A Life-course Perspective on the Relationship between Socio-economic Status and Health: Testing the Divergence Hypothesis

(**Condensed Title:** SES, Health, and the Life-course)

(**Keywords:** Health; Socio-economic Status; Life Course; Healthy Aging)

Steven G. Prus, Ph.D.
Assistant Professor
Department of Sociology and Anthropology, Carleton University
1125 Colonel By Drive, Ottawa, ON K1S 5B6
fax: (613) 520-4062
telephone: 520-2600, ext. 3760
e-mail: sprus@ccs.carleton.ca

AUTHOR'S NOTE: This research was supported by the SEDAP (Social and Economic Dimensions of an Aging Population) Research Program, which is funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) through Grant No. 412-98-0008. The author wishes to thank Victor Marshall and the anonymous reviewers for their helpful comments and suggestions on an earlier draft of this article. Address correspondence to Steven Prus, Department of Sociology and Anthropology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6; sprus@ccs.carleton.ca.

Abstract

While adults from all socio-economic status (SES) levels generally encounter a decline in health as they grow older, research shows that health status is tied to SES at all stages of life. The dynamics of the relationship between SES and health over the life course of adult Canadians, however, remain largely unexplored. This paper tests the divergence hypothesis, which postulates that the SES-based gap in health widens with age, using a representative sample of Canadians aged 25 to 79 from the 1994/1995 National Population Health Survey. Multiple linear regression analyses show support for this assumption; that is, the relationship between SES (measured by years of education and annual household income) and health (measured by self-rated and functional health indexes) strengthens with age. The results of this study provide insight and answers about healthy aging among Canadians.

Introduction: The Relationship between Socio-Economic Status and Health over the Life course

Despite universal access to essential health care in Canada, research shows that socio-economic status (SES) is closely linked to health status among both younger and older adults (e.g., Cairney, 2000; Cairney & Arnold, 1996; Cairney & Arnold, 1998; Hay, 1988; Hirdes & Forbes, 1989; Hirdes, Brown, Forbes, Vigoda, & Crawford, 1986; Mustard, Derksen, Berthelot, Wolfson, & Roos, 1997; Wilkins, Adams, & Brancker, 1991; Wolfson, Rowe, Gentleman, & Tomiak, 1993). Canadians with higher SES, especially well-educated and higher-income persons, have lower rates of morbidity and mortality than those with lower status.

Socio-economic inequalities in health largely reflect differential social circumstances that are divided along class lines. Adulthood experiences, exposures, and conditions that directly and indirectly influence health differences between SES groups are mainly related to material, lifestyle, and psychosocial factors, and the interplay between them. In brief, material factors are the direct effects of SES on health. For example, those with higher education (which is a primary indicator of SES) tend to have higher occupational status and earnings and, thus, adequate financial resources to support the purchase of good housing, nutrition, and private health care, safer working conditions, and so on, all of which are directly tied to better health (Roberge, Berthelot, & Wolfson, 1995). SES also influences health indirectly, as position in the socio-economic structure affects psychosocial (e.g., chronic stress, stressful life events, personal sense of control, self-mastery, coping skills, and social support) and health-related lifestyle preferences and behaviours (e.g., cigarette smoking, excessive alcohol and refined-food consumption,

leisure-time exercise, access/use of preventative health-care services, and acquisition/interpretation of health-education information), which in turn affects health (e.g., Gilmore, 1999; Millar, 1996; Millar & Stephens, 1993; Stronks, Mheen, Looman, & Mackenbach, 1998; Villeneuve, Morrison, & Elaguppillai, 1994).

While health status is related to SES, adults from all socio-economic levels generally encounter a decline in health with age as they begin to experience minor ailments in the earlier part of the later life course and more severe health problems in the later part. However, less is known about the particular interaction between age, SES, and health. The SES gap in health with age can take, theoretically, various paths; it can: converge (i.e., age acts as leveler whereby health differences between SES groups are diminished), stay the same (i.e., health inequalities by SES persist with age), diverge (i.e., a double jeopardy whereby the aging process amplifies SES differences in health), or some combination of the above patterns (e.g., diverge then converge or vice-versa).

