.0	0.8, 1.3	17.4*	1.2*	1.0, 1.5
Alberta	15.6	1.1	0.8, 1.4	12.8	1.0	0.8, 1.3
British Columbia	14.1	0.9	0.8, 1.1	13.9	1.0	0.8, 1.2
Yukon, Nunavut, Northwest Territories	27.3 ^E	2.2*	1.1, 4.7	F	1.2	0.4, 3.2

Data source: 2003 Canadian Community Health Survey

Notes: Based on 10,990 male and 16,563 female respondents; 451 male and 668 female respondents were excluded from analyses because of missing data. Missing categories for education, main source of income, BMI, physical activity and smoking were included in models, but odds ratios are not shown. Because of rounding, some odds ratios with 1.0 as the lower/upper confidence limit were statistically significant.

† Reference category; reference category for province/territory is Canada (15.0% of men and 13.9% of women were hospitalized).

* Significantly different from estimate for reference category ($p < 0.05$)

E Coefficient of variation 16.6% to 33.3% (interpret with caution)

F Coefficient of variation greater than 33.3% (suppressed because of extreme sampling variability)

... Not applicable

had been admitted to hospital, compared with around 13% of those who had not been injured. And about 25% of seniors who reported their health as "fair" or "poor" had been hospitalized, compared with 8% of those who judged their health to be "very good" or "excellent." Even allowing for the effects of other potentially influential variables, chronic conditions, injury and self-perceived health remained strongly associated with the likelihood that seniors would be hospitalized (Table 5).

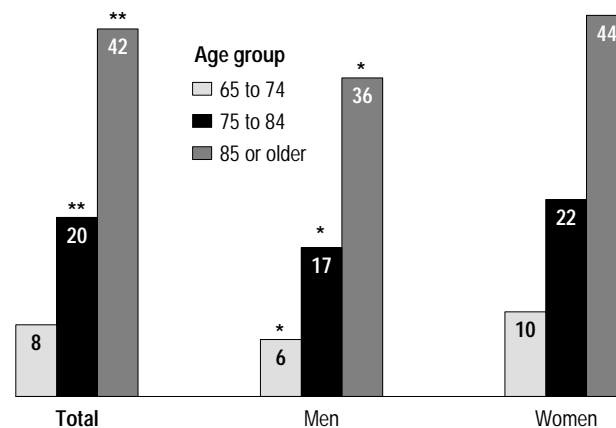
Relatively high percentages of seniors with less than secondary graduation or who reported social assistance or Old Age Security and the Guaranteed Income Supplement as their main source of income had been hospitalized. However, when these factors were considered along with variables reflecting health in multivariate models, neither education nor source of income was significantly related to hospitalization. This suggests that the higher likelihood of hospitalization for seniors with lower education or limited means reflects their higher prevalence of conditions requiring care.

Home care

In 2003, 15% or 566,500 non-institutionalized seniors reported receiving home care (Table 6). The services included nursing care, other health care, personal care, everyday housework, meal preparation or delivery, shopping and respite care. Sources of care were formal providers, such as nurses and homemakers, and/or informal providers such as family, friends, or neighbours.

The percentage receiving home care rose from 8% at ages 65 to 74 to 42% at 85 or older (Chart 5). At every age, women were more likely than men to receive home care. Factors associated with being female, such as living arrangements and needing help with

Chart 5
Percentage who received home care in past year, by age group and sex, household population aged 65 or older, Canada, 2003



Data source: 2003 Canadian Community Health Survey
 Note: Differences between age groups not tested for each sex.
 * Significantly different from estimate for women ($p < 0.05$)
 ** Significantly different from estimate for 65-to-74 age group ($p < 0.05$)

activities of daily living, likely account for much of this difference.^{41,42} For example, for both sexes, a higher percentage of those living alone than those living with others received home care, and elderly women were more likely than elderly men to live alone (data not shown).

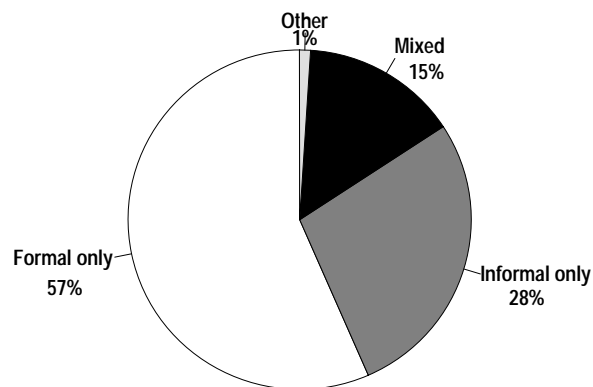
More than half of seniors who reported home care (57%) received that care exclusively from formal sources (Chart 6). Another 28% relied on family, friends and neighbours, while the remaining 15% received both types of assistance. It is possible,

Table 6
Number and percentage who received home care in past year, by sex and source of care, household population age 65 or older, Canada, 2003

Source of care	Total		Men		Women	
	'000	%	'000	%	'000	%
Total	566.5	15.0	193.5	11.7*	373.0	17.6
Formal only	321.7	8.5	114.6	6.9*	207.2	9.8
Informal only	155.8	4.1	51.9	3.1*	103.9	4.9
Mixed	84.7	2.2	26.5	1.6*	58.2	2.7
Other	4.3	0.1 ^E	F	F	3.6 ^E	0.2 ^E

Data source: 2003 Canadian Community Health Survey
 Note: Because of rounding, detail may not sum to totals.
 * Significantly different from estimate for women ($p < 0.05$)
 E Coefficient of variation 16.6% to 33.3% (interpret with caution)
 F Coefficient of variation greater than 33.3% (suppressed because of extreme sampling variability)

Chart 6
Percentage distribution of source of care reported by household population aged 65 or older receiving home care, Canada, 2002/03



Data source: 2003 Canadian Community Health Survey
 Note: Because of rounding, detail does not sum to 100%.

Table 7
 Percentages and adjusted odds ratios for receiving home care in past year, by sex and selected characteristics, household population aged 65 or older, Canada, 2003

	Men			Women		
	%	Adjusted odds ratio	95% confidence interval	%	Adjusted odds ratio	95% confidence interval
Number of chronic conditions						
None [†]	4.7	1.0	...	5.6	1.0	...
1	7.6*	1.4	0.9, 2.1	9.2*	1.5*	1.0, 2.1
2	9.2*	1.2	0.8, 1.9	14.3*	2.0*	1.4, 2.9
3	14.3*	1.6*	1.1, 2.5	17.8*	2.2*	1.6, 3.1
4	19.1*	2.0*	1.3, 3.1	21.9*	2.1*	1.5, 3.0
5 or more	26.6*	2.3*	1.5, 3.7	33.8*	3.1*	2.2, 4.4
Activity-limiting injury						
Yes	17.4*	1.3	1.0, 1.8	30.4*	1.6*	1.3, 2.0
No [†]	11.2	1.0	...	16.3	1.0	...
Self-perceived health						
Fair/Poor	23.7*	2.0*	1.5, 2.7	33.5*	2.6*	2.1, 3.1
Good	9.5*	1.3*	1.0, 1.8	14.2*	1.2*	1.0, 1.5
Very good/Excellent [†]	5.5	1.0	...	9.0	1.0	...
Hospitalized in past year						
Yes	36.4*	5.5*	4.3, 7.1	46.1*	4.0*	3.4, 4.7
No [†]	7.3	1.0	...	13.0	1.0	...
Age group						
65-74 [†]	6.5	1.0	...	9.7	1.0	...
75-84	17.5*	2.7*	2.2, 3.4	22.5*	2.1*	1.8, 2.4
85+	36.4*	6.1*	4.2, 8.7	44.5*	5.7*	4.5, 7.1
Education						
Less than secondary graduation	13.4*	1.1	0.9, 1.4	19.4*	0.9	0.8, 1.1
Secondary graduation or more [†]	9.5	1.0	...	15.2	1.0	...
Main source of income						
Social assistance or Old Age Security and Guaranteed Income Supplement	17.0*	1.2	0.9, 1.6	20.9*	1.1	0.9, 1.3
Other [†]	10.6	1.0	...	16.0	1.0	...
Living arrangements						
Alone	16.9*	1.8*	1.4, 2.2	21.8*	1.5*	1.3, 1.7
With others [†]	10.8	1.0	...	14.9	1.0	...
Body mass index (BMI)						
Underweight (< 18.5)	40.3*	3.4*	1.8, 6.4	29.5*	1.1	0.8, 1.6
Normal (18.5-24.9) [†]	12.1	1.0	...	16.4	1.0	...
Overweight (25.0-29.9)	10.1*	1.0	0.8, 1.2	15.8	1.0	0.8, 1.1
Obese class I (30.0-34.9)	11.9	1.1	0.8, 1.5	19.7*	1.1	0.9, 1.4
Obese class II or III (≥ 35.0)	13.7 ^E	1.3	0.8, 2.1	24.9*	1.6*	1.1, 2.3
Leisure-time physical activity						
Active [†]	5.3	1.0	...	7.9	1.0	...
Inactive	13.8*	2.0*	1.6, 2.6	20.3*	1.9*	1.6, 2.3
Smoking status						
Never daily smoker [†]	10.2	1.0	...	17.5	1.0	...
Former daily smoker (10+ years)	12.2	1.0	0.8, 1.4	17.4	1.0	0.8, 1.2
Former daily smoker (< 10 years)	13.2	0.9	0.6, 1.3	20.5*	1.2	0.9, 1.6
Current daily smoker	11.3	0.9	0.6, 1.3	15.3	1.0	0.8, 1.2
Area of residence						
Urban [†]	12.1	1.0	...	17.6	1.0	...
Rural	10.4	0.8*	0.6, 1.0	17.6	1.1	0.9, 1.3
Province/Territory						
Newfoundland and Labrador	11.5 ^E	0.9	0.5, 1.4	15.6	0.8	0.6, 1.3
Prince Edward Island	11.9 ^E	0.6	0.3, 1.2	20.4	1.1	0.8, 1.7
Nova Scotia	17.7*	1.6*	1.1, 2.3	22.9*	1.2	0.9, 1.5
New Brunswick	20.0*	1.4	1.0, 2.0	21.4	1.1	0.9, 1.5
Québec	11.4	1.0	0.8, 1.2	16.7	0.9	0.8, 1.1
Ontario	11.4	1.0	0.9, 1.2	17.2	1.0	0.9, 1.1
Manitoba	9.7	0.6*	0.4, 0.9	17.8	0.9	0.7, 1.2
Saskatchewan	11.7	0.8	0.6, 1.2	18.4	0.9	0.7, 1.1
Alberta	11.4	0.9	0.7, 1.3	15.9	0.9	0.8, 1.1
British Columbia	10.8	1.0	0.8, 1.2	19.1	1.1	1.0, 1.3
Yukon, Nunavut, Northwest Territories	26.7 ^{E*}	3.0*	1.3, 7.3	31.6 ^{E*}	3.5*	1.9, 6.6

Data source: 2003 Canadian Community Health Survey

Notes: Based on 10,983 male and 16,545 female respondents; 458 male and 686 female respondents were excluded from analyses because of missing data. "Missing" categories for education, main source of income, BMI, physical activity and smoking were included in models, but odds ratios are not shown. Because of rounding, some odds ratios with 1.0 as the lower/upper confidence limit were statistically significant.

