

Age-Related Changes in Factors Associated with Loss of Good Health

Robert L. Brown¹
Andrew MacKenzie²
Steven G. Prus³

Presented at the Living to 100 Symposium
Orlando, Fla.
January 5–7, 2011

Copyright 2011 by the Society of Actuaries.

All rights reserved by the Society of Actuaries. Permission is granted to make brief excerpts for a published review. Permission is also granted to make limited numbers of copies of items in this monograph for personal, internal, classroom or other instructional use, on condition that the foregoing copyright notice is used so as to give reasonable notice of the Society's copyright. This consent for free limited copying without prior consent of the Society does not extend to making copies for general distribution, for advertising or promotional purposes, for inclusion in new collective works or for resale.

¹ Department of Statistics and Actuarial Science, University of Waterloo.

² Statistics Canada.

³ Department of Sociology, Carleton University.

Using longitudinal data from the Canadian National Population Health Survey, proportional hazards models were used to identify factors associated with loss of good health (from good to poor self-rated health) over a 14-year period among people age 20 to 44, 45 to 64, and 65 and older. The data show that about 30 percent of people age 20 to 44 lost their good health over this period, compared to about 50 and 80 percent of middle and old age people respectively. The data further reveal that determinants of health loss vary across the three age groups—loss of good health among young and middle-aged adults was significantly associated with socioeconomic factors, and less so with behavioural and psychosocial ones. Elderly people, on the other hand, who previously smoked or who remained physically inactive with an unhealthy body weight were most likely to experience loss of good health. Alcohol consumption and social involvement helped to prevent health decline in old age. The results help to better understand determinants of healthy aging and to develop policies and programs aimed at keeping people healthy as they age.

Introduction

A great constant throughout much of human history has been the search for the keys to healthy aging. Classic suggestions such as “an apple a day keeps the doctor away” have been echoed throughout time, but it has only been in the past century through the introduction of large-scale longitudinal surveys and other scientific methods that these types of tales could be empirically tested. Healthy aging has been at the center of much debate in recent years, and the importance of this debate is growing for policy makers in countries with aging populations.

The leading edge of the baby boomer generation will turn 65 in 2011, marking the beginning of a mass migration to senior citizenship for a large segment of many western populations. Previous research has shown that health behaviors of the baby boomer generation in the past, present and future will significantly affect their healthy aging process, which will in turn impact health care systems (Hartman-Stein and Potkanowicz 2003). The flood of aging baby boomers could bring a spike in health care needs and present significant new challenges for our already over-burdened health care systems. This paper seeks to identify social, behavioral and psychosocial factors associated with change in health status to provide insight for the aging baby boomers to help them foster a healthy aging experience.

Literature Review

There is wide-ranging literature on determinants of healthy aging. A review of the literature by Peel, McClure and Bartlett (2005) found that the most commonly cited correlates of healthy aging were smoking, physical activity, body weight, diet, alcohol use and health practices. Similar reviews of healthy aging studies reveal several dimensions of lifestyle risk factors that adversely affect the likelihood of experiencing healthy aging, including alcohol and tobacco consumption, exercise, social support, and the absence of mental and physical disability (Depp and Jeste 2006, Hartman-Stein and Potkanowicz 2003).

A handful of studies have looked at healthy aging among Canadians (Kaplan, Huguet, Orpana, Feeny, McFarland and Ross 2008; Martel, Bélanger, Berthelot and Carrière 2005; Orpana, Lemyre and Gravel 2009, Ramage-Morin, Shields and Martel 2010; Shields and Martel 2006). Most of these studies use longitudinal data from the Canadian National Population Health Survey (NPHS). Consistent with the research described above, Canadian data from the NPHS reveal that staying healthy is significantly related to behavioral and psychosocial factors, as well as socioeconomic status (SES).

A recurring criticism of many studies on healthy aging relates to either the sample size or the length of time passed since the launch of the longitudinal panel. There were a number of longitudinal age group studies launched in the 1930s and 1940s, but the sample sizes were typically less than 500 and rarely approached 1,000 or more. These small groups often lack the sample size necessary to generate the significant statistical associations required to make causal conclusions about the effects of lifestyle behaviors on healthy aging.

On the other hand, most large-scale longitudinal age group studies are relatively young, and need time to fully mature into powerful longitudinal analysis instruments. The NPHS boasts one of the largest samples in the world, and has an observation period that now runs over 14 years. The NPHS offers a substantial amount of analytical potential to examine factors associated with maintaining good health.

Research Question

The relationships between social, behavioral and psychosocial factors and change in health status have been examined at various points in the life course. No study has examined if these relationships remain the same across the adult life course. The current study addresses this question using NPHS data to examine determinants of change in health status among young (20 to 44), middle-aged (45 to 64) and old (65 and older) adults. By comparing determinants of change in health across age groups, we can assess if and what factors play an increasingly important role in the healthy aging process.