The divergence theory (also called the cumulative advantage/disadvantage hypothesis) has attracted considerable attention in the literature on age, SES, and health. It predicts that socioeconomic-based inequalities increase over the life course as individuals endure the cumulative effects of earlier-life behaviours and economic and psychosocial experiences on their health (House, Kessler, Herzog, Mero, Kinney, & Breslow, 1990; House, Lepkowski, Kinney, Mero, Kessler, & Herzog, 1994; Mustard et al., 1997; Ross & Wu, 1996). For instance, the cumulative effects of healthier living/lifestyle over the life course of higher SES persons help postpone or compress morbidity and disability into a very short period of their last years of life. By contrast, individuals with early-life SES disadvantages tend to have less healthy lifestyles. In turn,

they often become less and less fit and more and more overweight with age, increasing the risk of muscle/joint, respiratory, heart, and other chronic conditions, resulting in an ever-increasing sedentary lifestyle and poorer and poorer health (Ross & Wu, 1996). The more risky lifestyles of low SES groups therefore begin to have an impact on their health in middle life but have their largest impact in later life, as long-term exposure to these factors eventually produces morbidity and disability at an age (i.e., old age) when people are generally more susceptible to disease and illness.

In sum, differences in social resources between SES groups produce relatively few inequalities in health in earlier parts of the life course since younger persons tend to be in good health. As health advantages and disadvantages associated with material, lifestyle, and psychosocial resources accumulate with age (i.e., the health status of individuals with early SES advantages generally deteriorates more slowly relative to their counterparts), SES-based inequalities in health widen. While a convergence in the health gap between SES groups eventually does occur, it is not until near or at the end of the human life span as higher SES persons ultimately become vulnerable to disease and illness due to universal biological forces and as lifestyle changes (e.g., greater likelihood of quitting smoking and drinking) among lower SES elderly persons reduce their relative risk of morbidity and disability (House et al., 1994).

Research Question

The empirical relationship between age, SES, and health among adult Canadians remains largely unexplored. This paper contributes to the social epidemiology literature

by asking if older Canadians are a more heterogeneous group in terms of health status compared to younger Canadians. Specifically, does the SES-based gap in health increase with age, as predicted by the divergence model?

Methods

Data This study is based on cross-sectional data from the public-use version of the 1994/1995 National Population Health Survey (NPHS), which covers a representative sample of private Canadian households (excluding those on Reserves and Canadian Forces Bases and in some remote areas in Quebec and Ontario). The NPHS is based on a multistage stratified cluster probability sampling design. (The data used here are weighted to take into consideration the sampling design). The household response rate for the 1994/5 NPHS was 88.7 percent. In each sampled household, some limited information was collected from all household members (n=58,439) and one person, aged 12 years and over, was randomly selected for a more in-depth interview. These in-depth interviews, which are the data used in this paper, were obtained from 17,626 individuals, for a response rate of about 96.1 percent. At the Canada level, these yield a combined response rate of about 85 percent for the 1994/5 NPHS.

This study is restricted to those aged 25-79 who did not attend school in the 12 months prior to the interview, producing a sample of 13,531 persons. Individuals who are at least 25 years of age were selected since the vast majority of them have completed their formal education, which is a primary indicator of SES in this study. The age variable in most public-use datafiles, such as the NPHS, is top-coded at around 80 years

of age to guard against disclosure. Given the wide-range of age values in the top-coded 80+ category in the NPHS, it is excluded from this analysis. This study, therefore, focuses on the adult life course from ages 25 to 79.