† Reference category; reference category for province/territory is Canada (men 11.7% and women 17.6% received home care).

^E Coefficient of variation 16.6% to 33.3% (interpret with caution)

* Significantly different from reference category ($p < 0.05$)

... Not applicable

however, that some informal care, from a spouse for instance, was not reported, because it is perceived as part of the usual support provided to family members.

Other research, focusing on the *amount* of care received from each type of provider, revealed that more than half the total hours of help time came from informal sources.⁴³ Seniors who depended exclusively on formal sources reported fewer hours of care a week than did those assisted by informal sources alone or those getting help from mixed sources.

As might be expected, poor health was an important determinant of receiving home care. Around a quarter of senior men (27%) and a third (34%) of senior women with five or more chronic conditions had received home care in the past year, compared with about 5% of those who reported no chronic conditions (Table 7). Home care was also more likely to be reported by seniors who had suffered an activity-limiting injury, compared with those who had not been injured, and by those who described their health as “fair,” “poor” or “good,” compared with those in better health. When the effects of the other variables were taken into account in a multivariate model, the odds of receiving home care were significantly high among seniors with multiple chronic conditions, a serious injury (women), or poor, fair or good health.

Relatively high proportions of seniors with less education (13% of men and 19% of women) and lower income (17% of men and 21% of women) received home care. However, when the effects of the other variables were taken into account, education and main source of income were not significantly associated with receiving home care.

Concluding remarks

In relation to their numbers in the population, seniors are heavy users of health care services. This is largely a reflection of the decline in health that often accompanies advancing age.

Not surprisingly, the number of chronic conditions was the strongest determinant of the frequency with which seniors consulted physicians and used medications. Having chronic conditions also increased the likelihood of being hospitalized and receiving home care. As well, injury and fair or poor self-perceived health contributed substantially to health care use.

When these indicators of health and the other variables were considered, differences in seniors' level of education or main source of income generally were no longer significantly associated with their use of health care resources. Thus, seniors' use of doctors, medications, hospitals and home care was determined by their health, not by their education or financial means. ■

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Successful aging in health care institutions

- *Four out of ten seniors living in long-term care facilities in 1996/97 had positive self-perceived health.*
- *When the effects of age, sex and the presence of chronic conditions were controlled, over a six-year period, institutionalized seniors with positive self-perceived health were less likely to die than were those with more negative perceptions.*
- *Seniors were more likely to report positive health if they were pain-free and independent.*
- *Participation in social activities and feeling close to at least one staff member were significantly related to positive self-perceived health among institutionalized seniors.*

Abstract

Objectives

This article explores factors associated with positive self-perceived health among Canadian seniors who live in health care institutions.

Data source

Cross-sectional and longitudinal data are from the institutional and household files of the National Population Health Survey (NPHS).

Analytical techniques

Prevalence rates of positive self-perceived health were estimated using 1996/97 cross-sectional data from the NPHS. Logistic regression models were used to identify factors associated with positive self-perceived health. With four cycles of longitudinal data, the relationship between positive self-perceived health and mortality was explored using survival analysis.

Main results

In 1996/97, 43% of the institutional population aged 65 or older reported positive self-perceived health. Institutional residents with positive self-perceived health had a lower risk of mortality. The odds of positive self-perceived health were higher for those who were usually free of pain and were independent. Participation in social and recreational activities and having a close relationship with at least one staff member of the institution were associated with positive self-perceived health.

Keywords

self-perceived health, residential facilities, chronic conditions, social support

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The Canadian population is aging. In 2004, 13% of the population was 65 or older; in 1971, the figure was just 8%.¹ Even greater changes in the proportion of seniors will occur in 2011 when the oldest baby boomers, those born in 1946, reach 65. It is projected that by 2051, a quarter of Canadians will be in their senior years.²

Aging is often accompanied by the onset or exacerbation of disease and disability, and a greater need for assistance with daily activities and personal care. While most seniors remain in the community as their needs increase, some require long-term institutional care. Since 1981, the proportion of people aged 65 or older living in health care institutions has remained fairly stable at around 7%.³ However, over the same period, as the elderly population increased, the actual number living in health care institutions rose from about 173,000 to more than 263,000.³

Methods

Data sources

This article is based on data from the National Population Health Survey (NPHS). The NPHS, which began in 1994/95, has three components: private households, the North, and health care institutions. This study relies most heavily on the last component.

The NPHS Health Institutions component collected data from people living in hospitals, nursing homes, and facilities for people with disabilities. The institutions were sampled from a list of residential care facilities collected by the Canadian Institute for Health Information and a list of hospitals maintained by the Health Statistics Division of Statistics Canada. The sample was restricted to facilities with at least four beds. In-scope institutions were stratified in three stages, first by geography (five regions excluding the Territories), then by type of institution (institutions for the elderly, institutions for those who are cognitively impaired, and other rehabilitative institutions), and finally, by size (number of beds). The first cycle of the NPHS (1994/95) was cross-sectional, while the second (1996/97) was both cross-sectional and longitudinal. Beginning in cycle 3 (1998/97), the NPHS became strictly longitudinal.

Interviewers initially met with institution administrators to establish which residents would require proxy interviews because of illness or incapacity (see *Proxy responses*). Next-of-kin were contacted and given the option of completing the interview on their relative's behalf or having a knowledgeable staff member or volunteer respond for their relative. Most interviews were done in person, although telephone interviews were accepted for proxy respondents who could not be met in person.

Prevalence rates for the institutional and household populations were based on the NPHS 1996/97 (cycle 2) cross-sectional files. The institutional file contains data for 2,118 respondents, 1,711 of whom were 65 or older, representing about 185,100 seniors at the Canada level. This cycle had an institutional response rate of 100% and an individual response rate of 89.9%. The 1996/97 household file contains data for 81,804 respondents, 13,363 of whom were 65 or older, representing approximately 3.4 million seniors. The response rate for the selected person in the household component was 95.6%.

Four cycles (1994/95, 1996/97, 1998/99, 2000/01) of the NPHS Health Institutions component, longitudinal file, were used to calculate proportional hazards ratios for death, by self-perceived health. The original sample of 2,287 respondents was restricted to 1,768 people who were 65 or older in the first cycle (1994/95) and for whom information was available in every cycle. The analysis relied on the full file (responses at every cycle) because of the availability of bootstrap weights. By cycle 4 (2000/01) 1,449 people had died, leaving 319 survivors. The initial 1,768 respondents represented about 186,300 seniors at the Canada level. The cycle 4 longitudinal institutional response rate was 99.3%. Within these institutions, interviews were completed for 97.6% of selected residents (individual response rate).

Detailed documentation on the NPHS can be found at Statistics Canada's Web site (<http://www.statcan.ca>).

In addition to the NPHS, census data from 1971 onwards were used to provide background information on the number and percentage of seniors in Canada, as well as the proportion of the population living in health care institutions. The population projections were produced by the Demography Division of Statistics Canada.²

Analytical techniques

Prevalence rates of self-perceived health by selected characteristics were estimated using cross-sectional data from the 1996/97 NPHS institutional and household components. The institutional component was used for the multiple logistic regression analysis to model associations between selected factors and self-perceived health. Some factors were not modifiable (selected chronic physical conditions), while others could be modified, or modified at least in part (social network, social involvement, independence, pain and barriers to communication). In addition, age (entered as a continuous variable), sex, and proxy reporting status were included in the model. Separate models were examined; that is, groups of factors were entered in blocks, but only the final model, which includes all variables, is presented in this analysis.

Proportional hazards ratios for death were calculated with data from the longitudinal file of the NPHS Health Institutions component. Death dates were imputed for 47 people reported to have died during the study but whose date of death was missing. These people were assumed to have died midway between cycles. For missing values in cycle 2, the imputed year of death is the year of the first interview, plus one; for cycle 3, it was the year of the first interview plus three. There were no missing death dates for cycle 4. Month of death was imputed to the same month as the first interview, and day of death was set to the first day of the month. Multivariate proportional hazards analysis was used to assess the association between positive self-perceived health and survival time. The proportional hazards coefficient estimates the effect on survival time of each covariate entered in the model. For respondents who died during the six-year follow-up period, the duration of survival was measured as the number of days from the date of the cycle 1 interview until the date of death at some time before the cycle 4 interview. For people who completed the cycle 4 interview, the duration of survival was defined as the difference in days between the cycle 1 and cycle 4 interviews; after the cycle 4 interview, the survival time was considered censored. A single model was generated that controlled for sex, age (entered as a continuous variable) and selected physical conditions.

