S E D A P

A PROGRAM FOR RESEARCH ON

SOCIAL AND ECONOMIC DIMENSIONS OF AN AGING POPULATION

The Effect of Health Changes and Long-term Health on the Work Activity of Older Canadians

Doreen Wing Han Au
Thomas F. Crossley
Martin Schellhorn

SEDAP Research Paper No. 119

For further information about SEDAP and other papers in this series, see our web site:
http://socserv2.mcmaster.ca/sedap

Requests for further information may be addressed to:
Secretary, SEDAP Research Program
Kenneth Taylor Hall, Room 426
McMaster University
Hamilton, Ontario, Canada
L8S 4M4
FAX: 905 521 8232
e-mail: qsep@mcmaster.ca

The Effect of Health Changes and Long-term Health on the Work Activity of Older Canadians

Doreen Wing Han Au
Thomas F. Crossley
Martin Schellhorn

SEDAP Research Paper No. 119

August 2004

The Effect of Health Changes and Long-term Health on the Work Activity of Older Canadians*

Doreen Wing Han Au[a,b], Thomas F. Crossley[a,b,] and Martin Schellhorn[c,b]**

August 2004

Abstract: Using longitudinal data from the Canadian National Population Health Survey (NPHS), we study the relationship between health and employment among older Canadians. We focus on two issues: (1) the possible endogeneity of self-reported health, particularly "justification bias", and (2) the relative importance of health changes and long-term health in the decision to work. The NPHS contains the HUI3, an "objective" health index which has been gaining popularity in empirical work. We contrast estimates of the impact of health on employment using self-assessed health, the HUI3, and a "purged" health measure similar to that employed by Bound et al. (1999) and Disney et al. (2003). A direct test suggests that self-assessed health suffers from justification bias. However, the HUI3 provides estimates that are similar to the "purged" health measure. We also corroborate recent U.S. and U.K. findings that changes in health are important in the work decision.

Key words: Health, Health Changes, Employment, Older Workers
JEL codes: I12, J26

---

[a] Department of Economics, McMaster University, Hamilton, Canada.
[b] Research Program on the Social and Economic Dimensions of an Aging Population (SEDAP), McMaster University, Hamilton, Canada
[c] Institute for the Study of Labor (IZA), Bonn, Germany.
[*] Author order is alphabetical. The authors gratefully acknowledge support of the Social and Economic Dimensions of an Aging Population research program at McMaster University that is primarily funded by SSHRC and also receives substantial additional support from Statistics Canada. The authors also thank Deborah Fretz and participants in several workshops for helpful comments and James Chowan of Statistics Canada for assistance with the data. The usual caveat applies.
[**] Corresponding author. Department of Economics, McMaster University, 1280 Main Street West, Hamilton, Ontario, Canada, L8S 4M4, crossle@mcmaster.ca.

1. Introduction

The population of most developing countries is aging. The increasing share of older persons in the population may put a severe strain on public pensions. It may have important labour market and macroeconomic consequences as well, including labour shortages and slower growth. If there is to be continued growth in labour supply over the coming years, it must come in part from older workers. Thus the determinants of work activity among older persons are of considerable concern among policy makers.

A potentially important determinant of work activity among older persons is the financial incentives provided by social security systems. In particular, the introduction of early retirement options in public pension systems is often cited as one potential cause of the decreasing average retirement age observed in many developed countries. The financial incentives in public pension systems have been the object of considerable recent research attention, both internationally (Gruber and Wise, 1999), and in Canada (Baker et al., 2003). Another potentially important determinant of the work activity of older workers is private wealth. Current older workers are, of course, wealthier than earlier cohorts.

While such financial considerations are surely important in the work decisions of older workers, they are almost equally surely not the entire story. There is a great deal of heterogeneity in the work and retirement decisions of older workers, and other factors are certainly at play. One of the most important of these is health. For example, Table 1 summarizes self-reported retirement reasons (from retired persons over 55 years of age) in three Canadian cross-sectional surveys: the 1975 Retirement Survey, the 1989 General Social Survey, and the 1994 General Social Survey. In each year, among both men and women, "Poor Health" is the most frequently cited retirement reason for those aged 55-64. For retired persons over aged 65 and over (the official retirement age in Canada), mandatory retirement was more often cited in the earlier surveys, but by 1994, health was the most cited retirement reason for this group as well. Health may also be a factor in the trend towards earlier retirement observed in many countries. In particular, more generous health and disability insurance systems may have contributed to this trend by enabling individuals in poor health to drop out of the labor market without facing severe financial consequences.

In this study we employ longitudinal data from the Canadian National Population Health Survey (NPHS) to study the relationship between health and employment among older Canadians. The literature on retirement in Canada has focused, with a few exceptions, on the financial incentives in Canada's public pensions (for example, Baker et al., 2003). Thus, the first contribution of this study is to help redress that relative imbalance in the Canadian literature.

The international literature, in contrast, contains considerably more evidence on the relationship between health and retirement (or employment at older ages). We contribute to that literature by providing additional evidence on two issues that have figured prominently: (1) the possible endogeneity of self-reported health, particularly "justification bias", and (2) the role of health shocks and long-term health in the decision to work.

A particular novelty of the current study is that the NPHS contains the Health Utilities Index Mark 3 (HUI3), an "objective" health index which has been gaining popularity in empirical work. We contrast estimates of the impact of health on employment using self-assessed health, the HUI3, and a "purged" health measure similar to that employed by Bound et al. (1999) and Disney et al. (2003) (in studies using U.S. and U.K. data respectively.)

Our principal findings are as follows. First, we find some evidence that self-assessed health (SAH) suffers from justification bias. Second, the HUI3 provides estimates of the effect of health on employment that are similar to estimates based on a "purged" health measure. Finally, we corroborate recent U.S. and U.K. findings that changes in health are important in the work decision.

The rest of the paper is organized as follows. In Section 2 we briefly summarize the two literatures which are most relevant to the current study: studies of retirement in Canada, and the international literature on health and employment at older ages. In Section 3, we describe the NPHS data which forms the basis of our study, and the characteristics of our sample. Section 4 presents our main empirical results. Finally Section 5 concludes and discusses possible directions for future research.

2. Previous Research

2.1 Determinants of Retirement in Canada

The literature on retirement decisions in Canada has largely focused on the financial incentives in the public pension system. The Canadian public pension system has three components. One component, the Canada Pension Plan/Quebec Pension Plan (CPP/QPP) offers flexibility with respect to retirement age. For each month diverting from the "official" retirement age 65, the pension is reduced or increased by 0.5%. Benefits from CPP/QPP can be claimed starting from age 60 and will start at age 70 at the latest. Up to age 65 individuals have to prove that they actually retired, but that test is thought not to be very strictly applied.[1]

In their analysis of early retirement provisions on the labor force behavior of older Canadian men, Baker and Benjamin (1999a,b) show that the option of early retirement is mainly taken up by individuals who are only loosely attached to the labor market. Based on data from the Survey of Consumer Finances (SCF) they reject the hypothesis that the provision of early retirement options causes large effects on labor supply but find that the new pension beneficiaries are those who would not have been working anyway.

[1] A second component of the pension system - the Old Age Security benefit (OAS) - is a lump-sum benefit that is payable to all individuals who meet certain residency requirements. It equals roughly one fifth of median monthly earnings of 20-64 year old males and offers no choice of the retirement age. The Guaranteed Income Supplement (GIS) - a means-tested income supplement to the OAS - also offers no choice on the retirement age due to the way it is linked to the OAS. For spouses of OAS beneficiaries between the ages of 60 and 64 the Allowance provides some incentive for early retirement. It is a means-tested benefit and its maximum is equal to the OAS pension plus the maximum GIS pension.

Tompa (1999) also analyzes the determinants of the transition to retirement in Canada. Using data from the Longitudinal Administrative Databank (LAD)[2] he estimates hazard-rate models for CPP take-up among Canadians over 59. He finds that an early take-up (exit from the labor force) is most often observed for low labor income earners, unemployed individuals, receivers of private pensions and individuals with retired spouses. Overall, Tompa concludes (like Benjamin and Baker) that many who take up early are only loosely attached to the labour force.