The 1994/5 NPHS is one of the best available datasets for this particular study because it provides detailed descriptions of health status and educational attainment. While these data are appropriate for this study, long-term longitudinal data (longitudinal data have recently been created by Statistics Canada but have not matured to the point where they are suitable for this study) are usually more appropriate for testing models of age, SES, and health for various reasons.

First, lifetime health data are essential for testing hypotheses about an individual's health over time (e.g., the health status of persons with early-life SES advantages generally deteriorates more slowly relative to individuals with early-life SES disadvantages). However, this is not the explicit intent of this paper; rather, it is to examine the dynamics of the relationship between SES and health over the life course of adult Canadians (i.e., to examine if the SES-based gap in health diverges with age).

Second, it is difficult to establish causal order without longitudinal data; that is, to what degree are SES inequalities in health the result of social causation (SES affects health) vis-à-vis social selection (health affects status attainment). Longitudinal studies on social status and health in Canada, however, support the social causation claim (e.g., Hirdes & Forbes, 1989; Wolfson et al., 1993). This position is also assumed by the divergence theory and by this study.

Third, when studying aging-related issues, a combination of three effects can confound findings: 1) aging effects (i.e., changes due to aging); 2) cohort effects (i.e.,

differences between young, middle, and old age cohorts due to their unique social and economic experiences); and 3) period effects (e.g., changes in society, culture, or economy that influence all ages). While it is more difficult in cross-sectional studies to isolate the effects of cohort and age as opposed to longitudinal studies, the SES standardization approach discussed below and employed here helps to reduce the influence of cohort effects. Further, the confounding effects of age and period are more difficult to disentangle in longitudinal studies.

Fourth, it is possible that patterns of age, SES, and health are influenced by SES-bias in mortality/morbidity (House et al., 1994). Specifically, this bias may alter distributions of education, income, and other measures of SES within age groups and consequently how the effect of SES on health is conditioned by age. That is, SES differences in health, especially in old age, reported in this paper may be underestimated because a disproportionate amount of those with lower SES (e.g., lower educated and/or lower-income persons) have died or have been institutionalized or are unable to participate in a survey due to poor health, leaving a relatively smaller but healthier population of lower status seniors as well as augmenting the overall average education level of a birth cohort as it grows old. When compensating for the selective effects of mortality Beckett (2000), however, finds that SES-based inequalities in health change very little. Long-term longitudinal data, nonetheless, are necessary to replicate the findings observed in this paper, and to more precisely determine to what extent the SES-bias in mortality influences patterns of age, SES, and health.

Despite these methodological issues, the findings produced here using 1994/5 NPHS cross-sectional data are interpreted with confidence, and provide a primary step

toward understanding the relationship between SES and health over the life course of adult Canadians.

Measurement Age is a categorical variable that is divided into 5-year intervals and recoded here into years of age by taking the mid-point of each category (e.g., 25-29=27; 30-34=32; ….70-74=72; 75-79=77). Both years of formal education and household annual income are used as a measure of SES. Given the life-course focus of this study, education is a particularly good measure of SES because it is generally fixed after early adulthood (although this is less so today than in the past) and usually occurs prior to change in health. Hence, while the relationship between education and other indicators of SES may vary over time, education overall provides one of the best measures of lifetime SES (Ross & Wu, 1996).

Highest level of education obtained is a categorical variable in the NPHS and recoded here by assigning a value indicating total years of schooling to each category as follows: doctorate, masters, or medical degree (20); bachelors degree (16); community college diploma or some university (15); trade/technical/vocational college diploma or some community college (14); some trade/technical/vocational (or other) (13.5); high school graduate (12); some high school (10); elementary or some elementary school (6); and no schooling (0). The analysis in this study is based on a standardized version of number of years of education. Specifically, education is collapsed into age-specific quintiles to reduce the impact of cohort effects (e.g., young adults are better educated than old adults). Each education quintile represents 20 percent of the cases for a given age. For those aged 25-29, for example, respondents are rank-ordered by years of education and then divided into five equal groups, where the first quintile is made-up of