All analyses based on survey data were weighted to reflect the age and sex distribution of the appropriate target population. To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique.⁴⁻⁶

The number of institutional beds required to meet the needs of the aging population is growing. One projection suggests over half a million (565,000) people will require long-term care by 2031.⁷ Based on population projections,² and assuming that the proportion of seniors living in health care institutions remains at the 2001 rate of 6.7%, by 2051, between 600,000 and 670,000 Canadians will be residing in such institutions. The demand will likely rise most rapidly among the oldest seniors (85 or older), because almost a third of people in this age group live in health care institutions, and because the number aged 80 or older is expected to increase nearly fourfold to more than 3 million by 2051.²

While the need for institutional care has increased with the aging population, so, too, has the emphasis on “successful aging.” The idea that declining life satisfaction is inevitable in the senior years has given way to the belief that people can maintain a good quality of life as they age.⁸⁻¹¹

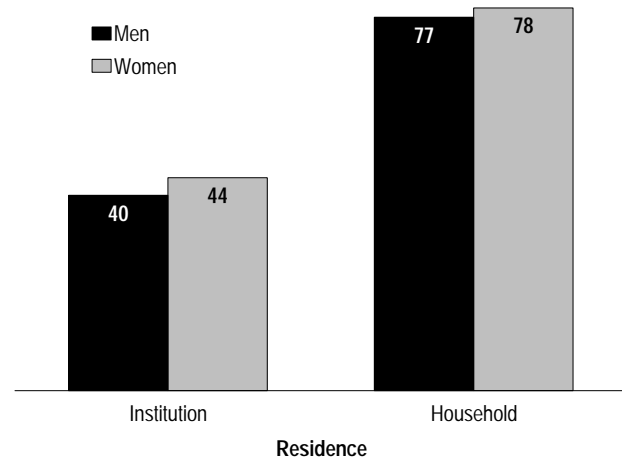
“Successful aging” is a multidimensional concept that includes physical, psychosocial and spiritual components.⁸⁻¹² It has been operationalized using both objective and subjective measures: physician-diagnosed conditions and self-reported physical health, for example.^{10,13} For some, “successful aging” means living in the community, a perspective that automatically excludes residents of health care institutions. Others cite the importance of adaptation to life’s circumstances, such as chronic diseases and institutionalization. Although community-residing seniors age more successfully than those who are institutionalized, the latter are not excluded from a positive aging process.¹⁰

Based on cross-sectional and longitudinal data from the National Population Health Survey (NPHS), this analysis examines seniors living in health care institutions to determine factors associated with successful aging (see *Methods, Definitions and Limitations*). Following the patient-centred approach of other research,⁹ this study uses seniors’ perceptions of their own general health as a measure of successful aging.

Evidence of successful aging

Having good, very good or excellent self-perceived health (referred to here as “positive” self-perceived health) is used to identify seniors who are likely to be aging successfully. Self-perceived health is a reliable and valid measure of overall well-being, encompassing mental and emotional health, as well as physical conditions and underlying symptoms.¹⁴⁻¹⁹ This indicator has been used with a variety of age groups, including seniors.^{16,18,20-22} However, most studies focus on

Chart 1
Percentage with positive self-perceived health, by sex and residence, population aged 65 or older, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional samples, Health Institutions and Household components

household populations and exclude people who are institutionalized.^{15,18,20,22,23}

As expected, seniors in health care institutions were far less likely to report positive self-perceived health than were those in private households (Chart 1) (see *Proxy responses*). However, a sizeable proportion of institutionalized seniors—43%—reported their health as good, very good or excellent. Unlike the results of some earlier studies,²¹ the proportions of men and women with positive self-perceived health did not differ. Even when other possible confounders such as age and health status were taken into account, no gender differences were apparent in institutionalized seniors’ odds of reporting positive health (Table 1).

Older seniors most positive

While negative perceptions of health are often associated with aging,¹⁸ this is not inevitable.^{17,19} In fact, based on NPHS data, the oldest (85 or older) seniors in health care institutions were more likely than younger residents (65 to 84) to rate their health positively (Chart 2). Even when the other factors were controlled, as residents aged they had higher odds of reporting positive self-perceived health (Table 1). The opposite was true for seniors in private households; those who were older were more likely than younger seniors to rate their health as fair or poor (Chart 2).

This pattern is consistent with the idea that people assess their health in relation to their circumstances, their expectations and their peers.^{17,19,21} The context

Table 1
Prevalence of and adjusted odds ratios for positive self-perceived health, by selected characteristics, institutional population aged 65 or older, Canada excluding territories, 1996/97

	%	Adjusted odds ratio	95% confidence interval		%	Adjusted odds ratio	95% confidence interval
Total	42.8	...	...	Independent			
Sex				Yes	66.0*	1.7*	1.1, 2.6
Men†	40.5	1.0	...	No†	37.3	1.0	...
Women	43.6	1.1	0.8, 1.5	Pain-free			
Age group				Yes	52.5*	2.6*	1.9, 3.4
65-84†	39.8	...	...	No†	29.9	1.0	...
85+	45.7*	...	...	Barriers to communication			
Age (continuous)	...	1.04*	1.02, 1.06	Yes	36.2*	0.9	0.7, 1.1
Proxy response				No†	50.0	1.0	...
Yes	34.3*	0.7*	0.5, 0.9	Social network			
No†	55.4	1.0	...	Close staff member(s)			
Chronic conditions				Yes	48.0*	1.3*	1.0, 1.8
Alzheimer's disease				No†	40.8	1.0	...
Yes	35.8*	0.8	0.6, 1.1	Missing	...	0.9	0.6, 1.4
No†	48.2	1.0	...	Close friend(s) inside facility			
Arthritis/Rheumatism				Yes	47.4*	0.9	0.7, 1.2
Yes	39.3*	0.8	0.6, 1.1	No†	41.4	1.0	...
No†	47.0	1.0	...	Missing	...	1.3	0.8, 2.3
Cataracts				Close relative(s) or friend(s) outside facility			
Yes	35.4*	0.6*	0.4, 0.8	Yes	43.2	0.7	0.4, 1.2
No†	46.6	1.0	...	No†	47.5	1.0	...
Diabetes				Missing	...	0.4	0.1, 1.1
Yes	27.5*	0.5*	0.3, 0.8	Social involvement			
No†	45.9	1.0	...	Daily	56.5*	2.4*	1.4, 3.9
Effects of stroke				At least once a week	49.3*	1.8*	1.3, 2.5
Yes	29.0*	0.7*	0.5, 1.0	At least once a month	45.8*	2.1*	1.3, 3.4
No†	47.3	1.0	...	Less than once a month	44.2*	1.4	0.9, 2.2
Heart disease				Never†	29.6	1.0	...
Yes	31.4*	0.7*	0.5, 0.9				
No†	47.3	1.0	...				
Urinary/Bowel incontinence							
Yes	35.0*	0.7*	0.5, 0.9				
No†	55.1	1.0	...				

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health Institutions component

Note: Because of rounding, some odds ratios with 1.0 as the lower/upper limit were statistically significant.

† Reference category

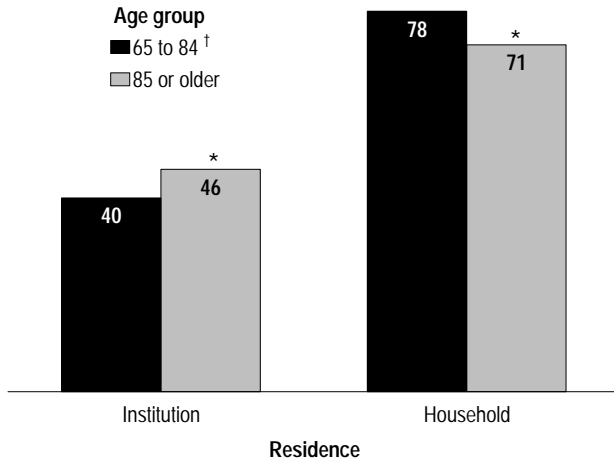
*Significantly different from estimate for reference category ($p < 0.05$)

... Not applicable

of seniors in institutions is very different from that of seniors who reside in the community. Simply reaching an older age may give a person in an institution the perception of being among the “healthiest.” As well, the relatively high percentage of very old institutional residents with positive self-perceived health may be a “healthy survivor” effect: those who had reached 85 or older may have been hardier, and many who were not as healthy had already died.¹⁸ Alternatively, self-perceived health may depend more on a *change* in

health status than the actual level of health before or after that change.^{17,18} Younger seniors whose declining health prompted a recent move into an institution may view their health more pessimistically than do those who have been institutionalized for a longer period. The move to an institution can be a particularly difficult transition, as it often represents a “last resort” where people may surrender their self-image as independent, productive members of society.²⁴

Chart 2
Percentage with positive self-perceived health, by age group and residence, population aged 65 or older, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional samples, Health Institutions and Household components
 † Reference category
 * Significantly different from estimate for reference category ($p < 0.05$)

Table 2
Adjusted proportional hazards ratios for death by 2000/01, by selected characteristics, institutional population aged 65 or older in 1994/95, Canada excluding territories

	Proportional hazards ratio	95% confidence interval
Self-perceived health		
Good/Very good/Excellent	0.6*	0.6, 0.7
Fair/Poor†	1.0	...
Sex		
Men†	1.0	...
Women	0.6*	0.5, 0.7
Age (continuous)	1.05*	1.04, 1.06
Chronic physical conditions		
Alzheimer's disease	1.1	1.0, 1.3
Arthritis/Rheumatism	0.9	0.8, 1.0
Cataracts	1.1	1.0, 1.3
Diabetes	1.2*	1.0, 1.4
Effects of stroke	1.2*	1.1, 1.4
Heart disease	1.0	0.9, 1.1
Urinary/Bowel incontinence	1.2*	1.1, 1.4

Data source: 1994/95, 1996/97, 1998/99 and 2000/01 National Population Health Survey, longitudinal sample, Health Institutions component
Note: Because of rounding, a hazards ratio with 1.0 as the lower limit was statistically significant.
 † Reference category. When not noted, reference category is absence of characteristic; for example, reference category for diabetes is no reported diagnosis of diabetes.
 *Significantly different from estimate for reference category ($p < 0.05$)
 ... Not applicable

Self-perceived health and mortality

Studies of community samples have found that self-perceived health is predictive of mortality.^{17,20,21,25,26} According to NPHS data, this relationship also exists in the institutional population. Seniors who reported positive self-perceived health in 1994/95 were less likely to die over the following six years than were those with poor self-perceived health, even when age, sex and physical conditions were taken into account (Table 2).

The strength and consistency of self-perceived health as a predictor of mortality may lie in its ability to reflect an array of information not easily captured by objective health measures, including early symptoms of disease, severity of diagnosed conditions, availability of resources including social networks and support, family history, and other factors that can influence both short- and longer-term mortality.^{17,20,25}

Factors associated with positive self-perceived health

The relationship between self-perceived health and mortality raises questions about the factors associated with positive perceptions. Helping people maintain or improve their perception of their health likely contributes to successful aging. Earlier studies have explored how personal characteristics and the availability of resources affects self-perceived health.^{18,22,23}

In this analysis, factors associated with self-perceived health are divided into three categories: those that cannot be modified, those that can, and those with elements of both. The non-modifiable factors are chronic conditions that frequently affect seniors. Although these conditions can be treated, they are non-modifiable in the sense that they cannot easily be eliminated; they represent the circumstances that seniors must live with as a result of the aging process, earlier lifestyle choices, past environmental conditions, and genetic make-up. Respondents' social networks and levels of social involvement are modifiable factors. These factors may be changed by the individual, by family and by friends, or through the actions of the health care institutions. Independence, pain and barriers to communication have modifiable and non-modifiable elements. While they may result from a non-modifiable physical condition, their effects can be modified with the use of medications and assistive devices.