Baker, Gruber and Milligan (2003) use administrative data compiled from a variety of sources to investigate the incentive effects of the full spectrum of income security programs available to older Canadians. They find significant effects of financial incentives on retirement decisions, but also note that failure to control for lifetime earnings leads to over-estimates of these effects.

The Canadian literature on the relationship between health and retirement or health and employment at older ages is brief. Two early papers, Breslaw and Stelener (1986), Maki (1993) documented a significant association between health and employment in Canadian data. Neither pursues the issues of endogeneity of health status and the dynamic relationship between health and work that have been the focus of the subsequent literature. Campolieti (2002) takes up the issue of endogenous health status in a paper that focuses on disability status. He estimates various labour force participation models and finds that the coefficient on the disability measure tends to be underestimated when that variable is not properly instrumented.

Baker, Stabile, Deri (forthcoming) match survey data to administrative records to investigate the reliability of self-reports of specific conditions. Their results suggest that reporting

---

[2] A longitudinal data set constructed from income tax records. This data has very limited information on health status. Tompa includes in his analysis a dummy for an individual having a disability tax deduction in a particular year, and a continuous variable of medical expenses which are claimed as a tax deduction.

error and justification bias are not just characteristic of general SAH: many specific self-reported conditions suffer from similar reporting problems as well.

All of these papers employ a single cross section and so cannot explore dynamic aspects of the relation between health and labor force participation.

2.2 International evidence on health and retirement

There is a much larger international literature on health and retirement, as surveyed by Currie and Madrian (1999). One key issue in the broader area of health and retirement (and health and employment more generally) is the possible endogeneity of SAH and, in particular, "justification bias". It is possible that associations between SAH and employment occur because employment actually causes good health. Alternatively, it could be that, for a given level of "true health", individuals who are not working report poorer health in order to "justify" their employment status.

Facing this possibility, researchers have typically looked to "more objective" measures of health. These typically include self reports of specific medical conditions and functional limitations. Such measures can then be used in lieu of SAH or as instruments for SAH. This, it is hoped, provides more reliable estimates of the effects of health on employment/retirement.[3] Moreover, comparisons of estimates using SAH and more objective measures, or comparisons of estimates in which SAH is or is not instrumented, provide one kind of test of the justification-bias hypothesis. The results in the literature are mixed. For example, Kerkhofs et al. (1999) and Lindeboom and Kerkhofs (2003) find that the choice of health measure does matter for their estimates, and conclude that SAH is endogenous. In contrast, Dwyer and Mitchell (1999) compare

[3] McGarry (2002) takes an alternative approach to dealing with the possibility of justification bias. Using data from the U.S. H.R.S., she focuses on employed workers, and the effect of health on their retirement expectations. Because the individuals in her sample are employed, they presumably have no motive to misreport their health (justify their employment status). She finds significant effects of SAH on retirement expectations.

OLS and IV estimates and conclude that SAH is not endogenous and does not suffer from significant justification-bias.

A second issue that has received attention is the dynamics of the health and employment relationship, and the relative roles of long run health and health shocks. Two recent papers that have investigated this issue are Bound et al. (1999) using the U.S. Health and Retirement Survey, and Disney et al. (2003) using the British Household Panel Survey. Both sets of authors take the possibility of justification-bias seriously. They created "purged" health measures, which are the predicted values from an estimated model of SAH. The predictors are "more objective" measures of health (reports of specific medical conditions and functional limitations) and demographics. They then use these purged health measures to estimate the effects of health on retirement. The common finding in the two studies is that *changes* in health play an important role in retirement decisions: health dynamics are important. An implication of this finding is that panel data is required to model the relationship between health and retirement or health and employment.

3. Data and Descriptive Statistics

Our data is drawn from the National Population Health Survey (NPHS) which is a Canadian longitudinal (panel) survey, with interviews conducted every two years. The currently available data consists of the following four cycles (interviews): 1994-1995, 1996-1997, 1998-1999, and 2000-2001. The NPHS includes responses from all 17,276 panel members, though not every respondent is present in every cycle.

In this study, we focus on a subset of respondents who were age 50 or over at the time of cycle 1 (1994-1995). We separately analyze four subgroups as we split our sample by gender and by the official retirement age (of 65 years). Our sample contains 1182 (701) men and 1365 (972) women aged 50 to 64 (aged over 65) in the first cycle. Appendix Table A1 summarizes the socioeconomic characteristics of our sample.

The main strength of the NPHS is that it collects very detailed health information. Table 2 gives the distribution of Self-Assessed Health (SAH) and of the Health Utilities Index Mark 3 (HUI3) in our four subgroups. The HUI3 is a generic health status index which is generally considered to be more objective than SAH. It is based on a comprehensive set of (self-reported) medical conditions and functional limitations, which are aggregated using preference scores (Feeney et al., 1995). In principle it describes (assigns a utility level to) thousands of distinct health states. A score of 1 indicates perfect health, while a score of 0 indicates death. Health states worse than death are admissible.

The HUI3 has now been used in a large number of studies. Previous applications of the HUI3 range from providing quality of life/functional limitation measures for clinical trials, to monitoring the health of populations, and to studying the determinants of health.

Two features of Table 2 stand out. First, there is considerable attrition between the first and fourth cycle. Second, for all subsamples, the median HUI3 improves slightly as the panel ages. This is especially surprising in the subsamples aged 50 to 64 as the subsamples only include 58 to 64 year olds in the fourth cycle. This suggests that attrition is correlated with poor health. The association between health and panel wave is less stark when health is measured by self-assessed health status. Nevertheless, we will return to the issue of potential attrition bias below.

Further detail regarding the health of our sample is provided in Appendix Table A2, which reports summary statistics for a wide range of medical conditions, functional limitations, and health measures.

Recently, van Doorslaer and Jones (2003) have demonstrated how the empirical distribution of the HUI3 can be used to cardinalize SAH by mapping the cumulative proportions of the SAH categories to the respective quantiles of the HUI3 distribution.

4. Estimation Results

4.1 The association between SAH and employment, and "naive" estimates

Table 3 shows the raw association between SAH and employment status for our samples of men and women, aged 50 to 64 and 65 and older in 1994-5 and 2000-1. Employment is defined as working for pay at the time of the interview. In every cycle, and for both men and women, there is a strong, positive, monotone relationship between -health and employment. For the men aged 50 to 64, those in excellent health are twice as likely to be employed as those in poor health and twice as likely as those reporting fair health. In the post-retirement age group the health gradient is even steeper.

Tables 4a and 4b present "naïve" estimates of the effect of health on employment. For the four groups defined by age and gender groups we estimate an employment model by OLS and by linear fixed effects. We use linear models because the coefficients are easily interpreted (as marginal effects).[4] We have also estimated logits and conditional logits and the results are very similar.[5] Explanatory variables include age, education, region, household size and home ownership, and SAH. In order to be comparable with the (almost) continuous and cardinal HUI3 and estimated health stock variables that we use subsequently, we convert the categorical SAH into a single cardinal variable. In particular we use the empirical cumulative distribution of the HUI3 to cardinalize SAH, following Doorslaer and Jones (2003).[6] We then standardize this variable to have a mean of zero and standard deviation of one.

---

[4] While marginal effects are easily calculated for logits, this is not the case for conditional logits. Since fixed effect estimates are an important part of our empirical strategy, we report estimates from linear models throughout.

[5] Full results are available from the authors.

[6] The basic idea is that if X% of the population report a SAH of "poor", we look at the cumulative distribution of the HUI3 up to X% and assign the median value of HUI3 between 0 and X% to all those reporting a SAH of "poor". We then proceed in an analogous way for other categories of SAH. Doorslaer and Jones allow the cutoffs to differ for different demographic/socioeconomic groups. We are only allowing the cutoffs to vary by gender.

In this simple framework (which ignores the endogeneity of SAH, unobserved heterogeneity and dynamics in the health-employment relationship) we find a significant effect of SAH on employment (as the raw numbers would suggest). For the pre-retirement age groups the size of the coefficient is similar for men and women: a one standard deviation improvement in health increases employment probabilities by about eleven percentage points. When we move to the fixed effects estimates, we are estimating the effect of changes in health on changes in employment. Here again we find significant effects, and again they are similar for men and women. Health changes do impact employment, but the effects are somewhat smaller than those that we find in levels.

The coefficients for the post-retirement groups are only significant in the OLS model and indicate a three percentage point increase in employment probability for men (one and a half percentage points for women).