25-29 year-old respondents with the lowest 20 percent of years of education, the second quintile comprises 25-29 year-olds with the next lowest 20 percent of educational attainment, and so on. This procedure is replicated for each age group; hence, every respondent in the sample is assigned to one of five education quintiles based on his/her educational ranking within a particular age group. It is important to emphasize that education is measured here on a relative level (as opposed to an absolute one), and that this could influence the relationship between age, education, and health. Yet, when the analysis was re-done using an unstandardized measure of education (i.e., education in years), as well as with income in dollars, the findings reported in this study were largely replicated.

Household annual income is also a categorical variable that is divided into income intervals, but recoded here into dollars by taking the mid-point of each category (e.g., no income=$0; $1-$4,999=$2,500; $5,000-$9,999=$7,500; $10,000-$14,999=$12,500 ….). Various other adjustments were made to the income data. First, these data have been capped at $80,000+ to guard against disclosure. Hence, 1995 income data from the Census, which are less restricted, were used here to calculate the median household income of those in this category. This value ($106,800) was then used to represent the annual household income of those in the $80,000+ category. Second, adjustments to household income were made for the number of persons in the household. This was accomplished by dividing household income by the square root (to reflect the “economies of scale” in different sized households) of household size. Third, the standardization process discussed above was repeated for income (i.e., income was collapsed into age-specific quintiles to reduce the impact of cohort effects). Fourth, the income variable

contained more missing cases than any other variable used in this study. However, since the number of missing cases was relatively small (546) and because they were reasonably scattered through the entire dataset in a random manner, they were excluded from the analyses. This approach was employed to deal with missing cases for all variables with missing data.

A multifaceted approach is also used to provide a robust measure of overall/global health status. Health status is measured on both subjective and objective levels. In the NPHS, subjective health status is assessed through the question “In general, how would you say your health is?” and has a five-point scale: poor (0), fair (1), good (2), very good (3), and excellent (4). Self-rated health, when measured on such a Likert-type scale, is typically treated as a continuous variable; this is also the case in this study.

Objective health status is based on a respondent’s answers to questions about functional health/ability. Specifically, the Health Utility Index (HUI) is used. The HUI, developed at McMaster University’s Centre for Health Economics and Policy Analysis, measures both quantitative and qualitative aspects of functional health. It is an index of an individual's overall functional health based on eight self-reported attributes: vision, hearing, speech, mobility (ability to get around), dexterity (use of hands and fingers), cognition (memory and thinking), emotion (feelings), and pain/discomfort. Respondents are asked up to seven questions per attribute, which are weighted to reflect the views of society concerning health status (i.e., preferences about various health states elicited from a representative sample of individuals). It is important to note that these questions are not about illnesses that affect people for short periods of time, but are concerned with an

individual's usual abilities or day-to-day health -- the entire HUI module for the NPHS questionnaire is available at: www.statcan.ca/english/concepts/nphs/quest94e.pdf.

The HUI is a single numerical value for any possible combination of levels of these eight health attributes, and ranges from 0 (completely unfunctional) to 1 (perfect functional health) in increments of 0.001. For example, a respondent who is near-sighted, yet fully healthy on the other seven attributes, receives a score of 0.973 or 97.3 percent of full health (Statistics Canada, 1995). More information on the development and methodology of the HUI is found at: http://www.fhs.mcmaster.ca/hug.

Overall, self-rated health and the HUI are the most suitable indicators of health in the NPHS for this study. They are often considered broad measures of individual and population health, and the HUI in particular provides a rather objective measure of overall functional limitations and disabilities. Hence, self-rated health and the HUI provide a comprehensive, global measure of health. This is important for this study because the divergence theory assumes that lower SES persons are more likely to experience a general susceptibility to disease and illness or multiple health problems (as opposed to condition-specific health problems) and thus a more rapid decline in global health status with age.

