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Healthy today, healthy tomorrow? Findings from the National Population Health Survey

Healthy Aging

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Long life is most desirable especially if it is lived in good health. While it is not surprising that old age would be accompanied by health problems, some people stay healthy as they age, thereby increasing their chances of enjoying retirement and taking full advantage of their senior years. Who are they and why do they remain in good health?

In countries such as Canada where the proportion of seniors is increasing rapidly, it is crucial to better understand the determinants of healthy aging. As the large cohorts of baby-boomers get older, the demand for health care and home care is likely to increase. People can be empowered to take charge of their health by informing them of the dangers of particular behaviours, protecting them from avoidable risks, and creating a healthy social environment. This aid could limit the expected increase in the demand for health care services and consequently contribute to reducing the burden of illness and dependence on the public health care system and on the main caregivers of the informal support network - spouses and children.

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This study examines factors associated with maintaining good health after the age of 45. It is based on longitudinal data from the National Population Health Survey (NPHS), which has interviewed a representative sample of Canadians every two years since 1994/95 (see *Definitions* and *Methods*). This analysis uses all five NPHS cycles: 1994/95, 1996/97, 1998/99, 2000/01 and 2002/03. Thus, the observation period runs over an eight-year period.

A broad range of health and mortality determinants are evaluated: demographic and socio-economic characteristics (age, sex, living arrangements, education, household income, rural/urban residence), health related behaviours (smoking, alcohol consumption, physical activity in leisure time, weight), psycho-social factors (stress, sense of coherence, social support), chronic conditions and frequency of medical consultations.

Two groups are considered: *middle aged adults* who, in 1994/95, were aged 45 to 64 and *seniors*, those who were 65 years old or more. This distinction is useful analytically because in order to age in a healthy manner through the senior years, individuals must first reach age 65 in good health. As well, health—whether it improves or deteriorates—often changes at a different pace and in different contexts from one age group to the next. Finally, the harmful consequences of many risk behaviours such as smoking may be perceptible on health only over the medium- or long-term. Thus, the determinants of healthy aging could well be different for the two groups.

The dynamics of health at age 45 and older

In 1994/95, two out of three middle aged adults were in good health. At age 65 or older, one person out of two was in good health, a reflection of the tendency for health to deteriorate with advancing age. These "healthy" middle aged adults and seniors are the population under study and were followed over the next eight years to identify those who remained in good health throughout the entire period.

Between every two year cycle, about one out of five middle aged adults (20%) lost their good health or died. By 2002/03, a little more than

MEASURING HEALTH

According to the World Health Organization, good health is not merely an absence of illness or infirmity, but a state of complete physical, mental and social well-being.[6] Based on that definition, *four criteria* were used to define heath in this analysis: two criteria were related to physical health—disability and dependence; one referred to mental health—depression; and the last one, to self-perceived health.

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 good health.

Dependency is a measure of one's autonomy regarding others. To meet the *second criterion* for good health, respondents had to report that they did not need assistance from others with meal preparation, shopping, everyday housework, personal care, or moving about in the home.

The probability of having had a major depressive episode in the previous year, based on the work of Kessler and Mroczek[7], was used to assess mental health. 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* for good health.

Finally, respondents who reported their overall health to be "good," "very good" or "excellent," as opposed to "fair" or "poor," met the *fourth criterion*.

To be considered in good health, respondents had to be alive and be free of all problems related to these four criteria. That means they did not have a disability or dependency, had not experienced a major depressive episode, and reported that their general health was good, very good or excellent. If no answer had been provided for one of these measures, but the three other responses suggested that the respondents were in good health, they were considered to be so. If answers were missing for two or more measures, the respondents were excluded from the study.

two middle aged adults out of five (44%) were still alive and in good health.

Not surprisingly, the decline in health status was even sharper among older people: about one senior out of three (30%) had lost their good health or died in each two-year period. Only 22% of seniors who had been in good health in 1994/95 were still alive and healthy eight years later.

Demographic factors

As anticipated, age at the time of the first NPHS cycle was significantly related to health loss. The older the individuals were in 1994/95, the less likely they were to remain healthy over the next eight years (Table 1).

No differences were detected between men and women in their chances of remaining alive and in good health during the period. This apparent similarity may result from the way that death was treated in the analysis—as a loss of good health. Mortality is higher among men, while morbidity is more prevalent among women. Together, the effects of these two phenomena may have cancelled each other out.