We carry out tests for attrition bias in the spirit of Verbeek and Nijmann (1992). While there appears to be no attrition bias in our fixed effects specifications, the attrition variables have significant coefficients in the levels estimations. However, the estimations appear to be quite robust as the estimated coefficients and their standard errors stay practically unchanged.

4.2 Testing for "justification bias"

To test directly for "justification bias" we estimate ordered logit models of SAH (the raw categorical responses, not the cardinalized variable) as a function of a polynomial of HUI3 and employment status. The idea is that if the HUI3 is a measure of "true" health, then the coefficient on employment captures the effect of employment status on reported health, holding true health constant. Thus it is a measure of justification bias. The second columns of tables 5a and 5b report that controlling for the HUI3, employment has a positive and statistically significant effect on SAH. For a given level of the more objective index (HUI3) the employed report better (self-assessed) health and those not in employment worse health. We take this to be evidence that is very suggestive of justification bias in SAH. Of course, it remains possible that SAH captures some aspect of "true" health that is not captured by the HUI3, and that the correlation we are documenting here is a correlation between that aspect of "true" health and employment. However, we note that a key feature of the HUI3 is its comprehensiveness (Feeney et al., 1995).

Lindeboom and van Doorslaer (2003) develop tests for different reporting behaviours in SAH. Their tests allow distinguishing reporting heterogeneity which leads to cut-point shifts in an ordered response model from heterogeneity which leads to an index shift. They find evidence for a cut-point shift for age and gender but not for other socio-economic variables like income, education or language.

Starting from these results we use their methodology and test for additional reporting heterogeneity in SAH due to employment status in the four subsamples. We compare the "index-shift" specification of the ordered probit model[7] as discussed above with more flexible specifications where we allow for interactions of HUI3 with employment (column 3) or separate estimations for working and non-working individuals (columns 4 & 5) which turns out to be the preferred model for the 50 to 64 year olds. We interpret this to be suggestive for not only a cut-point shift of SAH with regard to employment but also to a work-related gradient shift in the ordered probit regression of SAH on HUI3. For the post-retirement age groups the evidence points towards an index-shift only as the gain from the additional flexibility is relatively small.

4.3 Modeling the health stock

Given that we have evidence that SAH suffers from justification bias, we would like to use an alternative, more "objective" measure of health when modeling the effects of health on

[7] To take into account the longitudinal aspect of our data we estimated the same approaches with a random effects ordered probit model. The results remained qualitatively unchanged and are available from the authors.

employment. One option, which we will pursue, is to use the HUI3. Another possibility is to estimate, for each individual, at each cycle, the health stock. This is done by modeling SAH as a function of more “objective” health information, in particular, answers to questions about specific medical conditions and functional limitations (as well as demographics). This procedure has been previously employed by Bound et al. (1999) and Disney et al. (2003). Because the predicted values are functions only of the more objective health measures, they constitute a “purged” health measure.

Note that the estimated health stock and the HUI3 are functions of a similar set of medical conditions and functional limitations. Thus they differ primarily in the way the information in those responses is aggregated. Comparison of the empirical distribution functions of the HUI3 and our estimated health stock are provided in Figures 1 (for men) and 2 (for women).

Our exact procedure is to estimate an ordered probit for SAH, and to use the predicted (linear) index from this model as the measure of the health stock. We do this separately for men and women and for each cycle. The estimates for the first cycle are reported in Table 6. Estimates for the other cycles are similar and are available from the authors. Many of the individual health measures have significant effects, as do demographics, particularly education. The results are broadly similar to those reported by Disney (2003). The estimated health stock improves with education and wealth and declines with most of the reported health conditions. Interestingly, the estimated health stock declines up to age 58 for both genders and then starts to increase again.

4.4 Comparing Estimates of Employment Effects

We now turn to estimates of the effect of heath on employment among older Canadians. As our tests for justification bias raise concern mainly about the validity of our estimates for the pre-retirement age group we focus on this group in the remainder of the paper. Our estimates for men are reported in Table 7 and our estimates for women are reported in Table 8. The outcome variable we are modeling is employment, defined as work for pay at the time of the interview (as in Tables 4a and 4b). For each gender we report estimates of 2 x 2 x 2 = 8 models. First, we have two measures of health: the estimated health stock and the HUI3. We use each health measure in two ways: (1) we estimate what could be called "reduced form" or "proxy variable" models in which the HUI3 or the estimated health stock enters directly, and (2) we estimate models in which health is measured by cardinalized SAH, and HUI3 or the estimated health stock is used as an instrument for SAH. Finally, each of these models (reduced form and IV, HUI3 and estimated health stock) is estimated in levels and with fixed effects (in changes.) All models are linear, so that coefficients are marginal effects. We have also estimated the reduced form models by logit and conditional logit. The results are broadly similar, and are omitted here for brevity.[8]

Time varying control variables are a polynomial in age, household size, and dummies for married, the household owns the home, and the household receives capital income. OLS (levels) estimates also control for time invariant variables: race dummy, region dummies and education dummies. Note that both health measures are standardized, so that the coefficients represent the effect of a one standard deviation change in health.

In all specifications, for both men and women, we find statistically significant effects of health on employment. Depending on the sample and specification, a one standard deviation improvement in health raises employment probabilities by between three and eighteen percentage points. We view these effects as being economically significant. For example, for women, the employment effect of a one standard deviation improvement in health is about the same as the effect of postsecondary education.

A comparison of our "reduced form" and IV estimates to the "naïve" estimates in Table 4 is somewhat surprising. Estimates using more objective health measures (the HUI3 or estimated health stock) directly give employment effects that are very similar to those using SAH. The IV

[8] Again, full results are available from the authors.

estimates give effects that are larger than the OLS estimates. These results suggest that the naïve estimates do not suffer from justification-bias (which would be at odds with the results presented in Table 5 and discussed above) or that justification bias is outweighed by a counteracting attenuation bias caused by measurement error.

For both men and women we find smaller effects when we model changes (in health and employment) than when we model levels. Nevertheless, the effects of health changes are statistically and economically significant. This suggests that individual health shocks (and not just cross sectional differences in long run health) are important in the work decision.

For both men and women, and for all specifications, we find that the HUI3 and estimated health stock give very similar results. We also estimated full IV models using all specific health conditions as instruments. The estimated coefficients and standard errors are almost identical to the ones using the estimated health stocks. Tests for overidentifying restrictions show that they cannot be rejected for men but fail to hold for women. This suggests that the various health indicators have different impacts on labor force participation. We leave the analysis of the varying effects of specific health aspects on labor force participation for future research as the focus of this paper is on the effect of overall health.

4.5 The dynamic effects of Health on Employment

Our final empirical exercise is to investigate, a bit further, the role of health dynamics in employment decisions. We focus here on the HUI3.

First, we analyze the dynamics of the HUI3 itself. Table 9 describes some features of the dynamics of the HUI3. We regress current HUI3 on various lags of itself. HUI3 is obviously a highly auto-correlated variable. Still, there seems to be enough change in health status at older ages to warrant the inclusion of changes in health status in the employment models. Table 10 reports estimates of employment models with both health levels and changes. Note that the fixed effects estimates therefore have changes and in health and changes in changes. Typically, for the models estimated in levels the coefficients for levels and changes in health are significant. In the fixed effects specifications the coefficients are only significant in the women's estimates.

The key finding is that lagged health matters in levels, but lagged shocks typically do not. These results suggest a fairly simple dynamic structure in the male subgroup while the dynamic effects of health on female employment appear to be somewhat more complex.

5. Summary, Conclusions and Directions for Future Research

In many developing countries the aging of the population poses series challenges for public pension systems and for the economy generally. It is important therefore to understand the determinants of work activity among older workers.

Using longitudinal data from the Canadian National Population Health Survey (NPHS), we have studied the relationship between health and employment among older Canadian workers. This helps to fill a gap in the Canadian literature on retirement, which, with a few exceptions, has focused on the financial incentives in public pensions.

Our analysis also contributes to the international literature by shedding new light on two issues: (1) the possible endogeneity of self-reported health, particularly "justification bias", and (2) the relative importance of health shocks and long-term health in employment decisions. With respect to the latter, our analysis supports recent U.S. and U.K. findings that changes in health are important in the work decision.