Definitions

Self-perceived health is based on the question: “In general, would you say your health is: ...” The five response categories were combined: good/very good/excellent health comprises “positive” self-perceived health, while fair/poor health constitutes “negative” self-perceived health.

The presence of a *chronic condition* was established by asking respondents if a doctor had told them that they had a chronic disease that had lasted, or was expected to last, at least six months. Respondents were read a list of conditions that included Alzheimer’s disease/other dementia, arthritis/rheumatism, cataracts, diabetes, effects of stroke, heart disease, and urinary or bowel incontinence.

Seniors were considered *independent* if they did not need the help of another person with any of the following activities:

- Personal care (bathing, dressing or eating).
- Moving about inside the residence or institution.
- Getting in or out of bed.
- Getting in or out of a chair or wheelchair.

Seniors were considered *pain-free* if they answered “yes” to the question, “Are you usually free of pain or discomfort?”

Derived variables for speech and hearing problems were used to identify seniors who reported a *barrier to communication*. The National Population Health Survey uses a series of questions to derive an ordinal variable with categories from “no speech problems” (1) to “not understood by friends” (5). Similarly, categories for hearing range from “no hearing problems” (1) to “cannot hear” (7). Between these extremes are problems of varying degrees that are corrected or are not. Seniors with any degree of speech or hearing problem (a response category greater than (1) were considered to have a barrier to communication.

Three *social network* variables were derived from four questions:

- “How many staff members of this facility do you have a close relationship with, that is, feel at ease with or can talk to about private matters?”
- “Not counting relatives or staff, how many close friends do you have living inside this facility?”
- “How many relatives do you feel close to?”
- “Again, not counting relatives or staff, how many close friends do you have living outside this facility?”

For staff members and friends inside the facility, two dichotomous variables were created to indicate if the respondent had one or more close friends/staff members versus no close relationships. The third derived variable indicates if the respondent felt close to at least one relative or friend outside the institution.

Social involvement was derived from the following questions:

- “Do you belong to any groups or participate in groups inside this facility such as a social club, a hobby group, or religious services or meetings?”
- People who responded “yes” to the first question were then asked: “How often did you participate in meetings or activities in the past 12 months? If you belong to many [groups], just think of the one in which you are most active.”
- “During the past 12 months, how often did you leave this facility for social or recreational purposes, such as outings, visits or trips?”

From these three questions, respondents were categorized as having daily, at least once a week, at least once a month, less than once a month or no social involvement.

Physical conditions

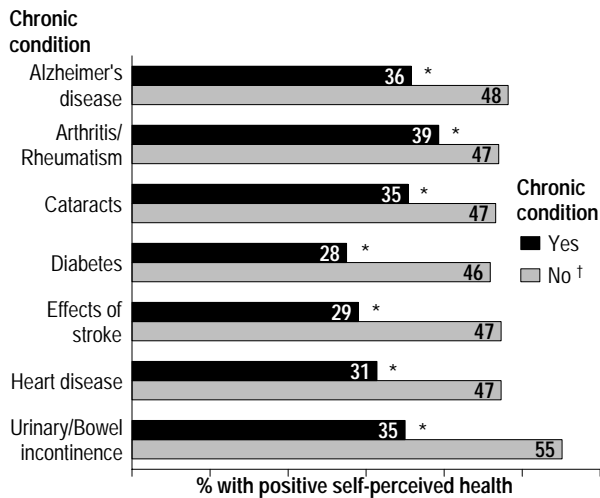
Consistent with earlier studies,^{15,23,27} findings from the NPHS show that seniors who suffer from selected chronic conditions were less likely to have a positive perception of their health (Chart 3). Even when other factors were taken into account, people with heart disease, incontinence, cataracts, diabetes, and those experiencing the effects of stroke had lower odds of having positive self-perceived health than did those who were free of these conditions (Table 1). Are physical conditions the only influence on seniors’ perceptions of their health, or is it possible to have positive self-perceived health despite these conditions? These are important questions.

Social network and social involvement

For seniors living in private households, social contacts and networks have been identified as important influences on their quality of life.^{10,28,29} Seniors residing in health care institutions also need social resources, but the nature of their networks and contacts may be different.¹⁰

According to NPHS data, seniors in institutions who were close to at least one staff member and those with at least one close friend in the institution tended to have positive self-perceived health (Chart 4). When possible confounding factors were considered, seniors who reported being close to at least one staff member still had higher odds (1.3) of having positive self-perceived health (Table 1).

Chart 3
Percentage with positive self-perceived health, by presence of chronic condition, institutional population aged 65 or older, Canada excluding territories, 1996/97



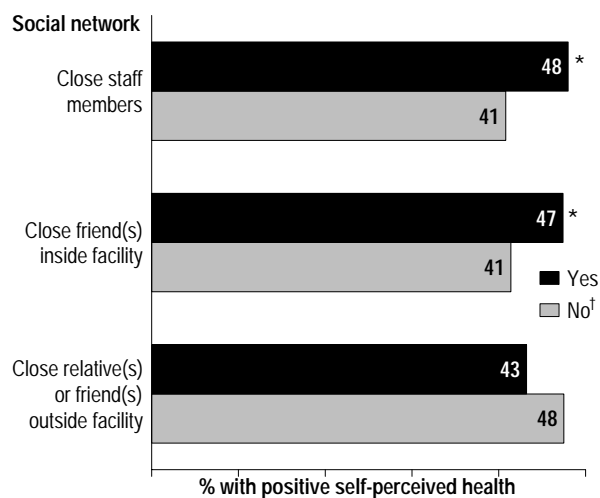
Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health Institutions component
 † Reference category
 * Significantly different from estimate for reference category ($p < 0.05$)

In addition, those who had some social involvement were more likely to have a positive perception of their health (Chart 5, Table 1). Daily social involvement was particularly valuable. Even when the other factors were taken into account, those with daily social involvement had 2.4 times the odds of having positive self-perceived health, compared with those who did not participate in such activities.

Forming close relationships with staff members and social involvement likely go hand-in-hand. Staff members who are close to residents may offer extra encouragement to attend social and recreational activities, while higher levels of participation offer more opportunities to get to know staff members and form close relationships.

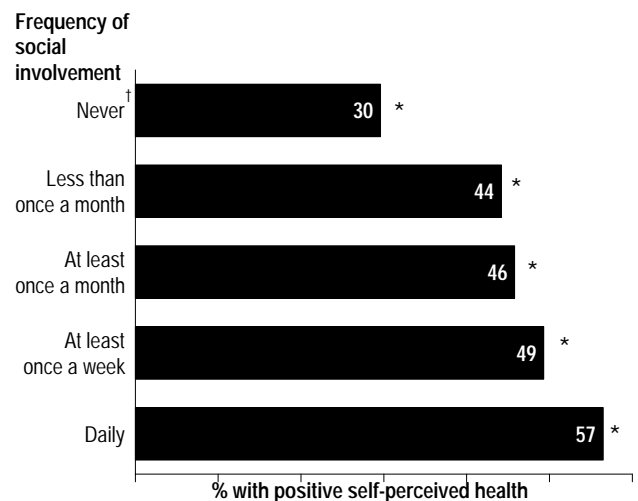
No association was evident between having close friends or relatives outside the health care institution and residents' positive self-perceived health (Chart 4, Table 1). While it is possible that such relationships may not be associated with a person's feelings about their health, there may be other explanations. The responses may be based on too broad a range of potential relationships to show an association. For example, a close friend or relative could be an adult child who visits daily or an elderly friend or sibling with

Chart 4
Percentage with positive self-perceived health, by availability of social network, institutional population aged 65 or older, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health Institutions component
 † Reference category
 * Significantly different from estimate for reference category ($p < 0.05$)

Chart 5
Percentage with positive self-perceived health, by frequency of social involvement, institutional population aged 65 or older, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health Institutions component
 † Reference category
 * Significantly different from estimate for reference category ($p < 0.05$)

whom only telephone contact is maintained. Alternatively, the cut-offs for dichotomizing this variable (zero versus 1 or more close friends or relatives) may not have been appropriate, since most respondents (93%) were close to at least one person outside the facility.

Pain-free, independent, able to communicate

Earlier studies have shown that severity of pain and changes in the level of pain are related to perceptions of health.^{18,23,30} Results from the NPHS are consistent with these findings. Seniors in institutions were much more likely to report positive health if they were generally pain-free (Chart 6). Even when physical conditions and other factors were taken into account,

Proxy responses

For reasons of illness or other incapacity, surveys of residents of health care institutions often depend on staff members, relatives or friends of the selected respondent to complete the interview. Such proxy responses can be particularly problematic for attitudinal or self-assessment information. Indeed, for this reason, proxy responses are often excluded from analyses.²⁰ However, proxy responses are necessary for many institutional residents, and the choice is to either work with this limitation or ignore the institutionalized population. In the 1996/97 NPHS, 59% of the institutional interviews were completed by proxy, compared with 18% of the household interviews for the same age group (65 or older). The rates of proxy response did not differ by sex (data not shown).

Age initially appeared to be associated with the use of a proxy, but this apparent link disappeared when other factors were taken into account. Certain conditions, such as Alzheimer's disease, were understandably associated with the use of proxy respondents. Fully 93% of people with Alzheimer's disease relied on proxy respondents, compared with 37% of people without this condition. As well as those with Alzheimer's disease, people with incontinence, those with a barrier to communication (hearing and/or speaking), and those who had suffered a stroke all had higher odds of using a proxy respondent (data not shown).