Analysis Multiple linear regression analysis is used to estimate how the effect of SES on health is conditioned by age. For each health variable, two regression models are estimated. The first model includes education as a sole measure of SES. This analysis is done again using both education and income as a measure of SES. This estimates the extent to which the findings in the first model are influenced by income, as well as the extent to which health advantages associated with higher income (i.e., income-based

inequalities in health) change with age above and beyond the influence of education. Specifically, age, education, and an interaction term for age and education are included in the first regression analysis, and income and an interaction term for age and income are additionally included in the second one. (Note, the data were shifted/centered to deal with multicollinearity issues between the main effects of age, education, and income and their interaction effects). A positive interaction between age and education (or age and income) suggests that the positive effect of education (or income) on health increases with age, hence lending support to the divergence theory. On the other hand, a negative interaction or an insignificant interaction indicates that SES-based inequalities in health converge or stay the same, respectively, over the adult life course. To partial out the influence of two notable socio-demographic factors linked to health, all findings are adjusted for gender (coded as a dummy variable: male [1] vs. female [0]) and for marital status (married/common-law [1] vs. not married/common-law [0]).

Before these analyses were done, the shape of the age-SES-health relationship was analyzed to determine if SES differences in health change at a constant rate (i.e., linear effect of age) or at an accelerated rate (indicating a curvilinear effect of age) over the adult life course. Relatedly, it is possible that the SES-gap in health diverges over part of the life course (e.g., up to age 65), then converges (e.g., after age 65) or vice-versa (Ross & Wu, 1996). All of these scenarios were tested, and the linear equation [e.g., health = a - b_1 (age) + b_2 (education) + b_3 (age*education)] was found to provide a superior fit to the data. All models presented in this paper are based on this equation.

Results

Various findings are shown in Tables 1 and 2. First, there is a strong relationship between the socio-demographic covariates (gender and marital status) and health. For example, the first model in Table 1 shows that men, at any age or education level, tend to report better health than women, as do married/common-law individuals compared to their counterparts. Men's advantage in self-rated health, however, disappears when both education and income are controlled (Model 2 of Table 1). Second, the significant and negative age coefficients reflect a decrease in health status over the adult life course. The average respondent experiences a drop in his/her self-rated health and HUI score with each additional year of age, regardless of gender, marital status, and SES. Third, the data reveal a strong relationship between SES and health. Both education and income have a significant, positive influence on health -- persons with higher SES are advantaged in self-rated and functional health over the adult life course.

Tables 1 and 2 about here

Finally, the combined influence of age and education (i.e., age*education interaction term) is significant and positive. This observation is made even after the introduction of income into the analysis; that is, the positive interaction between age and education is not meaningfully influenced by income (see Model 2 in Tables 1 and 2). These findings reflect a divergence pattern between education groups in self-rated health and HUI from ages 25 to 79. A comparable picture emerges for the age-income interaction, namely in terms of self-rated health.

The models in Tables 1 and 2 can be visually depicted to more clearly show the positive interaction between age and SES. Graphs 1 and 2, which are based on the first model of these tables, plot predicted self-reported health and HUI scores, respectively, by age and education. The lines in both graphs show that health status decreases faster for those in lower education quintiles relative to those in higher education quintiles, increasing the education-based gap in health with age. The graphs specifically illustrate that by late-middle age and early-old age (50-65) the gaps between education quintiles start to widen considerably, and they continue to do so during later-old age (65+).

The predicted self-reported health score for the best-educated persons (fifth quintile) at age 25-29, for example, is 3.28. The comparable figure at age 65-69 is 2.68 -- a drop of 18 percent. There is a further decline to 2.51 at age 75-79 -- a 6 percent decrease from age 65-69. On the other hand, those in the first education quintile have a lower predicted self-reported health score which drops more sharply over the later part of the adult life course -- it falls from 2.90 at age 25-29 to 2.07 and 1.82 at age 65-69 and 75-79, respectively. This is a drop of almost 30 percent between age 25-29 and 65-69, and a further drop of 12 percent between age 65-69 and 75-79. Hence, the largest education-based inequalities in subjective health appear in very old age (i.e., age 75-79).