Methods

The study uses data from the household component of the NPHS. The NPHS is a population-based longitudinal study conducted by Statistics Canada. The survey is representative of the household population of Canada in 1994, the first wave of data collection.

Respondents were interviewed, in person or through the telephone, every two years. Eight waves of data (1994 to 2008) have been collected, providing an observation period of 14 years. The NPHS started with 17,276 respondents, and about 70 percent responded in each of the eight cycles. More detailed information on the NPHS sample and design are available at www.statcan.gc.ca.

This study uses all eight cycles. To be included in the analysis, individuals had to be 20 or older in 1994 and in excellent, very good or good self-rated health. Respondents with any data missing in 1994 were excluded from the study.

The event of interest, or dependent variable, is loss of good health. Respondents can lose their good health by either reporting fair or poor self-rated health or by dying at any time over the observation period. The health status of respondents with missing self-rated health data in any one survey cycle was imputed as “good” if it was good in the preceding and subsequent cycles. Those with missing self-rated health data in two or more consecutive cycles, or in the last cycle, were excluded.

A range of health determinants, measured at the baseline in 1994, were considered, and organized in four domains: sociodemographic (age, sex, marital status, race, nativity); socioeconomic (education, income); behavioral (smoking, alcohol consumption, exercise, body weight); and psychosocial (self-esteem, mastery, sense of coherence, and social support and involvement). Scores on continuous variables were dichotomized at their median score. Missing data on these variables were coded as a response category and included in the analysis.

Cox proportional hazards modeling was used to examine the effects of these variable on the risk of losing good health over the 14-year observation period. All determinants were included in the models simultaneously. Separate analyses were

conducted for people ages 20 to 44, 45 to 64, and 65 and older in 1994. Longitudinal survey and bootstrap weights were included in the analyses.

Results

Figure 1 shows that, in 1994, 95 percent of young adults were in good health, compared to 85 and 73 percent of middle-aged adults and seniors respectively. Figure 2 shows that 70 percent of young adults who had been in good health in 1994 had good health in 2008. Just over 50 percent of 45- to 64-year-olds maintained their good health over this period, while 18 percent of elderly people were still alive and in good health in 2008.