With respect to the former, we have investigated the use of the HUI3 in modeling employment. The HUI3 is an "objective" health index which has been gaining popularity in empirical work. We compared estimates of the impact of health on employment using self-assessed health, the HUI3, and a "purged" health measure. We also conducted direct tests of justification bias in SAH. The results of the direct test suggest that self-assessed health suffers from justification bias. However, estimates of employment effects using either the HUI3 or a “purged” health measure (either directly or as instrumental variables) give similar results to those using SAH as a health measure. Our analysis also suggests that the HUI3 provides estimates that are similar to those achieved with a “purged” health measure.

Our work suggests several promising areas of future research. First, our analysis of work activity has been limited to paid employment. It would be useful to extend the analysis to other measures of activity, possibly including hours or part-time/full-time status, job search, and unpaid (volunteer) work.

Second, both our estimated health stock and the HUI3 are based on self-reports about specific medical conditions and functional limitations. Many researchers consider such self-reports to be much more objective than self reports of overall health status. However, by matching a cross section of survey data (from the NPHS) to administrative (medical) records, Baker, Stabile, Deri (forthcoming) have recently shown that these self-reports may still suffer from mismeasurement and justification bias. We repeated our analysis with a health stock measure based on fewer health conditions by dropping those conditions which Baker, Stabile and Deri reported to be particularly unreliable. However, our results did not change substantially. Obviously, if longitudinal administrative health records could be matched to longitudinal employment data, estimates of the employment effects of health could be obtained that are potentially superior to the ones we have reported.

Third, it would be desirable to model jointly the impacts of financial incentives and health shocks on the employment and retirement decisions of older workers. There may be important interactions between the two. The data requirements of such analysis are high, but such research is now being undertaken in some countries (see, for example, Kerkhofs et al., (1999) using Dutch data). Among currently available Canadian longitudinal data sets, the Survey of Labour and Income Dynamics contains the necessary detailed information on income and earnings, but only self-assessed health (which our analysis suggests suffers from justification bias). On the other hand, the National Population Health Survey, used in this study, has detailed health information but very limited income information. Thus the joint modeling of financial incentive and health effects in the Canadian retirement decisions awaits new data sources.

References

Baker, M., Gruber, J. and Milligan, K., (2003), "The Retirement Incentive Effects of Canada's Income Security Programs," *Canadian Journal of Economics*, 36(2):261-290.

Baker, M., Stabile, M. and Deri, C., (forthcoming), "What do Self-reported, Objective Measures of Health Measure?" forthcoming, *Journal of Human Resources*.

Baker, M., and Benjamin, D., (1999), "Early Retirement Provisions and the Labor Force Behavior of Older Men: Evidence from Canada." *Journal of Labour Economics*, 17:724-756.

Baker, M., and Benjamin, D., (1999), "How do retirement tests affect the labour supply of older men?" *Journal of Public Economics*, 71:27-51.

Bound, J., Schoenbaum, M., Stinebrickner, T. and Waidman, T., (1999), "The dynamic effects of health on the labor force transitions of older workers". *Labour Economics*, 6:179-202.

Breslaw, J.A. and Stelener, M. (1986): "The effect of health on the labor force behavior of elderly men in Canada." *Journal of Human Resources*, 22: 490-517.

Campolieti, M., (2002), "Disability and the Labor Force Participation of Older Men in Canada". *Labour Economics*, 9: 405-32.

Currie, J. and Madrian, B. (1999), "Health, Health Insurance and the Labor Market" *Handbook of Labor Economics*, Volume 3C: 3309-3416, Amsterdam; New York and Oxford: Elsevier Science, North-Holland.

Disney R., Emmerson C., and Wakefield M., (2003), "Ill-Health and retirement in Britain: A panel data-based analysis" The Institute for Fiscal Studies.

Doorslaer, E. van and Jones, A. M., (2003), "Inequalities in Self-Reported Health: Validation of a New Approach to Measurement." *Journal of Health Economics* 22: 61-87.

Dwyer, D.S., Mitchell, O.S., (1999), "Health problems as determinants of retirement: Are self-rated measures endogenous?" *Journal of Health Economics*, 18:173-193

Feeney, D., Furlong, W., Boyle, M. and Torrance, G.W., (1995), "Multi-Attribute Health Status Classification Systems: Health Utilities Index." *PharmacoEconomics*, 7(6):490-502.

Gruber, J., (1999), "Social Security and Retirement in Canada." In: Gruber, J. and Wise, D. A., eds. *Social security and retirement around the world,* NBER Conference Report series. Chicago and London: University of Chicago Press, 73-99. (NOT CURRENTLY CITED.)

Gruber, J. and Wise, D. A., eds., (1999), *Social security and retirement around the world,* NBER Conference Report series. Chicago and London: University of Chicago Press.

Kerkhofs, M., Lindeboom, M., Theeuwes J., (1999), "Retirement, financial incentives and health". *Journal of Labour Economics*, 6:203-227.

Lindeboom, M. and Kerkhofs, M., (2002), “Health and Work of the Elderly.” ECuity III project working paper #5

Lindeboom, M. and van Doorslaer, E. (2003): “Cut-point shift and index-shift in the self-reporting of health.” Journal of Health Economics (forthcoming)

Maki, D.R. (1993), “The economic implications of disability insurance in Canada.” *Journal of Labour Economics*, 11:148-169.

McGarry, K., (2002), “Health and Retirement: Do Changes In Health Affect Retirement Expectations?” NBER Working Paper 9317.

Tompa, E., (1999), “Transitions to Retirement: Determinants of Age of Social Security Take Up.” SEDAP, Research Paper No. 6.

Verbeek, M., and Nijman, T. (1992), “Testing for Selectivity Bias in Panel Data Models.” *International Economic Review*, 33(3):681-703.

Table 1: Self-reported reason for retirement

	Men					
	Age 55-64 (in %)			**Age 65 and over (in %)**		
(Sample Size)	**1975 (70)**	**1989 (132)**	**1994 (254)**	**1975 (423)**	**1989 (446)**	**1994 (738)**
Mandatory retirement	1.4	3.8	8.7	36.4	39.9	17.2
Early retirement incentive		15.0	14.2		9.1	6.7
New technology		2.7	0.8		2.0	1.4
Poor health	**65.7**	**51.7**	**28.5**	**33.6**	**28.3**	**27.2**
Spouse retired	1.4		0	3.3		0
Unemployment	7.1		14.2	5.7		7.9
Family responsibilities	7.1		3.2	4.0		1.6
Personal choice			25.7			23.6
Old enough			3.6			12.3
More leisure time	8.6			5.0		
Relax	4.3			14.2		
Better for health	21.4			18.4		
Enough work	5.7			17.3		
Enough money	5.7			5.7		
Sold business	7.1			11.1		
Other reason	5.7	39.7	3.6	4.7	27.6	3.3

	Women					
	Age 55-64 (in %)			**Age 65 and over (in %)**		
	1975 (335)	**1989 (84)**	**1994 (160)**	**1975 (567)**	**1989 (370)**	**1994 (588)**
Mandatory retirement	1.5	1.2	4.4	7.8	27.0	11.4
Early retirement incentive		11.8	10.1		1.9	1.9
New technology		0	0		0.7	0.7
Poor health	**14.9**	**37.0**	**24.1**	**14.3**	**24.1**	**20.9**
Spouse retired	4.8		5.1	5.3		5.5
Unemployment	2.1		15.2	1.6		7.6
Family responsibilities	6.9		15.2	2.6		15.2
Personal choice			20.9			19.7
Old enough			1.9			11.2
More leisure time	3.9			1.6		
Relax	3.9			4.9		
Better for health	10.2			7.4		
Enough work	3.9			6.0		
Enough money	2.4			1.4		
Sold business	1.8			2.3		
Other reason	7.5	59.7	5.7	7.1	52.2	7.1

Source: Authors' calculations on the 1975 Retirement Survey, 1989 General Social Survey, and 1994 General Social Survey. Calculations only include respondents aged 55 and over because the 1975 Retirement survey only sampled individuals 55 and over.