Graph 1 about here

A spiraling divergence in the health status between education groups with age is also observed in Graph 2. Looking at age-specific relationships between HUI and education quintile rank, the predicted HUI score for each quintile is most similar at age 25-29; thereafter, inequalities grow continually, with the largest education gaps in HUI observed among persons in their late-70s.

Graph 2 about here

Discussion

The widening socioeconomic-based gap in health across age groups found in this paper is predicted by the divergence hypothesis. According to this hypothesis, the health disadvantages attached to early-life risky lifestyle and lack of economic and psychosocial resources of individuals with lower SES cumulate with age. As the exposure to and the health-related impact of financial deprivation, unhealthy lifestyle, and social and psychological deficiencies grow for those with lower SES, their health generally deteriorates faster relative to their counterparts over the life course. Hence, while morbidity and disability are increasingly experienced by lower SES persons from middle age and onward, higher SES persons -- who tend to have less exposure to these circumstances -- experience a “compression of morbidity” into a short period at the end of life. Socioeconomic-based inequalities in health consequently increase over the adult life course, as found in this study.

While it is reasonable to assume that a stronger SES-health relationship with age reflects the cumulative effects of lifestyle, economic, and psychosocial forces on health of low and high SES individuals, it is not possible to directly test this assumption with cross-sectional data. Indeed, the goal of this study is to examine the general relationship between age, SES, and health, and not whether health declines at a slower rate for individuals with early-life SES advantages and at a faster rate for individuals with early-life SES disadvantages per se. These two processes are inexorably linked, yet longitudinal data are required to test the latter. The author plans to undertake such

analysis in the future when sufficient longitudinal data from the National Population Health Survey become available. In addition, it is not possible to test the divergence hypothesis assumption that socio-economic differences in health eventually converge in very old age (80+) with the data used here. Further research is needed to assess this assumption and to expand on this paper via data that is not top-coded by age.

The findings presented here, however, do show a divergence pattern between SES groups in health over the adult life course. The implication of this is that there is potential for further compressing morbidity and disability among entire cohorts, and not just those with economic advantage within cohorts. Research shows that the relationship between education, income, and other indicators of SES and health is weakened when controls for material, lifestyle, and psychosocial resources are introduced (e.g., Cairney, 2000; Lantz, Lynch, House, Lepkowksi, Mero, Musick, & Williams, 2001; McDonough, Walters, & Strohschein, 2002), revealing that economic position per se is not likely at the core of successful aging. Instead, these resources act as a conduit through which education, income, and so on influence health (Denton & Walters, 1999). To achieve postponement of morbidity and disability for all persons, efforts therefore need to focus more forcefully on or target lower SES groups, especially the poorest of the poor and at earlier stages of the life course. For example, public policies can help reduce health inequalities, notably in middle and early-old age, by specifically targeting and reducing the exposure to and impact of health-related behavioural risk factors such as cigarette smoking and sedentary living among lower SES groups. The potential for healthy aging also hinges on economic resources. Strengthening public policies aimed at reducing economic inequalities in the total population would likely change how the relation of age to health varies across socio-

economic groups. The large socio-economic differences in health in old age observed in this paper would likely be counteracted to some extent by stronger income security and welfare programs.

Overall, this study provides a primary step toward understanding the relationship between SES and health over the life course of adult Canadians, and how this relates to healthy aging. A good deal more research and public policy discussion is needed to more broadly understand the dynamics of SES-based inequalities in health over the life course and how to best deal with them.

References

Beckett, M. (2000). Converging health inequalities in later life-An artifact of mortality selection. *Journal of Health and Social Behavior*, 41,106-119.