Even though living arrangements were significantly related to remaining healthy only among middle aged adults, a similar trend was observed for seniors. Those who lived with someone other than their spouse in 1994/95 had less chance of staying in good health than did those who lived with their spouse or who lived alone. Residing with someone other than a spouse is often a home care strategy[1], so it is possible that in 1994/95 these individuals were frail as a result of past health problems and were consequently at higher risk of losing their health.

Immigrants were no more or less likely than Canadian born to stay healthy over the eight years. Because the population in this analysis was at least 45 years old, few in the immigrant group would have recently arrived in Canada, so the well-known "healthy immigrant" effect (the tendency for recent immigrants to be healthier than the host population because they are selected partly on health reasons) does not show up.

As well, living in a rural or urban area did not make a significant difference to the maintenance of health.

Socio-economic factors: important for middle aged adults

Living in an upper-middle or high-income household increased middle aged adults' chances of staying healthy. For seniors, household income did not make a significant difference, which suggests that the health differences between income groups fades out with age. Furthermore, household income is not the best way to reflect wealth among this group.[2] Finally, a selection effect may be at work, since people with low incomes are less likely than those who are more affluent to reach age 65 in good health. Consequently, people with low incomes who enter their senior years in good health may be more robust.

Besides some chronic conditions, education level was one of the few determinants under study to be significantly associated with maintaining good health among both age groups. Better-educated individuals were more likely to remain healthy, probably because people with a relatively high level of education tend to be more aware of health risks, to adopt healthy behaviours, and to use medical services more effectively.[3]

Impact of lifestyle: important among seniors

For middle aged adults, smoking, alcohol consumption, physical inactivity in leisure time and not having a healthy weight were not significantly related to maintaining good health over the next eight years. It seems that the negative health consequences of those behaviours were not yet fully measurable for adults of this age group.

However, at older ages, the situation is very different. Seniors who smoke or quit in the

Table 1
Adjusted risk ratios relating selected variables to staying healthy between 1994/95 and 2002/03, by two age groups, household population aged 45 or older, Canada excluding territories