Table 2: Self-Assessed Health (SAH) and the Health Utilities Index Mark 3 (HUI3) in the NPHS

	Aged 50 to 64		Aged 65+	
Men				
	1994-5	**2000-1**	**1994-5**	**2000-1**
(Sample Size)	(1182)	(619)	(701)	(561)
SAH (%)				
Poor	0.04	0.04	0.06	0.04
Fair	0.12	0.14	0.19	0.19
Good	0.30	0.30	0.34	0.34
Very Good	0.35	0.35	0.29	0.30
Excellent	0.20	0.17	0.13	0.13
HUI3				
Mean	0.86	0.88	0.82	0.86
SD	0.20	0.19	0.22	0.21
Min	-0.21	-0.07	-0.28	-0.19
P25	0.84	0.88	0.74	0.84
P50	0.93	0.97	0.91	0.97
P75	0.97	0.97	0.97	0.97
Max	1.00	1.00	1.00	1.00
Women				
	Aged 50 to 64		**Aged 65+**	
	1994-5	**2000-1**	**1994-5**	**2000-1**
(Sample Size)	(1365)	(703)	(972)	(780)
SAH (%)				
Poor	0.04	0.04	0.05	0.04
Fair	0.13	0.14	0.18	0.18
Good	0.33	0.31	0.35	0.41
Very Good	0.30	0.38	0.30	0.27
Excellent	0.20	0.13	0.12	0.11
HUI3				
Mean	0.83	0.87	0.78	0.85
SD	0.22	0.19	0.26	0.20
Min	-0.22	-0.14	-0.31	-0.19
P25	0.78	0.84	0.70	0.83
P50	0.91	0.97	0.91	0.91
P75	0.97	0.97	0.97	0.97
Max	1.00	1.00	1.00	1.00

Note: Ages are in 1994-5.

Table 3: Employment and Self-Assessed Health (SAH) in the NPHS

	Men			
	Aged 50 to 64		**Aged 65+**	
	1994-5	**2000-1**	**1994-5**	**2000-1**
Overall	0.66	0.61	0.14	0.17
By SAH:				
Poor/ Fair	0.42	0.39	0.07	0.07
Good	0.64	0.57	0.13	0.10
Very Good	0.70	0.67	0.17	0.24
Excellent	0.83	0.78	0.26	0.39
	Women			
	Aged 50 to64		**Aged 65+**	
	1994-5	**2000-1**	**1994-5**	**2000-1**
Overall	0.45	0.38	0.05	0.04
By SAH:				
Poor/ Fair	0.17	0.13	0.03	Not released
Good	0.45	0.37	0.03	0.03
Very Good	0.53	0.47	0.07	0.06
Excellent	0.54	0.48	0.07	0.07

Note: Ages are in 1994-5

Table 4a: Employment and Cardinalized Self-Assessed Health in the NPHS: Men

	OLS		Linear Fixed Effects Model	
Ages	50-64	65+	50-64	65+
	Coef	Coef	Coef	Coef
Age/10	8.691	-22.169	8.197	-7.274
	(12.396)	(40.434)	(9.811)	(26.977)
$(Age/10)^2$	-1.326	3.115	-1.296	0.968
	(2.168)	(5.787)	(1.718)	(3.861)
$(Age/10)^3$	0.062	-0.147	0.064	-0.044
	(0.126)	(0.276)	(0.100)	(0.184)
Married	**0.073**	-0.018	-0.054	0.001
	(0.030)	(0.030)	(0.050)	(0.049)
Household Size	**0.097**	0.034	0.075	-0.016
	(0.033)	(0.031)	(0.044)	(0.042)
Household owns home	**0.056**	-0.002	-0.016	-0.013
	(0.022)	(0.018)	(0.035)	(0.031)
Household capital income	**-0.039**	-0.024	-0.030	-0.007
	(0.017)	(0.014)	(0.017)	(0.012)
White	-0.039	0.001		
	(0.031)	(0.040)		
Atlantic	**-0.085**	**-0.084**		
	(0.021)	(0.018)		
Quebec	**-0.133**	**-0.078**		
	(0.022)	(0.021)		
Prairies	**0.084**	0.035		
	(0.021)	(0.019)		
BC	-0.015	**-0.060**		
	(0.027)	(0.025)		
High school	-0.022	0.037		
	(0.024)	(0.022)		
Some postsecondary	-0.036	0.026		
	(0.020)	(0.018)		
Postsecondary Graduate	0.017	**0.043**		
	(0.018)	(0.018)		
Cardinalized SAH	**0.119**	**0.032**	**0.024**	-0.001
	(0.007)	(0.007)	(0.009)	(0.007)

Notes:

Pooled data from 4 waves of the NPHS (aged 50 to 75 in 1994-5)

Samples sizes: 65+ men(2540) 50-64 men (3599)

Coefficients in bold are significant at the 5% level.

The cardinalization of SAH is derived from the empirical cumulative distribution of the HUI3 (following Van Doorslaer and Jones, 2003) and standardized to have mean zero and s.d. 1. See text for further details.

Additional controls: Region Dummies

Table 4b: Employment and Cardinalized Self-Assessed Health in the NPHS: Women

	OLS		Linear Fixed Effects Model	
Ages	50-64	65+	50-64	65+
	Coef	Coef	Coef	Coef
Age/10	**27.493**	-18.589	**27.390**	-3.743
	(12.176)	(21.551)	(9.288)	(17.127)
$(Age/10)^2$	**-4.726**	2.584	**-4.729**	0.424
	(2.128)	(3.083)	(1.626)	(2.450)
$(Age/10)^3$	**0.266**	-0.120	**0.268**	-0.016
	(0.124)	(0.147)	(0.095)	(0.117)
Married	**-0.076**	**-0.062**	-0.076	-0.032
	(0.024)	(0.013)	(0.046)	(0.025)
Household Size	0.009	**0.050**	-0.013	0.028
	(0.026)	(0.013)	(0.033)	(0.020)
Household owns home	-0.004	0.005	0.007	-0.001
	(0.019)	(0.594)	(0.035)	(0.019)
Household capital income	**-0.059**	-0.007	**-0.046**	-0.009
	(0.016)	(0.008)	(0.016)	(0.008)
White	-0.041	**0.053**		
	(0.036)	(0.022)		
Atlantic	**-0.081**	**-0.034**		
	(0.020)	(0.010)		
Quebec	**-0.115**	**-0.038**		
	(0.021)	(0.011)		
Prairies	**0.050**	-0.002		
	(0.020)	(0.010)		
BC	-0.00001	-0.007		
	(0.026)	(0.013)		
High school	0.024	**-0.023**		
	(0.022)	(0.011)		
Some postsecondary	0.036	**0.028**		
	(0.019)	(0.010)		
Postsecondary Graduate	**0.102**	**0.027**		
	(0.019	0.010)		
Cardinalized SAH	**0.109**	**0.016**	**0.030**	-0.001
	(0.007)	(0.004)	(0.009)	(0.005)

Notes:

Pooled data from 4 waves of the NPHS (aged 50 to 75 in 1994-5)

Samples sizes: 65+ Female(3543) 50-64 Female (4058)

Coefficients in bold are significant at the 5% level.

The cardinalization of SAH is derived from the empirical cumulative distribution of the HUI3 (following Van Doorslaer and Jones, 2003) and standardized to have mean zero and s.d. 1. See text for further details.