Figure 1
Percentage in Good Health in 1994, by Age Group

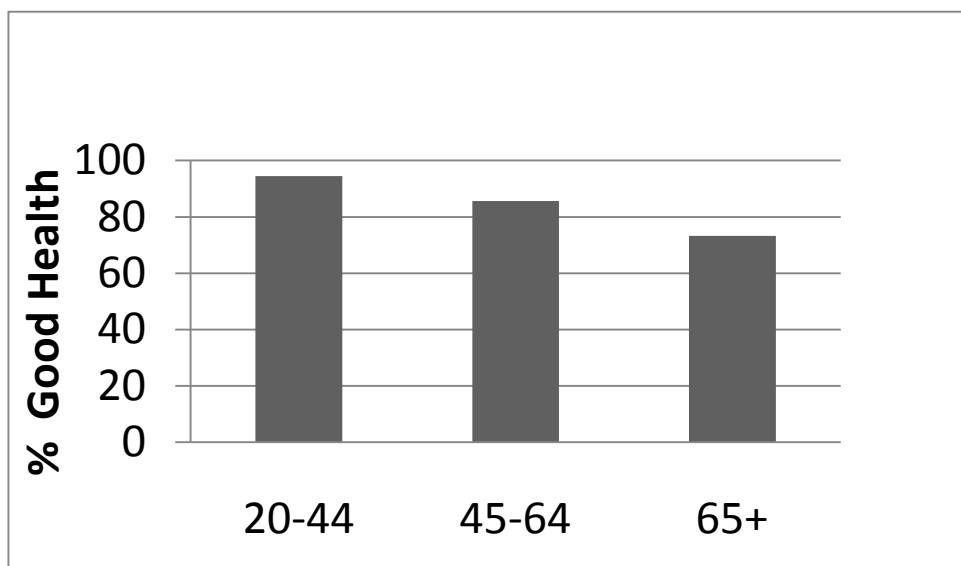


Figure 2
Risk of Losing Good Health Between 1994 and 2008, by Age Group

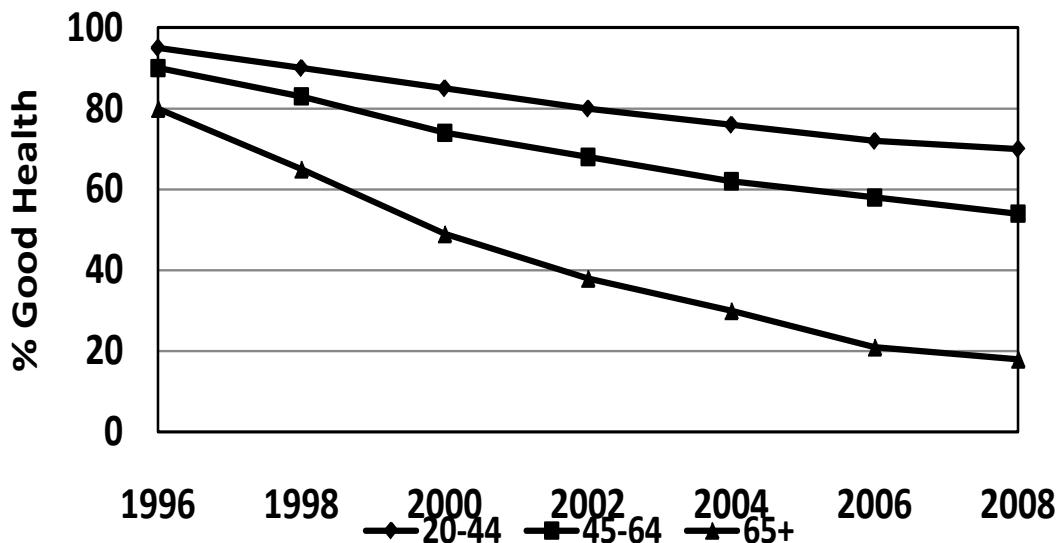


Table 1 shows the effect of each predictor on the risk of losing good health over the 14-year observation period for young, middle-aged and old people. The hazard ratios (HR) were adjusted for all other variables in model. HR values greater than 1 indicate that the variable is positively associated with health loss.

Not surprisingly, age was more significantly related to health loss for people 65 or older than it was for younger adults. Sex was strongly associated with change in health status in middle-age only, with women less likely to experience health loss at follow-up. Younger never-married people were at higher risk, and elderly never-married at lower risk, of losing their good health. Race related to health loss at younger ages, though recent immigrants were significantly more likely to experience a decline in health if they arrived in old age.

TABLE 1
**Proportional Hazards Ratios (HR) of Loss of Good Health Between 1994 and 2008 by
Sociodemographic, Socioeconomic Status (SES), Behavioral and Psychosocial Factors by
age Group at Baseline¹**

Baseline Characteristics	20-44		45-64		65+	
	HR	CI 95%	HR	CI 95%	HR	CI 95%
Sociodemographic						
Age (in years)	1.01+	1.00-1.02	1.03***	1.02-1.05	1.05***	1.04-1.06
Sex						
Female	0.99	0.83-1.17	0.83*	0.71-0.96	0.89	0.77-1.05
Male (ref)	1.00		1.00		1.00	
Marital Status						
Never Married	1.17+	0.97-1.41	1.43*	1.05-1.95	0.74+	0.52-1.05
Div/Sep/Widow	1.07	0.84-1.36	1.00	0.84-1.19	0.92	0.80-1.05
Married (ref)	1.00		1.00		1.00	
Race						
Non-white	1.38*	1.01-1.91	1.45*	1.01-2.09	0.95	0.50-1.80
White (ref)	1.00		1.00		1.00	
Yrs Since Immigration						
>10	1.18	0.82-1.71	1.05	0.53-2.13	1.04	0.89-1.21
10 or less	1.20	0.80-1.80	1.12	0.91-1.37	2.05**	1.08-3.89
Canadian-born (ref)	1.00		1.00		1.00	
SES						
Education						
Elementary or less	2.96***	1.74-5.02	1.64**	1.20-2.24	1.47**	1.16-1.86
Some HS	2.06***	1.59-2.67	1.30*	1.01-1.68	1.21	0.96-1.53
HS	1.39**	1.14-1.67	1.27*	1.03-1.57	1.12	0.90-1.38
PS (ref)	1.00		1.00		1.00	
Income						
Low/Low-middle	1.79***	1.44-2.23	1.62***	1.31-2.01	1.04	0.86-1.27
Middle	1.25*	1.03-1.52	1.36**	1.12-1.65	1.10	0.93-1.32
Upper-mid/Upper (ref)	1.00		1.00		1.00	
Missing	1.65**	1.12-2.43	1.00	0.62-1.61	0.96	0.69-1.35
Psychosocial						
Stress						
High	1.23*	1.04-1.46	1.26***	1.06-1.50	1.07	0.92-1.26
Low (ref)	1.00		1.00		1.00	
Distress						
High	1.48***	1.18-1.84	1.00	0.70-1.45	1.34*	1.01-1.85
Low (ref)	1.00		1.00		1.00	
Mastery						
Low	0.99	0.83-1.17	1.21*	1.01-1.45	1.11+	0.97-1.27
High (ref)	1.00		1.00		1.00	
Sense of Coherence						
Low	1.32***	1.10-1.56	1.07	0.89-1.29	1.02	0.88-1.20
High (ref)	1.00		1.00		1.00	
Social Support						
Low	1.26**	1.04-1.52	0.96	0.78-1.18	0.86*	0.74-0.99
High (ref)	1.00		1.00		1.00	
Social Involvement						
Low	1.07	0.91-1.25	1.19**	1.03-1.37	1.17*	1.03-1.33
High (ref)	1.00		1.00		1.00	
Behavioral						
Type of Smoker						
Daily	1.53***	1.23-1.91	1.59***	1.29-1.95	1.22*	1.03-1.45
Former Daily	1.00	0.80-1.26	1.11	0.93-1.33	1.29***	1.10-1.50
Other (ref)	1.00		1.00		1.00	