Cairney, J (2000). Socio-economic status and self-rated health among older Canadians. *Canadian Journal on Aging*, 19, 456-78.

Cairney, J. & Arnold, R. (1996). Social class, health and aging: socioeconomic determinants of self-reported morbidity among the non-institutionalized elderly in Canada. *Canadian Journal of Public Health*, 3, 199-203.

Cairney, J. & Arnold, R. (1998). Socioeconomic position, lifestyle and health among Canadians aged 18 to 64: a multi-condition approach. *Canadian Journal of Public Health*, 3, 208-12.

Denton, M. & Walters, V. (1999). Gender differences in structural and behavioural determinants of health: an analysis of the social production of health. *Social Science and Medicine*, 48, 1221-35.

Gilmore, J. (1999). Body Mass Index and health. *Health Reports* (Statistics Canada. Catalogue No. 82-003), 11, 31-43.

Hay, D. (1988). Socioeconomic status and health status: a study of males in the Canada health survey. *Social Science and Medicine*, 27, 1317-25.

Hirdes, J., Brown, S., Forbes, W., Vigoda, D., & Crawford, L. (1986). Association between self-reported income and perceived health based on the Ontario Longitudinal Study of Aging. *Canadian Journal on Aging*, 5, 189-204.

Hirdes, J. & Forbes, W. (1989). Estimates of the relative risk of mortality based on the Ontario Longitudinal Study of Aging. *Canadian Journal on Aging*, 8, 222-37.

House, J., Kessler, R., Herzog, R., Mero, R., Kinney, A., & Breslow, M. (1990). Age, socioeconomic status, and health. *The Milbank Quarterly*, 68, 383-411.

House, J., Lepkowski, J., Kinney, A., Mero, R., Kessler, R., & Herzog, R. (1994). The social stratification of aging and health. *Journal of Health and Social Behavior*, 35, 213-34.

Lantz, P., Lynch, J., House, J., Lepkowksi, J., Mero, R., Musick, M., & Williams, D. (2001). Socioeconomic disparities in health change in a longitudinal study of US adults: the role of health-risk behaviors. *Social Science and Medicine*, 53, 29-40.

McDonough, P., Walters, V., & Strohschein, L. (2002). Chronic stress and the social patterning of women's health in Canada. *Social Science and Medicine*, 54, 767-82.

Millar, W. (1996). Reaching smokers with lower educational attainment. *Health Reports* (Statistics Canada. Catalogue No. 82-003), 8, 11-9.

Millar, W. & Stephens, T. (1993). Social status and health risks in Canadian adults: 1985 and 1991. *Health Reports* (Statistics Canada. Catalogue No. 82-003), 8, 143-56.

Mustard, C., Derksen, S., Berthelot, J., Wolfson, M., & Roos, L. (1997). Age-specific education and income gradients in morbidity and mortality in a Canadian province. *Social Science and Medicine*, 45, 383-97.

Roberge, R., Berthelot, J., & Wolfson, M. (1995). Health and socio-economic inequalities. *Canadian Social Trends* (Statistics Canada. Catalogue No. 11-008E), Summer, 15-9.

Ross, C. & Wu, C. (1996). Education, age, and the cumulative advantage in health. *Journal of Health and Social Behavior*, 37, 104-20.

Statistics Canada, 1995. *National Population Health Survey: Public Use Microdata File User's Guide - Household component*. Ottawa: Statistics Canada.

Stronks, K., Mheen, D., Looman, C., & Mackenbach, J., (1998). The importance of psychosocial stressors for socio-economic inequalities in perceived health. *Social Science and Medicine*, 46, 611-23.

Villeneuve, P., Morrison, H., & Elaguppillai, J. (1994). Trends in mortality of selected smoking-related cancers, Canada, 1950-1991. *Chronic Diseases in Canada*, 15, 123-28.