Additional controls: Region Dummies

Table 5a: Testing for justification bias - men

	Men 50-64					Men 65+				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
working		**0.412**	**0.384**				0.470	0.254		
		(-0.039)	(-0.047)				(-0.065)	(-0.102)		
HUI	**0.707**	**0.653**		**0.659**	**0.674**	**0.694**	**0.676**		**0.986**	**0.652**
	(-0.037)	(-0.037)		(-0.055)	(-0.052)	(-0.042)	(-0.042)		(-0.135)	(-0.042)
HUI^2	**0.058**	**0.055**		**0.110**	**0.057**	**0.063**	**0.060**		**0.349**	**0.050**
	(-0.014)	(-0.014)		(-0.029)	(-0.017)	(-0.017)	(-0.017)		(-0.099)	(-0.018)
working*HUI3			**0.632**					**0.933**		
			(-0.054)					(-0.128)		
working*HUI3^2			**0.109**					**0.332**		
			(-0.028)					(-0.098)		
not-working* HUI3			**0.716**					**0.657**		
			(-0.051)					(-0.042)		
not-working* HUI3^2			**0.062**					**0.051**		
			(-0.017)					(-0.018)		
cut-point 1	-1.973	-1.774	-1.794	-2.400	-1.682	-1.849	-1.811	-1.822	-2.297	-1.810
cut-point 2	-1.002	-0.771	-0.779	-1.226	-0.715	-0.765	-0.718	-0.728	-1.083	-0.719
cut-point3	0.043	0.296	0.290	-0.071	0.248	0.273	0.332	0.322	0.119	0.316
cut-point4	1.134	1.402	1.395	1.049	1.313	1.362	1.436	1.429	1.240	1.420
log-likelihood	4663.47	4606.24	4598.57	2715.26	1873.65	3320.59	3294.17	3290.14	387.71	-2901.00
				-4588.91					-3288.71	

Table 5b: Testing for justification bias - women

	Women 50-64					Women 65+				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Working		**0.310**	**0.335**				**0.352**	**0.140**		
		(0.035)	(0.047)				0.086	0.154		
HUI	**0.847**	**0.818**		**0.773**	**0.836**	**0.763**	**0.757**		**1.236**	**0.742**
	(0.033)	(0.033)		(0.061)	(0.040)	(0.033)	(0.034)		(0.206)	(0.034)
HUI^2	**0.100**	**0.098**		**0.118**	**0.104**	**0.085**	**0.084**		0.240	**0.079**
	(0.013)	(0.013)		(0.032)	(0.014)	(0.014)	(0.014)		(0.173)	(0.014)
working*HUI3			**0.712**					**1.173**		
			(0.059)					(0.190)		
working*HUI3^2			**0.116**					0.220		
			(0.032)					(0.172)		
not-working* HUI3			**0.876**					**0.744**		
			(0.039)					(0.034)		
not-working* HUI3^2			**0.110**					**0.080**		
			(0.014)					(0.014)		
cut-point 1	-2.111	-2.020	-2.027	-2.868	-1.938	-2.001	-1.989	-1.994	-2.076	-1.995
cut-point 2	-0.990	-0.878	-0.872	-1.342	-0.814	(-0.835)	(-0.823)	(-0.827)	-1.106	(-0.823)
cut-point3	0.108	0.236	0.244	-0.049	0.212	0.341	0.356	0.352	0.226	0.352
cut-point4	1.264	1.400	1.407	1.146	1.344	1.489	1.509	1.507	1.478	1.500
log-likelihood	-5124.05	-5085.35	-5078.55	-1948.75	-3113.87	-4424.66	-4416.19	-4413.48	-195.514	-4216.96
				-5062.62					-4412.474	

Table 6: Health Stock Estimimates in the 1994-5 NPHS
Ordered Logits (Probits) for Self-Assessed Health (SAH) on Demographics and Health Meaures (Age 50-64)

	Men	Women
	Coef	Coef
	(std err)	(std err)
Age/10	-3.221	**-4.282**
	(2.181)	(2.013)
$(Age/10)^2$	0.277	**0.366**
	(0.192)	(0.177)
Married	0.254	0.126
	(0.130)	(0.098)
Household Size	-0.196	**-0.292**
	(0.144)	(0.107)
Household owns home	0.061	**0.210**
	(0.095)	(0.082)
Household capital income	**0.193**	0.077
	(0.075)	(0.068)
White	0.046	0.229
	(0.150)	(0.152)
High school	**0.340**	**0.207**
	(0.107)	(0.092)
Some postsecondary	**0.247**	**0.313**
	(0.087)	(0.080)
Postsecondary graduate	**0.441**	**0.442**
	(0.083)	(0.080)
Mental	0.001	**-0.006**
	(0.001)	(0.002)
Problems with activities of daily life	**-0.558**	**-0.470**
	(0.133)	(0.105)
Disability	**-0.738**	**-0.823**
	(0.089)	(0.091)
Food allergy	-0.123	0.026
	(0.176)	(0.123)
Other allergy	0.116	-0.053
	(0.107)	(0.081)
Asthma	**-0.457**	**-0.589**
	(0.183)	(0.133)
Arthritis	**-0.249**	**-0.316**
	(0.083)	(0.071)
Other back problems	-0.070	**-0.256**
	(0.082)	(0.082)
High blood pressure	**-0.249**	**-0.210**
	(0.087)	(0.078)

Migranes	**-0.478**	-0.182
	(0.176)	(0.102)
Bronchitus	**-0.511**	-0.107
	(0.171)	(0.149)
Diabetes	**-0.402**	**-0.586**
	(0.141)	(0.143)
Heart Disease	**-0.723**	**-0.401**
	(0.122)	(0.137)
Other chronic conditions	**-0.269**	**-0.312**
	(0.096)	(0.081)
Ulcer	**-0.314**	**-0.505**
	(0.143)	(0.138)
Cancer	**-0.554**	**-0.346**
	(0.253)	(0.163)
Stroke	-0.248	-0.356
	(0.275)	(0.284)
Urinary	-0.343	0.126
	(0.318)	(0.199)
Cataract	0.347	-0.078
	(0.237)	(0.191)
Glaucoma	-0.028	-0.139
	(0.301)	(0.245)
Insufficient weight (BMI)	-0.338	-0.178
	(0.217)	(0.132)
Some excess weight (BMI)	-0.106	0.048
	(0.089)	(0.092)
Overweight (BMI)	-0.094	**-0.157**
	(0.076)	(0.069)

Samples sizes:1182 Men and 1365 Women.

(Aged 50 to 64 in 1994-5)
Bold coefficients are statistically significant at the 5% level.
Results for other waves are similar, and available from the authors.
Additional controls: region dummies

Table 7: Employment Models, Men, 50-64

	Estimated Health Stock				HUI3			
	Linear	Linear FE	IV Linear	IV Linear FE	Linear	Linear FE	IV Linear	IV Linear FE
Age/10	17.557	12.624	7.109	10.117	11.579	8.438	8.458	9.271
	(12.144)	(9.793)	(12.941)	(10.166)	(12.376)	(9.914)	(13.015)	(10.257)
$(Age/10)^2$	-2.844	-2.051	-1.030	-1.607	-1.854	-1.331	-1.261	-1.452
	(2.124)	(1.715)	(2.263)	(1.780)	(2.165)	(1.737)	(2.277)	(1.796)
$(Age/10)^3$	0.149	0.107	0.044	0.081	0.094	0.066	0.057	0.071
	(0.123)	(0.100)	(0.132)	(0.104)	(0.126)	(0.101)	(0.132)	(0.105)
Married	0.052	-0.052	0.061	-0.064	**0.074**	-0.042	**0.063**	-0.063
	(0.029)	(0.050)	(0.031)	(0.052)	(0.030)	(0.051)	(0.031)	(0.052)
Household owns home	0.023	-0.027	0.020	-0.019	**0.045**	-0.019	0.017	-0.019
	(0.021)	(0.035)	(0.023)	(0.036)	(0.022)	(0.035)	(0.023)	(0.037)
Household capital income	**-0.069**	**-0.041**	**-0.068**	-0.023	-0.035	-0.030	**-0.069**	-0.024
	(0.017)	(0.017)	(0.018)	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)
Household size	**0.092**	0.073	**0.094**	0.081	**0.084**	0.071	**0.095**	0.079
	(0.033)	(0.044)	(0.035)	(0.046)	(0.033)	(0.044)	(0.035)	(0.046)
Health Measure	**0.161**	**0.065**	**0.252**	**0.141**	**0.128**	**0.036**	**0.253**	**0.134**
	(0.008)	(0.011)	(0.013)	(0.026)	(0.007)	(0.009)	(0.015)	(0.035)
White	-0.042				-0.022		-0.044	
	(0.030)				(0.031)		(0.033)	
High school	**-0.062**				-0.004		**-0.057**	
	(0.024)				(0.024)		(0.025)	
Some postsecondary	**-0.059**				-0.019		**-0.060**	
	(0.019)				(0.020)		(0.021)	
Postsecondary graduate	**-0.039**				0.024		-0.030	
	(0.018)				(0.018)		(0.020)	

Notes:

Aged 50 to 64 in 1994-5

Sample Size: 3559 Men in HUI3 case, 3599 Men in Health stock case

Bold coefficients are statistically significant at the 5% level.

Additional controls: region dummies

Health measures have been standardized to have mean zero and s.d. 1

Results for logit and conditional logitl are similar to linear and linear FE respectively, and available from the authors.