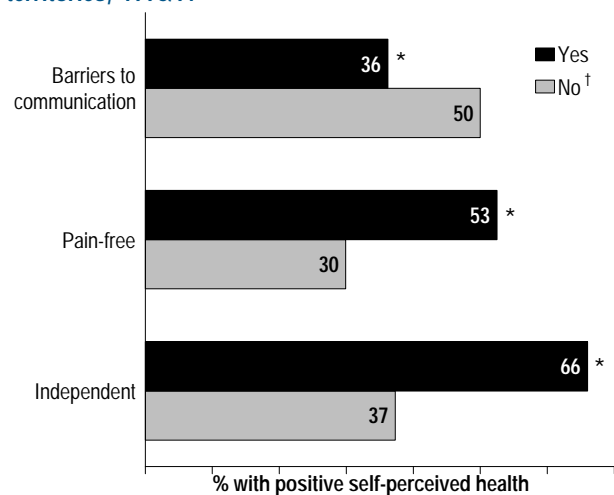
Proxy status was controlled in the logistic regression analysis (Table 1). Residents who depended on proxy respondents had significantly lower odds of reporting positive self-perceived health. This may reflect more severe levels of illness experienced by those who depended on others to respond on their behalf. Alternatively, it may indicate that proxy respondents systematically rate institutional residents' health more negatively than do residents who respond for themselves.

those who were pain-free had over twice the odds of reporting positive self-perceived health (Table 1). In fact, certain chronic conditions such as arthritis lost their association with positive self-perceived health when pain was entered into the model. This suggests that it is not always the physical conditions themselves, but rather, the symptom of pain associated with them, that is associated with negative self-perceived health.

People whose independence is threatened or diminished are less likely to regard their health positively. In community samples, people with activity limitations or restrictions, and those with recently acquired disabilities, had lower odds of reporting positive health.^{18,23} Similarly, according to the analysis of NPHS data, some degree of independence was an important predictor of positive self-perceived health in the institutional population. Seniors who could move about inside the residence, get in or out of a bed, chair or wheelchair, and attend to their personal care without the help of others were more likely to report positive self-perceived health (Chart 6, Table 1). This relationship held even when the other factors were taken into account.

Meaningful interactions are important for the overall well-being of seniors in residential facilities.³¹ The inability to hear properly or be understood likely poses barriers to conversation. The NPHS revealed that 36% of institutional residents who had difficulty speaking

Chart 6
Percentage with positive self-perceived health, by presence of barriers to communication, pain and independence, institutional population aged 65 or older, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health Institutions component
 † Reference category
 * Significantly different from estimate for reference category (p < 0.05)

and being understood, or who had trouble hearing, rated their health positively, compared with 50% of those who did not experience such barriers to communication (Chart 6). However, these barriers lost significance in the final model, the effect being better accounted for by other factors (Table 1). It is possible, for example, that barriers to communication affect self-perceived health through social networks and involvement.

Limitations

In the 1996/97 National Population Health Survey (NPHS) Health Institutions component, 59% of the interviews were completed by proxy respondents, compared with 18% in the household component (see *Proxy responses*). The impact of a possible reporting bias is unknown.

Respondents were asked if they had certain physical conditions diagnosed by a health care professional. The presence of these self-reported conditions was not verified against clinical records. In addition, no information was available about the severity of the conditions reported.

Research in the area of social networks and support emphasizes the need for information about the nature of networks (size and geographic proximity, for example) and the quality of support they offer.³² Institutionalized respondents were asked to identify people that they felt "close" to. Information about the levels and types of social support was not available. For the question, "How many staff members of this facility do you have a close relationship with, that is, feel at ease with or can talk to about private matters?", information was not available for 21% of respondents. For the other social network variables, information was not available for 5% to 8% of respondents. In each instance, missing categories were included in the logistic regression model to optimize the sample size.

For investigations of social resources, self-perceived health and mortality, earlier work has demonstrated the benefit of analyzing men and women separately.^{21,33} However, the health care institution samples were too small to stratify the analysis by sex. The 1996/97 cross-sectional file contained 1,711 respondents aged 65 or older, 457 of whom were men. A similar situation exists with the longitudinal file used for the survival analysis: 485 of the 1,768 respondents aged 65 or older were men.

The prevalence of positive self-perceived health is presented for two age groups (65 to 84 and 85 or older). A further breakdown of the younger age group (65 to 74 and 75 to 84) in the institutional file revealed the same point estimate for positive self-perceived health for both age groups (39.8%). Thus, no information was lost by combining the two younger age groups, and combining them ensured more adequate cell sizes. Of the 1,711 respondents, only 261 were aged 65 to 74.

Concluding remarks

Positive self-perceived health is an indicator of successful aging among seniors living in health care institutions. In 1996/97, 43% of institutionalized seniors reported good, very good or excellent health. This suggests that it is important to include the institutionalized population in definitions of successful aging.

Seniors with positive self-perceived health had a lower risk of mortality. A number of factors associated with self-perceived health are, at least in part, modifiable. Results from this study suggest that efforts aimed at controlling pain, increasing independence, promoting social involvement and encouraging close relationships with staff may help seniors in health care institutions improve or maintain a positive perception of their health and thereby age successfully. ■

Acknowledgements

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Predictors of death in seniors

- *Chronic diseases, notably heart diseases and cancer, are the leading causes of death among seniors.*
- *Senior women who had high levels of psychological distress in 1994/95 were more likely to have died by 2002/03 than women who did not have such problems.*
- *For senior men, low education and widowhood increased the likelihood of dying over this eight-year period.*

Abstract

Objectives

This article updates information on the leading causes of death for people aged 65 or older, and examines factors associated with death in seniors over an eight-year period. The analysis focuses on psychosocial factors—psychological distress, financial and family stress—in relation to mortality.

Data sources

Data are from the Canadian Mortality Database and the 1994/95 to 2002/03 National Population Health Survey (NPHS), longitudinal file. The NPHS sample analysed contains records for 955 men and 1,445 women.

Analytical techniques

Death certificate information for 2002 and Census population estimates were used to calculate death rates and rank causes of death. NPHS data were cross-tabulated to examine selected characteristics reported in 1994/95 in relation to vital status (dead or alive) by 2002/03. Cox regression was used to calculate hazards ratios for psychological distress, financial and family-related stress in relation to subsequent mortality, while controlling for the effects of age, chronic diseases, and other potential confounders.

Main results

In senior women, psychological distress in 1994/95 was positively associated with mortality over the next eight years, even when controlling for the effects of other variables. The statistical significance of this relationship in senior men disappeared when controlling for chronic conditions.

Keywords

aged, mortality, psychological stress, risk factors, prospective studies, health surveys

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In Canada, as in all industrialized societies, most deaths occur in elderly people. This was not the case for earlier generations. In 1926—the first year for which vital statistics were centrally compiled for all provinces—only one in six deaths (17%) occurred in people aged 65 or older. By 2002, nearly four-fifths of people who died (78%) were in this age group (Chart 1).

Over the last century, fundamental changes have occurred in the causes of death and, as a consequence, in the average age at death. In 1926, cancer and diseases of the circulatory system (including stroke) accounted for only one-quarter of all deaths in Canada; by 2002, nearly two-thirds of deaths were caused by these conditions.^{1,2} The likelihood of dying from tuberculosis was slightly higher than that of dying from cancer in 1926, with each accounting for 7% of all deaths. Childhood was especially perilous at that time; 29% of deaths in 1926 occurred in infants and children younger than 5, compared with less than 1% in 2002.

Methods

Data sources

Death data for 1926 were compiled from *Vital Statistics 1926*,¹ and from the Canadian Mortality Database for 2002 (the most recent year for which data from all jurisdictions are available). Death records are based on information abstracted and compiled from death certificates, and are provided to Statistics Canada by the Registrar of Vital Statistics in each province and territory.

Longitudinal analysis was based on data from the longitudinal file of the National Population Health Survey (NPHS), cycles 1 to 5 (1994/95 to 2002/03). The NPHS covers household and institutional residents in all provinces and territories, except full-time members of the Canadian Forces, and residents of Indian reserves, Canadian Forces bases and some remote areas.

In 1994/95, 20,095 respondents were selected for the longitudinal panel; the response rate was 86.0%. These 17,276 respondents were re-interviewed every two years. The response rates for subsequent cycles, based on these 17,276 individuals, were: 92.8% for cycle 2 (1996/97); 88.2% for cycle 3 (1998/99); 84.8% for cycle 4 (2000/01); and 80.6% for cycle 5 (2002/03). More detailed descriptions of the NPHS design, sample and interview procedures can be found in published reports.^{3,4}

This analysis is based on data from the 2002/03 NPHS cycle 5 longitudinal "square" master file, which contains records for all 17,276 responding members of the original panel, whether or not information about them was provided in all five cycles. The longitudinal analysis was based on data for respondents who were 65 or older in cycle 1 (1994/95), who had completed the cycle 1 interview, and for whom vital status in cycle 5 (2002/03) was known. The number of respondents 65 or older in cycle 1 who provided full interview information was 2,685; 285 of them were dropped from the analysis because of unknown vital status in cycle 5. Information on vital status was unavailable for various reasons, including failure to contact the household, respondent's whereabouts unknown, and respondent moved out of Canada. The final sample numbered 2,400 seniors: 955 men and 1,445 women.

Analytical techniques

To compare the distribution of deaths according to age group between 1926 and 2002, the age groups 0 to 4, 5 to 64, and 65 or older were used. To present 2002 data by cause of death, deaths occurring in the 65-or-older age group were tabulated separately for each sex by underlying cause of death, which were combined into 113 standard groupings using the *International Statistical Classification of Diseases and Health Problems, Tenth Revision (ICD-10)*.^{5,6}

Bivariate tabulations were used to examine vital status in cycle 5 by the distribution of independent variables in cycle 1.

Cox proportional hazards models were used to assess the association between psychological distress in cycle 1 and duration of survival, while controlling for other respondent characteristics. The proportional hazards coefficient estimates the effect on survival time of each covariate entered in the model. For respondents who died during the follow-up period, the duration of survival was defined as the number of days from the date of the cycle 1 interview until the date of death. For people who completed the cycle 5 interview (or

who were known to be alive), duration of survival was defined as the number of days elapsed between the cycle 1 and cycle 5 interviews. After the cycle 5 interview, survival time was considered censored.

Of the analysis sample of 2,400 respondents for whom vital status in cycle 5 was known, 912 died over the eight-year follow-up period, and 1,488 remained alive. Date of death was not available for 56 (6%) of the decedents because linkage to Statistics Canada's Canadian Mortality Database, routinely attempted on the records of all NPHS respondents who are reported to have died, could not be successfully completed. For 23 of these cases, contact with an NPHS interviewer had last occurred in cycle 4 and death was then reported in cycle 5 (2002/03). Linkage was not possible for these 23 cases because the death records were not yet included in the Mortality Database. For the remaining 33 respondents whose deaths had occurred earlier, failure to link with the Mortality Database resulted from inconsistencies in data; for example, date of birth, missing maiden name, and/or delays in receiving the death record at Statistics Canada.