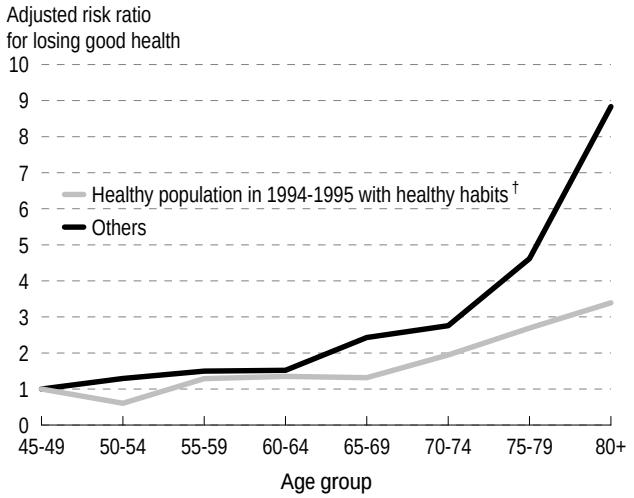
Characteristics in 1994/1995	45-64 Adjusted risk ratio‡	45-64 90% confidence interval	65+ Adjusted risk ratio‡	65+ 90% confidence interval
NPHS cycle				
1994/95 to 1996/97†	1.0	...	1.0	...
1996/97 to 1998/99	0.9	0.7, 1.0	0.8**	0.7, 0.9
1998/99 to 2000/01	1.0	0.8, 1.2	0.7***	0.5, 0.8
2000/01 to 2002/03	1.0	0.8, 1.2	0.6***	0.5, 0.8
Demographic				
Age				
45-49/65-69†	1.0	...	1.0	...
50-54/70-74	0.9	0.8, 1.1	0.8*	0.7, 1.0
55-59/75-79	0.8*	0.6, 0.9	0.5****	0.4, 0.7
60-64/80+	0.8	0.7, 1.0	0.3****	0.3, 0.4
Sex				
Men	1.0	0.9, 1.2	1.0	0.8, 1.2
Women†	1.0	...	1.0	...
Living arrangements				
With spouse†	1.0	...	1.0	...
Alone	1.1	0.9, 1.3	1.1	1.0, 1.4
With others (not spouse)	0.8*	0.6, 1.0	0.8	0.6, 1.1
Country of birth				
Immigrant	0.9	0.8, 1.1	0.9	0.7, 1.0
Canada†	1.0	...	1.0	...
Residence				
Rural	0.9	0.8, 1.1	1.0	0.8, 1.2
Urban†	1.0	...	1.0	...
Socio-economic				
Household income				
Other†	1.0	...	1.0	...
Upper-middle/High	1.3***	1.1, 1.5	1.0	0.8, 1.2
Education				
Less than postsecondary graduation†	1.0	...	1.0	...
Postsecondary graduation	1.4***	1.2, 1.7	1.3*	1.0, 1.7
Lifestyle				
Smoking				
Never smoked/Quit for 10+ years	1.2	1.0, 1.3	1.3**	1.1, 1.6
Current/Quit for <10 years†	1.0	...	1.0	...
Leisure-time physical activity				
Active	1.0	0.9, 1.2	1.2*	1.0, 1.4
Inactive†	1.0	...	1.0	...
Body mass index				
Healthy weight	1.0	0.8, 1.2	1.3**	1.1, 1.5
Underweight/Overweight/Obese†	1.0	...	1.0	...
Alcohol consumption				
Never drank	0.9	0.7, 1.2	0.7***	0.5, 0.8
Current/Former drinkers†	1.0	...	1.0	...
Psycho-social				
Chronic stress				
Stressed†	1.0	...	1.0	...
Not stressed	1.4***	1.2, 1.7	0.8*	0.7, 1.0
Sense of coherence				
High	1.1	1.0, 1.3	1.4***	1.1, 1.6
Low†	1.0	...	1.0	...
Social contact				
High	1.1	1.0, 1.3	1.1	0.9, 1.3
Low†	1.0	...	1.0	...
Chronic diseases‡				
Asthma	1.1	0.7, 1.8	0.8	0.6, 1.3
Arthritis	0.7***	0.6, 0.8	0.8*	0.7, 1.0
Back problems	1.0	0.8, 1.3	1.0	0.8, 1.3
Bronchitis/Emphysema	0.9	0.6, 1.5	0.5**	0.3, 0.9
Diabetes	0.4****	0.3, 0.6	0.7**	0.5, 0.9
Heart disease	0.6**	0.4, 0.9	0.5****	0.4, 0.6
Cancer	0.7	0.4, 1.2	0.7*	0.5, 1.0
Urinary incontinence	1.2	0.1,11.1	1.4	0.8, 7.6
Glaucoma/Cataracts	0.8	0.4, 1.5	1.0	0.8, 1.3
Physician consultations in past 12 months				
None	1.1	0.9, 1.3	0.8*	0.6, 1.0
One or two†	1.0	...	1.0	...
At least three	0.8***	0.6, 0.9	0.8**	0.6, 0.9

Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file
† Reference category
‡ Reference category is absence of chronic condition
** Significantly different from reference group (p < 0.10)*
*** Significantly different from reference group (p < 0.05)*
**** Significantly different from reference group (p < 0.01)*
***** Significantly different from reference group (p < 0.001)*
··· Not applicable

last ten years were less likely to stay in good health than those who never smoked or had quit smoking for at least ten years. Although smoking is harmful at any age, it is probably only after a given number of years that the diseases that it causes manifest themselves, thus reducing the chances for healthy aging. [4] Furthermore, for seniors, physical activity in leisure time, alcohol consumption and a healthy weight were significantly related to healthy aging.

Seniors who never drank alcohol were more at risk of losing their good health compared with seniors who were current or former drinkers. This result has been reported in many studies, which have shown that moderate drinking is protective against certain illnesses.[5] Because of the small sample size, it was not possible to distinguish heavy drinkers from others in the NPHS data, and thereby identify the point beyond which drinking becomes harmful to health.

Chart 1
People with healthy behaviours were at less risk of losing their good health



Data source: 1994/95 to 2002/03 National Population Health Survey, longitudinal file
† Never smoked or quit for at least 10 years, physically active in leisure time, normal weight range

To illustrate the effect of healthy behaviours on healthy aging after age 45, the healthy people aged 45 or older with healthy habits towards smoking and physical activity, and with a healthy weight were compared with the other adults. At all ages, people with healthy behaviours were at less risk of losing their good health, and the difference became more pronounced with advancing age (Chart 1). From this result it can be hypothesized that the impacts of healthy habits are cumulative through time.