Table 8: **Employment Models, Women 50-64**

	Estimated Health Stock				HUI3			
	Linear	Linear FE	IV Linear	IV Linear FE	Linear	Linear FE	IV Linear	IV Linear FE
Age/10	**28.752**	**27.655**	23.530	**25.053**	**32.504**	**27.816**	24.321	**23.637**
	(12.142)	(9.269)	(12.363)	(9.530)	(12.203)	(9.314)	(12.527)	(9.821)
$(Age/10)^2$	**-4.917**	**-4.760**	-4.005	**-4.291**	**-5.629**	**-4.810**	-4.134	**-4.029**
	(2.122)	(1.623)	(2.161)	(1.669)	(2.132)	(1.631)	(2.189)	(1.721)
$(Age/10)^3$	**0.275**	**0.269**	0.222	**0.241**	**0.320**	**0.273**	0.229	**0.225**
	(0.123)	(0.094)	(0.126)	(0.097)	(0.124)	(0.095)	(0.127)	(0.100)
Married	**-0.082**	-0.085	**-0.094**	-0.084	**-0.068**	-0.078	**-0.100**	-0.094
	(0.024)	(0.046)	(0.025)	(0.047)	(0.024)	(0.047)	(0.025)	(0.049)
Household owns home	-0.025	-0.004	-0.036	0.001	0.010	0.005	**-0.043**	-0.003
	(0.020)	(0.035)	(0.020)	(0.036)	(0.019)	(0.035)	(0.020)	(0.037)
Household capital income	**-0.072**	**-0.054**	**-0.070**	**-0.048**	**-0.057**	**-0.045**	**-0.074**	**-0.047**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)
Household size	0.017	-0.011	0.019	-0.001	-0.006	-0.019	0.020	-0.001
	(0.026)	(0.033)	(0.027)	(0.034)	(0.026)	(0.033)	(0.027)	(0.035)
Health Measure	**0.122**	**0.052**	**0.188**	**0.134**	**0.109**	**0.039**	**0.210**	**0.179**
	(0.008)	(0.011)	(0.012)	(0.030)	(0.007)	(0.009)	(0.014)	(0.043)
White	-0.065		**-0.076**		-0.015		**-0.084**	
	(0.036)		(0.036)		(0.036)		(0.037)	
High school	0.009		0.003		0.028		0.002	
	(0.022)		(0.023)		(0.022)		(0.023)	
Some postsecondary	0.008		0.020		**0.045**		0.016	
	(0.019)		(0.019)		(0.019)		(0.019)	
Postsecondary graduate	**0.065**		**0.074**		**0.106**		**0.067**	
	(0.019)		(0.019)		(0.019)		(0.020)	

Notes:

Aged 50 to 64 in 1994-5

Sample Size: 4034 Women in HUI3 case, and 4058 Women in health stock case

Bold coefficients are statistically significant at the 5% level.

Additional controls: region dummies

Health measures have been standardized to have mean zero and s.d. 1

Results for logit and conditional logitl are similar to linear and linear FE respectively, and available from the authors.

Table 9: Health Dynamics (HUI3)

	Men 50-64			Women 50-64		
	1 lag	2 lags	3 lags	1 lag	2 lags	3 lags
Lagged HUI3	**0.60**	**0.45**	**0.42**	**0.60**	**0.44**	**0.38**
	(0.02)	(0.03)	(0.04)	(0.01)	(0.03)	(0.04)
2nd Lag		**0.25**	**0.20**		**0.24**	**0.23**
		(0.03)	(0.05)		(0.02)	(0.05)
3rd Lag			**0.15**			**0.12**
			(0.04)			(0.04)
Adjusted R-square	0.33	0.35	0.41	0.38	0.39	0.40
Observations	2291	1313	548	2585	1479	632

Notes:
(Aged 50 to 64 in 1994-5)

Table 10: Employment Models with Health Levels and Changes, Selected Coefficients

	Men 50-64				Women 50-64			
	Linear	Linear FE	IV Linear	IV Linear FE	Linear	Linear FE	IV Linear	IV Linear FE
Health Measure (HUI3)	**0.169**	0.020	**0.298**	0.061	**0.130**	**0.056**	**0.214**	**0.203**
	(0.011)	(0.019)	(0.019)	(0.070)	(0.010)	(0.019)	(0.017)	(0.071)
Change in health	**-0.083**	-0.004	**-0.131**	-0.0004	**-0.063**	**-0.024**	-0.097	-0.100
	(0.011)	(0.012)	(0.044)	(0.056)	(0.011)	(0.012)	(0.054)	(0.061)

Notes:

(Aged 50 to 64 in 1994-5)

Sample Sizes: 2291 Men and 2585 Women

Health measures have been standardized to have mean zero and s.d. 1

Bold coefficients are statistically significant at the 5% level.

Specification contains, in addition, all the variables in Tables 7 and 8

Results for logit and conditional logit are similar to the linear and linear fixed effects estimates, respectively and are available from the authors.

Table A1: Socioeconomic Characteristics of the Sample, 1994-5

	Male (%)		Female (%)	
	50-64	65+	50-64	65+
Age	6.0	6.4	6.1	6.4
Married	82.5	82.7	65.5	64.0
Household Size	87.1	85.6	77.1	73.9
Household owns home	81.2	83.7	74.5	76.3
Household capital income	30.7	30.6	32.6	28.6
White	93.2	93.0	93.3	92.6
Atlantic	8.4	8.2	8.0	8.5
Quebec	24.5	25.9	27.6	27.2
Ontario	38.2	39.4	37.4	37.1
Prairies	15.5	14.8	14.5	14.7
British Columbia	13.2	11.5	12.2	12.2
Less than high school	41.0	35.8	42.1	36.0
High school	11.9	11.4	15.1	15.1
Some postsecondary	19.1	22.1	19.7	23.2
Postsecondary graduate	27.8	30.5	23	25.5

Notes: Sample Aged 50 to 75 in 1994-5
Sample sizes: 50-64 - male 1883, female 2337
65+ - male 1180, female 1483

Table A2: Health Characteristics of the Sample

	Male (%)		Female (%)	
	50-64	65+	50-64	65+
Mental	10.5	9.04	7.07	5.47
Problems with activities of daily life	10.0	19.4	18.1	31.3
Disability	25.1	21.8	22.5	17.4
Food allergy	3.3	3.0	5.6	7.8
Other allergy	10.1	12.8	16.6	27.0
Asthma	4.1	5.8	5.2	7.7
Arthritis	22.2	26.3	34.5	38.4
Other back problems	20.3	17.2	18.5	18.1
High blood pressure	18.7	29.9	23.9	35.9
Migranes	3.5	2.7	7.9	9.0
Bronchitus	5.2	3.6	4.6	4.3
Diabetes	8.2	11.1	6.1	8.7
Heart Disease	10.7	14.5	6.6	8.7
Other chronic conditions	11.8	8.6	15.3	9.9
Ulcer	4.9	2.9	5.0	5.3
Cancer	2.9	4.4	4.2	3.0
Stroke	2.2	3.7	1.9	1.9
Urinary	1.2	1.9	2.6	7.1
Cataract	3.4	6.6	5.9	10.6
Glaucoma	1.8	2.1	2.6	4.6
Insufficient weight (BMI)	2.3	3.1	6.5	5.7
Some excess weight (BMI)	21.8	22.2	15.7	18.3
Overweight (BMI)	43.1	44.6	36.7	38.8
Had chronic condition	67.6	75.6	72.7	81.6

Notes: Sample Aged 50 to 75 in 1994-5
Sample sizes: 50-64 - male 1883, female 2337
65+ - male 1180, female 1483