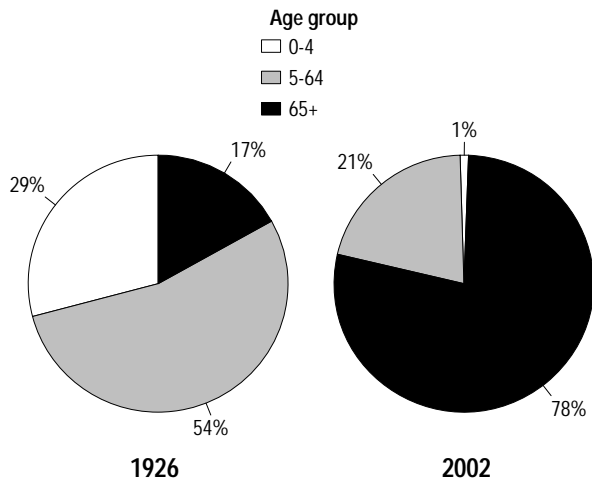
For the 56 respondents reported deceased but for whom information on date of death was unavailable in the NPHS data, a date was generated so that they could be included in the analysis. The year of death was defined as the most recent year in which the respondent's "alive" vital status had been reported by an NPHS interviewer, plus one. For example, a person contacted in 2000 who was reported deceased in cycle 5 (2002/03) was assigned 2001 as the year of death. January 1 was used for month and day of death.

Separate analyses were conducted for men and women. Selection of variables for the proportional hazards models was based on the literature, as well as on availability of information from the NPHS. Groups of variables were added sequentially to successive models. The base model (Model 1) contained age, psychological distress and financial and family stress. Education and marital status were added in Model 2; chronic conditions and functional limitation in Model 3; and behavioural risk factors (leisure-time physical activity, smoking, alcohol use and body mass index) in Model 4. As an additional measure of socio-economic status, a variable indicating main source of income was used in bivariate tabulations. To avoid multicollinearity, the main source of income variable was not included in proportional hazards models.

Preliminary proportional hazards models were produced to examine the relationship between age and survival, using a term for age-squared. Because the hazards ratio for the age-squared term was not significant, it was dropped from subsequent models. Similarly, a variable for social support was explored in preliminary analysis, but dropped from the final analyses. To explore the negative relationship between financial stress and mortality observed in men, interaction terms of financial stress with level of income were included in proportional hazards models, but they were not significant.

The data were weighted to reflect the age and sex distribution of the household population aged 65 or older in 1994. To account for survey design effects, variance on proportion estimates, on differences between proportions and on hazards ratios was estimated using the bootstrap technique.⁷⁻⁹

Chart 1
Percentage distribution of deaths, by age group, Canada, 1926 and 2002



Data source: Reference 1 and 2002 Canadian Mortality Database

Although the classification systems in use internationally permit deaths to be attributed only to disease or injury,⁶ the importance of social and psychological factors in the study of mortality is growing. Over the past few decades, interest has extended beyond the study of medically diagnosed disease to include socio-economic conditions and social and emotional stressors that might contribute to poor health or death.¹⁰⁻¹⁶ Recent research has focused on the pathways and physiological mechanisms through which psychosocial and socio-

economic factors may influence changes in health. Early findings suggest that biological changes occur in response to stress, weakening the immune response and thus increasing the mortality risk.^{17,18}

For this analysis, information provided by people aged 65 or older who were followed over an eight-year period is used to study selected characteristics in relation to death; the analysis focuses specifically on a measure of emotional health (see *Definitions*). Longitudinal data from Statistics Canada's National Population Health Survey (NPHS) complement information available from administrative sources (see *Methods*). In addition to information about physical health, the NPHS collects data on a rich array of other health-related personal and social factors.

This article provides current information on the leading causes of death among seniors and examines the relationship between psychological distress and mortality.

Most die from heart diseases, cancer

In 2002, 173,971 Canadians aged 65 or older died: 82,613 men and 91,358 women (Table 1). Although the total number of deaths among senior women substantially exceeded that for senior men, the rate of death in each age group—that is, the number of deaths per surviving population—was higher for men (Chart 2).

Information compiled from death certificates indicates that the top-ranking causes of death in seniors were cancer and heart diseases, followed by stroke and respiratory diseases (Table 1). Alzheimer's disease and cerebrovascular diseases accounted for

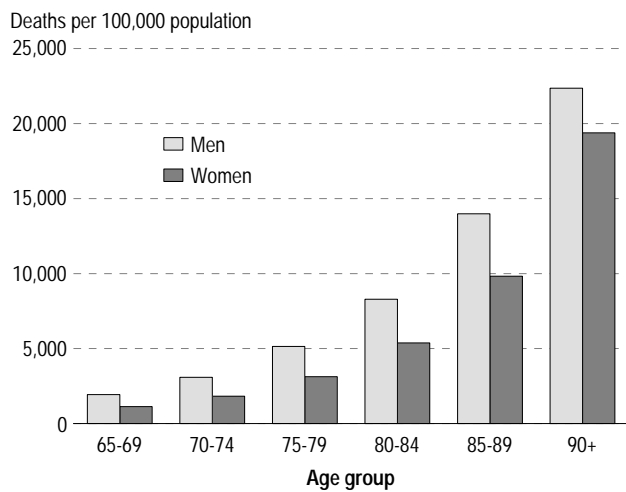
Table 1
Leading causes of death at age 65 or older, by sex, Canada, 2002

	Men			Women		
	Number	%	Rank	Number	%	Rank
All causes	82,613	100.0		91,358	100.0	
Malignant neoplasms	25,024	30.3	1	21,645	23.7	2
Lung cancer	7,294	8.8		4,760	5.2	
Prostate cancer (men) Breast cancer (women)	3,397	4.1		2,999	3.3	
Colorectal cancer	2,737	3.3		2,566	2.8	
Heart diseases	21,950	26.6	2	24,064	26.3	1
Cerebrovascular diseases (stroke)	5,632	6.8	3	8,466	9.3	3
Chronic lower respiratory diseases	5,012	6.1	4	4,096	4.5	4
Diabetes mellitus	3,080	3.7	5	3,466	3.8	6
Influenza and pneumonia	1,858	2.2	6	2,505	2.7	7
Accidents	1,850	2.2	7	2,249	2.5	8
Falls	646	0.8		761	0.8	
Alzheimer's disease	1,647	2.0	8	3,791	4.1	5
Chronic liver diseases and cirrhosis	707	0.9	9	436	0.5	10
Septicemia	556	0.7	10	672	0.7	9
Other	15,297	18.5		19,968	21.9	

Data source: 2002 Canadian Mortality Database

Note: Causes of death defined using Ref. 6

Chart 2
Age-specific death rates in people aged 65 or older, by sex, Canada, 2002



Data source: 2002 Canadian Mortality Database

higher proportions of deaths in women, while lung cancer was more important in men. However, in both sexes, lung cancer caused more deaths than any other cancer. Only 1% of deaths among seniors were attributable to diseases classified as infectious (data not shown).

Psychological distress and stress

In the NPHS sample of 2,400 respondents used for this analysis, 912 died between 1994/95 and 2002/03. By sex, the weighted proportions were 43% of the men and 31% of the women. Men survived an average of 2,338 days, and women, 2,526 days (Appendix Table A).

According to the analysis of NPHS data, psychological distress was strongly associated with death (Table 2). People who died had significantly higher average scores on the psychological distress scale (Appendix Table B). Of those reporting high levels of psychological distress in 1994/95, 62% of men and 44% of women died, compared with 37% and 25%, respectively, at lower levels of distress. These results are consistent with some earlier investigations that also found psychological distress to be predictive of mortality.^{19,20}

Women with high financial stress in 1994/95—those reporting that they did not have enough money to cover necessities—had a greater likelihood of dying by 2002/03 than did women reporting sufficient means. Curiously, the relationship was reversed for men: 33% of those reporting high financial stress in 1994/95 had died by 2002/03, a significantly lower percentage than

Table 2
Percentage who died by 2002/03, by sex and selected characteristics in 1994/95, household population aged 65 or older, Canada excluding territories

	Men	Women
	%	
Total	43.1	31.1
Age group		
65-69	26.6*	17.1*
70-79	43.9*	26.5*
80+†	75.4	61.8
Education		
Less than secondary graduation	49.1*	34.7*
Secondary graduation or more†	35.4	26.9
Main source of income is social assistance		
Yes	52.8*	33.9
No†	36.0	27.7
Marital status		
Married/Living with partner†	38.6	23.6
Single/Divorced/Separated	47.9	28.5 ^E
Widowed	64.0*	39.4*
Leisure-time physical activity level		
Moderately active/Active†	32.7	17.7
Inactive	49.1*	36.2*
Body mass index		
Underweight (<18.5)	87.2*	61.8*
Normal (18.5-24.9)†	45.7	32.4
Overweight (25.0-29.9)	35.9	25.2
Obese (≥ 30.0)	51.1	27.3
Alcohol use in past month		
Yes†	34.7	24.5
No	52.1*	34.2*
Smoking		
Never smoked/Quit ≥10 years†	39.4	28.9
Current smoker/Former, quit <10 years	52.9*	40.7*
Chronic disease in 1994/95		
Cancer	75.5*	47.1*
No cancer†	41.3	30.2
Effects of stroke	90.5*	55.7*
No effects of stroke†	40.9	30.2
High blood pressure	52.0*	32.8
No high blood pressure†	40.4	30.3
Heart disease	63.6*	47.8*
No heart disease†	37.9	28.0
Diabetes	53.3	52.7*
No diabetes	41.5	28.9
Respiratory disease	65.5*	53.0*
No respiratory disease†	40.9	29.7
Functional limitation (HUI3)		
Severe	67.1*	49.3*
None/Moderate†	35.9	25.1
Mental health, stress		
High psychological distress	61.6*	43.9*
Low psychological distress†	37.4	24.6
Worry about finances (high)	33.0*	38.3*
Worry about finances (low)†	44.1	28.1
Worry about health of family member (high)	44.2	27.5
Worry about health of family member (low)	41.5	30.0

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file

Note: Total estimates for men and women differ significantly from each other.

† Reference category

* Significantly different from estimate for reference category for same sex (p < 0.05)

^E Coefficient of variation 16.6% to 33.3% (interpret with caution)

the 44% of men with low financial stress. This finding was unexpected, as it runs counter to the abundant evidence that material need is strongly related to poor health. Additional calculations revealed that, as expected, high financial stress was more likely at lower levels of income, and the likelihood of mortality was also higher at lower levels of income (data not shown). Clearly, though, financial stress and level of income reflect distinct characteristics.