Positive attitude: helpful for healthy aging

A number of diseases and emotional problems have been linked to stress. Indeed, middle aged adults with low chronic stress had better chances of healthy aging than did those whose chronic stress was high. Among seniors, the reverse was true: less stressed individuals had reduced chances of aging in good health. This counterintuitive finding may reflect the measures of chronic stress used in this analysis. The stressors included in the NPHS seem less appropriate for seniors. For instance, one of the most common stressors—trying to take on too much and the resultant time crunch—has been shown to have negative health consequences during adulthood. However, among elderly people, such a situation might be gratifying and indicate that they are more engaged in life than their peers.

In fact, among seniors, the chances of healthy aging were significantly enhanced by a related variable: a strong sense of coherence, that is, finding life meaningful, manageable and comprehensible. Because a high sense of coherence is significantly associated with healthy aging, a positive attitude towards life is desirable in order to stay healthy while aging. On the other hand, the frequency of social contacts was not significantly related to healthy aging for either middle aged adults or seniors.

Chronic conditions, no surprise

For this analysis, it was possible for people to be in "good self-perceived and functional health" in 1994/95, even if they had a chronic disease. But not surprisingly, the presence of some chronic conditions significantly reduced the chances that such individuals would remain in good health. For both middle aged adults and seniors, arthritis, diabetes and heart diseases were associated with significantly reduced chances of remaining healthy. Cancer and bronchitis/emphysema had a similar effect but only on seniors. Other chronic conditions (asthma, back problems, and glaucoma/cataracts) were not significantly related to remaining in good health for either group under study.

Doctor's visit: important for seniors

For middle aged adults, not having consulted a physician in the year before their first NPHS interview made little difference to maintaining health. However, seniors who had not consulted a physician had significantly reduced chances of remaining healthy. This variable may be considered a proxy for the respondents' commitment to regular medical check-ups. Not having consulted a physician may represent a long-standing pattern of behaviours with a potentially negative effect on health. Both middle aged adults and seniors who reported having had at least three physician consultations in the year before their first interview had significantly reduced chances of aging in good health.

Concluding remarks

The factors that affected an individual's chances of remaining in good health over the eight years from 1994/95 to 2002/03 were not the same for middle aged adults and seniors.

For middle aged adults, socio-economic characteristics, specifically education and household income, are important. However, smoking, physical inactivity in leisure time and a non healthy weight are not significantly related to healthy aging for those adults, which indicates that the consequences of unhealthy behaviours had not yet had time to become fully apparent.

However, unhealthy behaviours eventually catch up with the people who adopt them. Seniors who started out in good health in 1994/95 were at a significantly higher risk of losing their health by 2002/03 if they smoked or quit in the last 10 years, had inactive leisure-time pursuits or were in a weight range that was not appropriate for their height.

A detailed analysis of the positive effects of healthy behaviours on healthy aging after age 45 has shown an increasing effect with age, supporting the hypothesis that the impacts of healthy habits are cumulative through time. This result reinforces the public health message that healthy habits are profitable throughout the life cycle.

Some chronic conditions such as arthritis, diabetes and heart disease have a clear negative relationship to healthy aging. Consequently, preventing those diseases before age 65 could improve the health of the elderly population.

The effect of household income on healthy aging for middle aged adults raises the need for a better understanding of the mechanisms by which low income impacts health. A better understanding of these mechanisms could allow policy makers to develop programs to reduce this effect, thus improving population health. The positive relationship between education and healthy aging is encouraging to the extent that each successive generation is more educated than the preceding one.

There are many ways to improve the health status of the Canadian population, a task that is both an individual and collective responsibility. Healthy aging, which contributes to "successful" aging, does not seem to be reserved to a small group of individuals with a well-kept secret: this study shows that through a combination of personal effort and public will, many people can make it.

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DEFINITIONS

Apart from age, sex and immigrant status, a number of demographic and socio-economic determinants and health behaviours were considered. All the health determinants were measured in 1994/95, the first cycle of the National Population Health Survey (NPHS).

Living arrangements classify respondents according to whether they live alone, with their spouse (with or without other persons in the household) or with others (excluding their spouse).

Educational levels differentiate respondents who had graduated from a postsecondary institution from those who had not.

The respondent is classified as being part of an upper-middle income household if its household gross annual income is from $30,000 to $59,999 for households with 1 or 2 two persons; from $40,000 to $79,999 for households with 3 or 4 persons or from $60,000 to $79,999 for households with 5 or more persons. To be classified in a high income household, the respondent lives in a household with a gross annual income of $60,000 or more for households with 1 or 2 persons or of $80,000 or more for households with 3 or more persons.