Alcohol consumption						
Regular	0.87	0.55-1.38	0.77+	0.57-1.04	0.69***	0.56-0.84
Occasional	1.05	0.66-1.69	0.90	0.64-1.24	0.82*	0.67-0.99
Former	1.10	0.70-1.77	0.89	0.62-1.26	1.02	0.84-1.24
Never (ref)	1.00		1.00		1.00	
Physical Activity						
Infrequent	1.02	0.84-1.24	1.14+	0.95-1.36	1.27***	1.11-1.43
Regular/Occas. (ref)	1.00		1.00		1.00	
BMI						
Under/Overweight	1.07	0.90-1.27	0.98	0.83-1.16	1.15*	1.01-1.32
Obese	1.44***	1.13-1.83	1.22*	1.01-1.50	1.08	0.90-1.28
Normal (ref)	1.00		1.00		1.00	

1. Variables were measured at baseline in 1994 (Cycle 1).

Differences between each category of the variable are statistically different from the reference category (ref) at: + p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001 (two-tailed tests).

Change in health status was most strongly associated with socioeconomic characteristics among younger adults. The effects of education and income on loss of good health were: very strong among young adults, moderately strong among middle-aged adults and nearly insignificant among old adults. Health differences between SES groups appear to diminish with age.

Turning to psychosocial and behavioral factors, the results show that the effect of stress on health loss increases, then decreases, with age. Interestingly, seniors with low social support were at higher risk of losing health. While being a smoker had a negative effect on healthy aging in each age group, current daily smokers were most vulnerable to loss of health if young or middle-age and former daily smokers if old. On the other hand, elderly people who drank alcohol were less likely to lose their good health compared with seniors who did not drink, suggesting that moderate alcohol consumption protects against health decline in old age. Finally, the results show that obesity is tied to health decline among young and middle-aged adults, while being underweight is strongly associated with change in health status for seniors, and that the effect of exercise on health loss increases with age.

Conclusion

The results show that the factors associated with loss of good health tend to differ across the life course. As such, they help to understand determinants of healthy aging, and to develop policies and programs accordingly aimed at keeping people healthy as they grow old.

References

- Depp, C., and D. Jeste. 2006. "Definitions and Predictors of Successful Aging: A Comprehensive Review of Larger Quantitative Studies." *American Journal of Geriatric Psychiatry* 14:6–20.
- Hartman-Stein, P., and E. Potkanowicz. 2003. "Behavioral Determinants of Healthy Aging: Good News for the Baby Boomer Generation. *Online Journal of Issues in Nursing* 8:1-6.
- Kaplan, M., N. Huguet, H. Orpana, D. Feeny, B. McFarland, and N. Ross. 2008. "Prevalence and Factors Associated with Thriving in Older Adulthood: A 10-Year Population-Based Study." *Journal of Gerontology* 63:1097–1104.
- Martel, L., A. Bélanger, J.M. Berthelot, and Y. Carrière. 2005. "Healthy Aging." *Healthy Today, Healthy Tomorrow? Findings from the National Population Health Survey*. Statistics Canada Catalogue 82-618-MWE2005004.
- Orpana, H., L. Lemyre, and R. Gravel. 2009. "Income and Psychological Distress: The Role of the Social Environment." *Health Reports* 20:21-8.
- Peel, N., R. McClure, and H. Bartlett. 2005. "Behavioral Determinants of Healthy Aging." *American Journal of Preventive Medicine* 28:298-304.
- Ramage-Morin, P., M. Shields, and L. Martel. 2010. "Health-Promoting Factors and Good Health Among Canadians in Mid- to Late Life." *Health Reports* 21:1-9.
- Shields, M., and L. Martel. 2006. "Healthy Living Among Seniors." *Health Reports* 16:7-20.