No significant differences emerged for either sex between death and level of concern over a family member's health.

Educational attainment protective

For both sexes, the likelihood of dying was greater among seniors who had not completed secondary education, compared with those who had. In men, but not women, source of income was also predictive of death. More than half (53%) of the men whose main source of income in 1994/95 was the Canada or Québec pension, Old Age Security/Guaranteed Income Supplement, or provincial/municipal social assistance or welfare had died by 2002/03, compared with 36% of those relying on other sources of income. These findings were expected, and are consistent with previous research.²¹

Men and women who were widowed were more likely to die than were those who were married or living with a partner. Of course, substantially higher proportions of younger seniors were married than were their older counterparts (data not shown), so the relationship was not surprising.

Behavioural risk factors

Several health-related behaviours were related to the likelihood of dying. Seniors who were inactive in 1994/95 were more likely to have died by 2002/03, compared with those who reported at least moderate leisure-time physical activity. And those who used alcohol at least once a month were less likely to die than those who drank less frequently or who abstained. These findings were expected, as the model did not control for the effects of age.

For both sexes, smoking history was related to the likelihood of dying. Seniors who, in 1994/95, had been current smokers or who had quit for less than 10 years were at significantly higher risk of dying by 2002/03 than were those who had never smoked.

Being underweight in 1994/95, which may be an indicator of poor health and advanced age, was strongly related to the likelihood of dying. Fully 87% of men and 62% of women in this weight category had died, compared with 46% and 32%, respectively, of those in the normal BMI range. This is consistent with

the findings of other prospective studies; the negative relationship between BMI and all-cause mortality was attributed to the tendency for serious disease to cause weight loss before death.^{22,23}

As expected, the likelihood of dying was higher among seniors with severe functional limitation, and with most of the chronic diseases examined. Notably high proportions of men with effects of stroke (91%) or cancer (76%) had died. For women, death was most likely among those with effects of stroke (56%), diabetes (53%), or respiratory disease (53%).

Distress effects persist in women

Multivariate models were used to assess the extent to which the association between psychological distress and dying was accounted for by other variables.

In men, when controlling for age, financial and family stress, education and marital status, psychological distress remained positively associated with mortality. However, the addition of chronic diseases to the model attenuated the hazards ratio slightly so that it was no longer statistically significant (Table 3, Model 3). As well, the effect of financial stress diminished when adjusting for chronic diseases. These findings for men are consistent with previous research reporting a weakening of the effects of psychological distress in relation to mortality by adjustment for baseline morbidity.^{24,25}

In women, however, a strong, positive association between psychological distress and death persisted, even when adjusting for the effects of chronic diseases and health-related behaviours (Table 4). The risk of dying by 2002/03 for women with a high level of psychological distress in 1994/95 was 60% higher than that for women whose distress level was lower (Table 4, Model 4). This persistent association between distress and subsequent mortality for women also corroborates previous research.²⁵

Low education, widowhood risky for men

For men, a lower level of education remained significantly associated with mortality in the fully adjusted model (Table 3). This finding has also emerged in other research.²⁶

As well, compared with men who were married or living with a partner, widowers had a strikingly higher likelihood of dying. The protective effects of marriage for men—an indicator of social support and social integration—with respect to mortality has been widely observed.^{10,16,27,28}

Of the chronic conditions studied, cancer, the effects of stroke, heart disease and respiratory disease remained significantly related to mortality for men when controlling for age, psychosocial factors, education and

Table 3
Adjusted proportional hazards ratios relating selected characteristics in 1994/95 to death by 2002/03, male household population aged 65 or older, Canada excluding territories

	Model 1		Model 2		Model 3		Model 4	
	Hazards ratio	95% confidence interval	Hazards ratio	95% confidence interval	Hazards ratio	95% confidence interval	Hazards ratio	95% confidence interval
Age (continuous)	1.1*	1.1, 1.1	1.1*	1.1, 1.1	1.1*	1.0, 1.1	1.1*	1.0, 1.1
Psychological distress/Stress								
Psychological distress	2.4*	1.8, 3.3	2.4*	1.7, 3.3	1.5	1.0, 2.1	1.2	0.8, 1.9
Financial stress	0.6*	0.4, 0.9	0.6*	0.4, 0.9	0.7	0.5, 1.0	0.7	0.5, 1.0
Family health stress	0.9	0.6, 1.3	0.9	0.6, 1.4	1.0	0.7, 1.4	1.0	0.7, 1.4
Socio-economic characteristics								
Less than secondary graduation			1.3	1.0, 1.8	1.5*	1.1, 2.1	1.5*	1.1, 2.0
Secondary graduation or more [†]			1.0	...	1.0	...	1.0	...
Married/Living with partner [†]			1.0	...	1.0	...	1.0	...
Single/Separated/Divorced			1.4	1.0, 2.0	1.3	0.9, 1.9	1.3	0.9, 1.9
Widowed			1.7*	1.2, 2.4	1.9*	1.3, 2.7	1.7*	1.2, 2.5
Chronic conditions/Health status								
Cancer					2.3*	1.3, 4.2	2.2*	1.2, 4.2
Effects of stroke					2.8*	1.6, 4.8	2.5*	1.4, 4.5
Heart disease					1.5*	1.1, 2.0	1.5*	1.1, 2.0
Diabetes					1.1	0.7, 1.7	1.1	0.7, 1.7
High blood pressure					1.3	0.9, 1.7	1.3	1.0, 1.8
Respiratory disease					1.8*	1.2, 2.7	1.6*	1.0, 2.6
Functional health status (HUI3) (continuous)					0.5*	0.3, 0.9	0.6	0.3, 1.0
Body mass index								
Underweight (<18.5)							2.5*	1.2, 4.9
Normal (18.5-24.9) [†]							1.0	...
Overweight (25.0-29.9)							0.9	0.7, 1.2
Obese (≥ 30.0)							1.0	0.6, 1.7
Health-related behaviours								
Leisure-time physical activity level								
Moderate/Active							0.8	0.6, 1.1
Inactive [†]							1.0	...
Smoking								
Never smoked/Quit ≥10 years [†]							1.0	...
Current smoker/Quit <10 years							1.3	0.9, 1.8
Alcohol use								
At least 1 drink in past month							0.8	0.6, 1.1
None/<1 drink in past month [†]							1.0	...

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file

Note: Models 1, 2, 3 and 4 are based on records for 868, 863, 854, and 852 men, respectively. Because of rounding, some hazards ratios with an upper or lower confidence limit of 1.0 are statistically significant.

[†] Reference category. When not noted, reference category is absence of characteristic; for example, reference category for cancer is no reported diagnosis of cancer.

* Significantly different from estimate for reference category ($p < 0.05$).

marital status. With adjustment for health-related behaviours, the associations weakened somewhat, but were still significantly elevated.

Functional impairment was significantly predictive of death when controlling for chronic conditions, but its effect was attenuated to non-significance ($p = 0.06$) by the addition of health-related behavioural factors (Table 3, Model 4). This suggests that in men, symptoms of physical or cognitive dysfunction or pain exert an effect on mortality risk that is independent of

clinically diagnosed conditions, but weakly linked with health-related behaviours.

The strong association between underweight and mortality persisted for men, even with adjustment for chronic diseases and functional impairment. At higher levels of BMI, no associations with mortality emerged.

Financial stress harmful to women

In women, education level was not related to death, but financial stress remained significantly predictive

Table 4
Adjusted proportional hazards ratios relating selected characteristics in 1994/95 to death by 2002/03, female household population aged 65 or older, Canada excluding territories

	Model 1		Model 2		Model 3		Model 4	
	Hazards ratio	95% confidence interval	Hazards ratio	95% confidence interval	Hazards ratio	95% confidence interval	Hazards ratio	95% confidence interval
Age (continuous)	1.1*	1.1, 1.1	1.1*	1.1, 1.1	1.1*	1.1, 1.1	1.1*	1.1, 1.1
Psychological distress/Stress								
Psychological distress	2.2*	1.6, 2.9	2.2*	1.6, 2.9	1.7*	1.2, 2.3	1.6*	1.1, 2.3
Financial stress	1.4*	1.0, 1.9	1.4*	1.0, 1.9	1.5*	1.0, 2.0	1.4*	1.0, 2.0
Family health stress	1.0	0.6, 1.4	1.0	0.6, 1.4	0.9	0.6, 1.4	0.9	0.6, 1.4
Socio-economic characteristics								
Less than secondary graduation			1.0	0.8, 1.3	1.0	0.8, 1.4	1.0	0.8, 1.4
Secondary graduation or more [†]			1.0	...	1.0	...	1.0	...
Married/Living with partner [†]			1.0	...	1.0	...	1.0	...
Single/Separated/Divorced			1.1	0.7, 1.8	1.1	0.6, 1.8	0.8	0.5, 1.4
Widowed			1.1	0.8, 1.5	1.1	0.8, 1.5	1.0	0.7, 1.3
Chronic conditions/Health status								
Cancer					2.1*	1.3, 3.3	2.2*	1.4, 3.6
Effects of stroke					1.3	0.8, 2.4	1.3	0.7, 2.3
Heart disease					1.4*	1.0, 1.9	1.3	1.0, 1.8
Diabetes					1.7*	1.2, 2.5	1.9*	1.3, 2.8
High blood pressure					0.8	0.6, 1.1	0.9	0.7, 1.2
Respiratory disease					1.7*	1.1, 2.8	1.4	0.9, 2.2
Functional health status (HUI3) (continuous)					0.5*	0.3, 0.8	0.5*	0.3, 0.9
Body mass index								
Underweight (<18.5)							2.3*	1.5, 3.6
Normal (18.5-24.9) [†]							1.0	...
Overweight (25.0-29.9)							0.8	0.6, 1.2
Obese (≥ 30.0)							1.0	0.7, 1.5
Health-related behaviours								
Leisure-time physical activity level								
Moderate/Active							0.7	0.5, 1.1
Inactive [†]							1.0	...
Smoking								
Never smoked/Quit ≥10 years [†]							1.0	...
Current smoker/Quit <10 years							1.6*	1.1, 2.2
Alcohol use								
At least 1 drink in past month							1.1	0.8, 1.5
None/<1 drink in past month [†]							1.0	...

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file

Note: Models 1, 2, 3 and 4 are based on records for 1,385, 1,385, 1,372 and 1,368, respectively. Because of rounding, some hazards ratios with an upper or lower confidence limit of 1.0 are statistically significant.