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

Respondents were asked if a health professional had diagnosed them as having any chronic conditions. Nine chronic conditions were considered in this analysis: asthma, arthritis, back problems, bronchitis/emphysema, diabetes, heart diseases, cancer, incontinence and glaucoma/cataracts.

Respondents who had consulted a family physician or general practitioner once or twice in the past 12 months before the first cycle of the survey were distinguished from those who had not consulted a physician in that time and those who had consulted a physician three times or more.

The smoking variable distinguishes respondents who had never smoked and former occasional or regular smokers who had quit for at least the last 10 years from current occasional and regular smokers, as well as those who quit in the last 10 years.

To be classified as physically active, respondents had to engage in leisure-time physical activity for at least 15 minutes a day, three times a week.

Respondents of healthy weight were those whose body mass index (obtained by dividing weight in kilograms by the square of height in meters) was between 18.6 and 24.9.

The alcohol consumption variable makes a distinction between respondents who had never consumed alcohol and those who had.

A chronic stress indicator in the NPHS, based on questions about relationships, family life, children, their health as well as the one of family members, finances and environment, was used to distinguish the least stressed respondents (indicator equal to 0) from others.

The sense of coherence scale developed by Antonovsky[8] was used to classify respondents based on whether they perceive events in life as understandable, controllable and meaningful. Those with a strong sense of coherence (indicator 70 or more) were distinguished from others.

An index was used to measure respondents' degree of social support. The index shows the average number of contacts, over the past 12 months, with friends, neighbours and family members who are not part of the household. Respondents with frequent contact (index of 5 or more on a scale of 0 to 6) were distinguished from more isolated individuals.

METHODS

Data source

The longitudinal component of the National Population Health Survey (NPHS) is based on a sample of 17,276 respondents who were living in private households and 2,182 respondents who were living in health care institutions in 1994/95. The survey has been conducted every second year since 1994/95. It does not cover members of the Canadian Forces or individuals living on Indian reserves or in some very remote regions.

No respondents were added from one cycle to another. Attrition has occurred because some of the original respondents refused to participate in subsequent cycles or could not be traced. Nonetheless, the attrition rate from cycle to cycle is low and does not affect the accuracy of statistical estimates. The statistical model used in this study takes attrition into account.

For this analysis, 6,627 respondents aged 45 or older were considered. It was not possible to determine the health status of 375 of them (7% of weighted value) in 1994/95, and as a result, they were excluded from the analysis.

The initial population for this study consisted of respondents who were in good health in 1994/95. Residents of health care institutions were excluded, on the assumption that they were all in poor health. A total of 2,498 respondents aged 45 to 64 and 1,310 aged 65 or older met the criteria for good health in 1994/95. In this study, respondents could lose their good health in two ways: by dying or by an actual loss of good health.

Analytical techniques

The technique used for this analysis is an adaptation of the proportional risk model (Cox regression). With the original Cox model it is not possible to take into account the bootstrap weighting method used to calculate variances and confidence intervals that reflect the effects of the complex survey design. Instead, a logistic regression model with a "cloglog" link was used, which produces the same results as a Cox regression and allows the use of bootstrap weights.

In addition to demographic and socio-economic variables, health behaviours, psycho-social factors and chronic conditions, a variable was included in the model to control for the effect of the passage of time, or duration. This variable simply reflects the chances to stay alive and in good health from one cycle to the other, everything else being equal. This variable is not significant among adults aged 45 to 64, meaning that during this period of life, the passage of time does not have yet a major effect on health as the wear and tear of the body is not yet very important. Among the elderly however, this passage is significant, showing that with each new cycle, the chances of staying healthy are getting lower.

For respondents about whom data were not available in one survey 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, very good or excellent in the preceding and subsequent cycles. If a shift to poor health was observed in the cycle following the non-response, the respondent was excluded at the last cycle completed prior to the missing cycle, based on the assumption that it was not possible to determine in exactly which cycle the poor health had appeared. The same procedure was followed for respondents with a non-response in two consecutive cycles.

Although the conceptual analytical framework was intended to be as comprehensive as possible, key variables may have been omitted, either because they were not collected by the NPHS or as a result of methodological problems. It is the case, for example, of responses to questions on family background that could not be used because those questions were only asked for cycle 3 (1998/99), questions that pertained only to respondents who had survived to that cycle.