Wilkins, R., Adams, O., & Brancker, A. (1991). Changes in mortality by income in urban Canada from 1971 to 1986. *Health Reports* (Statistics Canada. Catalogue No. 82-003), 1, 137-74.

Wolfson, M., Rowe, G., Gentleman, J., & Tomiak, M. (1993). Career earnings and death: a longitudinal analysis of older Canadian men. *Journals of Gerontology*, 48, S167-79.

Table 1: Metric coefficients for OLS regression of Self-rated Health on Age, Education, Age-Education Interaction (Model 1), Income, and Age-Income Interaction (Model 2), controlling for Gender and Marital Status

	Model 1	**Model 2**
Covariates		
Male	0.04231*	0.01901
Married/C-L	0.09818**	0.04444*
Independent Variables		
Age	-.01868**	-0.01851**
Education	0.12287**	0.09014**
Age*Education	0.00143**	0.00112*
Income		0.10587**
Age*Income		0.00088*
Constant	2.627	2.671
R^2	0.104	0.121

*p<.05, **p<.01.

Source: 1994/5 NPHS public-use microdata health file

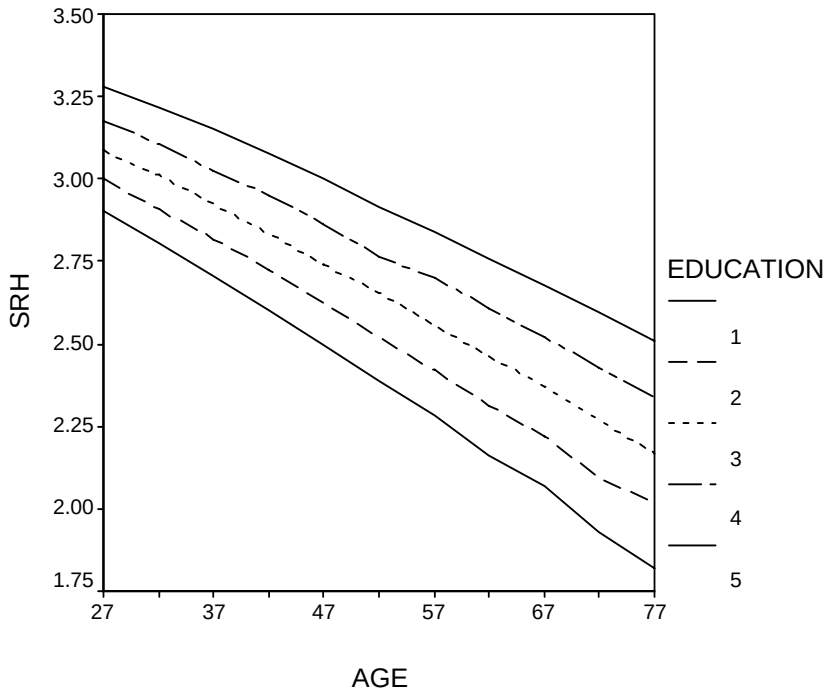
Table 2: Metric coefficients for OLS regression of HUI on Age, Education, Age-Education Interaction (Model 1), Income, and Age-Income Interaction (Model 2), controlling for Gender and Marital Status

	Model 1	**Model 2**
Covariates		
Male	0.01311**	0.01021**
Married/C-L	0.02342**	0.01923**
Independent Variables		
Age	-0.00213**	-0.00212**
Education	0.00952**	0.00678**
Age*Education	0.00020**	0.00017**
Income		0.00957**
Age*Income		0.00006
Constant	0.870	0.873
R^2	0.076	0.084

*p<.05, **p<.01.

Source: 1994/5 NPHS public-use microdata health file

Graph 1: Predicted Self-rated Health (SHR) score by Age and Education Quintile (based on Model 1 of Table 1)



Graph 2: Predicted HUI score by Age and Education Quintile (based on Model 1 of Table 2)