[†] Reference category. When not noted, reference category is absence of characteristic; for example, reference category for cancer is no reported diagnosis of cancer.

* Significantly different from estimate for reference category ($p < 0.05$).

of mortality, even in the fully controlled model. The persistence of the association between financial stress and the risk of death, even with psychological distress in the model, is notable, because it indicates that each of these factors exerts an independent effect.

Controlling for health-related behaviours in women diminished the lethal effects of chronic diseases to a greater degree than was the case in men. Before the effects of BMI, smoking, physical activity and alcohol use were taken into account, cancer, heart disease, diabetes and respiratory disease were associated with

death (Table 4). But in the fully adjusted model, only cancer and diabetes remained significantly predictive of mortality.

Another sex difference emerged in the relationship between functional impairment and subsequent mortality. In women, the hazards ratio for functional impairment remained significant in the fully controlled model (Table 4, Model 4), suggesting the independent contribution to mortality risk of the sub-clinical symptoms, pain and dysfunction reflected in the HUI3.

Definitions

Age was determined by asking National Population Health Survey (NPHS) respondents how old they were in cycle 1. For bivariate analysis, age groups were defined as 65 to 69, 70 to 79 and 80 or older. For proportional hazards models, years of age was used as a continuous variable.

Psychological distress was based on responses to the following questions: "During the past month, that is, from (date one month ago) to yesterday, about how often did you feel:

- so sad that nothing could cheer you up?"
- nervous?"
- restless or fidgety?"
- hopeless?"
- worthless?"
- that everything was an effort?"

Potential responses were: "All of the time," "Most of the time," "Some of the time," "A little of the time," or "None of the time." Responses to each question were scored in the range of 0 (none of the time) to 4 (all of the time); the maximum possible total score was 24. The variable was dichotomized as "low distress" (score of 0 to 4) and "high distress" (5 to 24); the high distress category contained the top quintile of the population in the weighted distribution of the psychological distress variable. The six questions used to measure psychological distress (known as the "K6") are a subset of items from the Composite International Diagnostic Interview.²⁹

Financial stress was based on the response to the true-false question, "You don't have enough money to buy the things you need." A response of "true" was defined as high stress over finances; 18% of the weighted distribution fell into this category.

Family health stress was based on responses to the true-false questions, "You have a parent, a child or a partner who is in very bad health and may die," and "Someone in your family has an alcohol or drug problem." Counting a "false" response as 0 and a "true" response as 1, the combined possible score for these questions ranged from 0 to 2. A "true" response to either or both questions was defined as high stress over family health; 15% of the weighted distribution fell into this category.

Education was categorized as less than high school graduation, or high school graduation or more.

Respondents were asked about their *main source of income*; those who identified Canada or Québec pension, Old Age Security/ Guaranteed Income Supplement, or provincial/municipal social assistance or welfare were categorized as receiving "social assistance" as their main income source.

Marital status was grouped as: married or living with a partner; single/divorced/separated; or widowed.

Level of *leisure-time physical activity* was based on calculations taking into account the reported frequency and duration of a

respondent's leisure-time physical activities in the three months before the survey, and the estimated metabolic energy demand of each activity.^{30,31} Leisure-time physical activity was classified as "active or moderate" (1.5 or more kilocalories per kilogram per day), or "inactive" (below 1.5 kcal/kg/day).

Alcohol use was defined as at least one alcoholic drink (one glass of wine, one beer, or 1.5 ounces of spirits) in the month before the cycle 1 interview.

Smoking status was dichotomized as: never smoked or quit 10 or more years ago, and current smoker or quit less than 10 years ago. The rationale for these categories stems from previous research reporting that for former smokers, the risk of mortality returns to that of a non-smoker after 10 to 15 years of abstinence.³²

Body mass index (BMI) is a measure of weight adjusted for height, and is defined as weight (kilograms) divided by height (metres squared). Level of BMI was defined using the World Health Organization standards now adopted by Health Canada,³³ as follows:

- underweight: less than 18.5
- normal: 18.5 to 24.9
- overweight: 25.0 to 29.9
- obese class I: 30.0 to 34.9
- obese class II: 35.0 to 39.9
- obese class III: 40.0 or more.

For the analysis, the three obese categories were combined into a single category. Height and weight were self-reported by CCHS and NPHS respondents.

The presence of a *chronic condition* was established by asking respondents if a doctor had told them that they had a chronic disease that had lasted, or was expected to last, at least six months. Respondents were read a list of conditions, including cancer, respiratory disease, high blood pressure, heart disease, effects of stroke and diabetes.

The *Health Utilities Index, version 3 (HUI3)* is a summary measure that incorporates functional health and societal preferences of health states.^{34,35} Based on responses to 30 questions about eight aspects of functional health (vision, hearing, speech, mobility, dexterity, emotions, cognition, and pain and discomfort) together with a valuation component, an overall score, or index, is produced for each individual. Perfect health is rated 1.000, and death, 0.000; negative scores reflect health states considered worse than death. Possible response values of the HUI3 range from -0.360 to 1.000. For bivariate analysis, HUI3 scores in the lower quartile of the sex-specific weighted distribution (from -0.324 to 0.686 in men and -0.312 to 0.632 in women) were categorized as severe functional limitation, and scores for men and women above 0.686 and 0.632, respectively, as moderate to none. In multivariate analysis, the HUI3 score was used as a continuous variable.

Limitations

The National Population Health Survey (NPHS) data file used for the analysis contains full responses in cycle 1 and vital status for the same respondents in cycle 5. To ensure that all deaths that occurred after the cycle 1 interview were included in the analysis, the independent variables are based only on data reported in cycle 1; therefore, they do not reflect subsequent changes. For example, low financial stress in cycle 1 may have risen to a higher level in a later cycle, but the analysis would not reflect this change. As a result, the observed associations with death may be weaker than they would have been if transitions in the independent variables had been considered.

Of the initial NPHS sample of 2,740 people aged 65 or older in cycle 1, 55 (2%) were dropped from the analysis because of incomplete information in cycle 1, and another 285 (10%) were excluded because information on their vital status in cycle 5 was unavailable, mostly because of refusal to participate or loss to follow-up for other reasons. Selection bias may have occurred if the respondents who were dropped differed systematically from the remaining sample. To assess the effects of non-response on age composition of the sample, mean age was compared between the initial sample of 2,740 and the sample of 2,400 used in the analysis. The mean age of cycle 1 respondents included in the analysis was 73.7 years, significantly higher than the average age (73.4) of the total initial sample. Although statistically significant, this difference was so small that it probably had little effect on the observed relationships between psychosocial factors and death.

The distribution of scores on the scale measuring psychological distress was highly skewed to the left, meaning that few seniors reported high levels of distress. For this reason, a binary rather than a continuous variable for psychological distress was used in proportional hazards analysis.

Although the longitudinal NPHS data establish the chronological sequence between the independent variables measured in cycle 1 and the outcome (death), causality cannot be inferred. The observed associations may be due to factors not included in the analysis.

The presence of chronic diseases was determined by asking respondents about conditions that had been diagnosed by a health practitioner and that had lasted, or were expected to last, six months or more. No clinical validation of these self-reported conditions was carried out.

Similarly, all other independent variables used in the analysis were based on self-reports and were not validated against objective criteria or by direct observation. Variation in unmeasured subjective factors, such as willingness to admit being worried about finances or feeling stressed, may explain some of the observed differences in responses.

Information was not available about many important objective measures of health (for example, blood pressure, blood chemistry, severity of disease, or diet) that may influence survival, or about many other factors (for example, personal and genetic) that affect resistance to disease and death. Similarly, the analysis did not take account of influences originating from the community that may affect the pathways through which psychosocial factors affect health.

As was true for men, the association between underweight and dying persisted for women even when adjustments were made to control for the effects of the other factors.

Smoking remained independently predictive of death among women. Women who were current smokers or who had quit for less than 10 years had a 60% higher risk of dying, compared with non-smokers or former smokers who had quit for 10 years or more. The significant effect of smoking for women, but not for men, in the fully controlled model has been observed before. In a previous report, researchers concluded that women may be more sensitive to some of the harmful effects of smoking.³⁶

Concluding remarks

In Canada today, most people die in old age. At age 65 or older, cancer is the major medical cause of death for men; for women, heart disease leads. Beyond these physical conditions, findings from this analysis of a nationally representative sample of seniors followed over eight years suggest that emotional health, specifically psychological distress, can also influence survival.

Psychological distress was strongly predictive of death in women, even when controlling for age, family and financial stress, level of education, major chronic diseases, smoking, BMI and alcohol use. This finding corroborates previous research indicating the independent contribution of psychosocial factors to mortality.

Although the relationship between psychological distress and death for men was initially similar to that for women, the strength of the association diminished when controlling for chronic diseases. The relatively stronger effect of psychological factors (distress and financial stress) on women might be a consequence of higher levels of these factors in women. It might also indicate men's greater vulnerability to the effects of chronic, degenerative conditions such as cancer, stroke, heart disease and respiratory disease, which offsets the effects of psychological factors.

The major finding of this analysis is the importance of psychological distress as a predictor of mortality among women. Currently, the mechanisms linking this factor to the risk of dying are not thoroughly understood. Poor emotional health may relate indirectly to death if resistance is lowered via neglect of physical needs. Or, the relationship may be more direct, through alterations of the immune response and other physiological defense systems. The strength of the association that emerges in this analysis underscores the need for further study. ■

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Appendix

Table A
Mean value for selected variables, by sex, household population aged 65 or older, Canada excluding territories, 1994/95 to 2002/03

	Men	Women
Age in 1994/95	73.2	74.1*
Duration of survival (days)	2,338	2,526

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file

* Significantly different from estimate for men ($p < 0.05$)

Table B
Mean value for selected variables in 1994/95, by vital status in 2002/03 and sex, household population aged 65 or older, Canada excluding territories, 1994/95 to 2002/03

	Men	Women
Psychological distress (0-24[†])		
Alive [‡]	1.74	2.70
Dead	2.80*	4.19*
Age (years)		
Alive [‡]	71.35	72.45
Dead	75.70*	77.86*
Health status (HUI3) (-0.360 to 1.000[‡])		
Alive [‡]	0.84	0.80
Dead	0.70*	0.61*

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file

[†] Reference category

[‡] Range of possible scores for scale used to measure variable

* Significantly different from estimate for reference category for same sex ($p < 0.05$)