Figure 1: Empirical CDF of HUI3 and predicted health stock, men aged 50-64

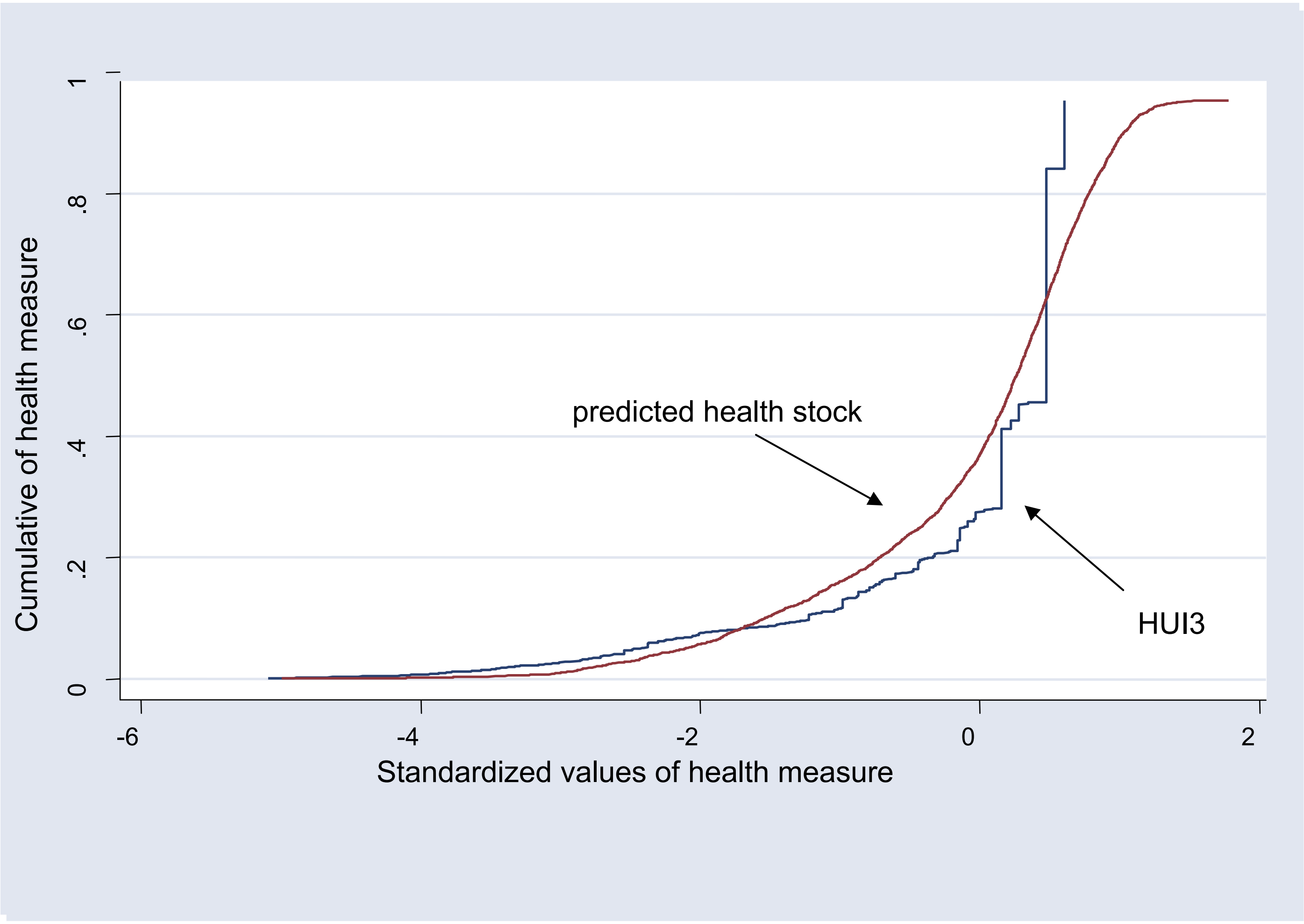
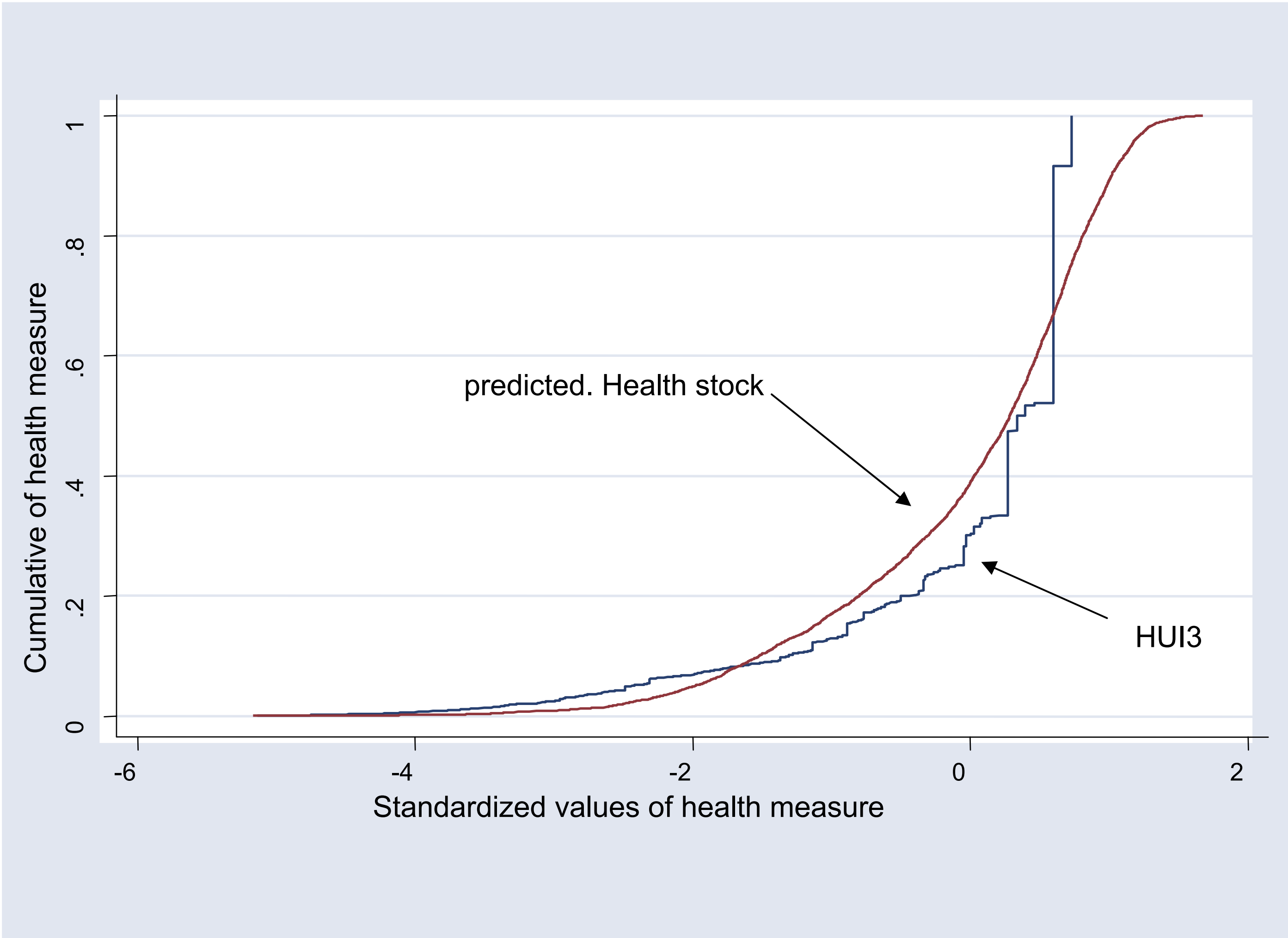


Figure 2: Empirical CDF of HUI3 and predicted health stock, women age 50-64



SEDAP RESEARCH PAPERS

Number	Title	Author(s)
No. 1:	Population Aging and Its Economic Costs: A Survey of the Issues and Evidence	F.T. Denton B.G. Spencer
No. 2:	How Much Help Is Exchanged in Families? Towards an Understanding of Discrepant Research Findings	C.J. Rosenthal L.O. Stone
No. 3:	Did Tax Flattening Affect RRSP Contributions?	M.R. Veall
No. 4:	Families as Care-Providers Versus Care-Managers? Gender and Type of Care in a Sample of Employed Canadians	C.J. Rosenthal A. Martin-Matthews
No. 5:	Alternatives for Raising Living Standards	W. Scarth
No. 6:	Transitions to Retirement: Determinants of Age of Social Security Take Up	E. Tompa
No. 7:	Health and Individual and Community Characteristics: A Research Protocol	F. Béland S. Birch G. Stoddart
No. 8:	Disability Related Sources of Income and Expenses: An Examination Among the Elderly in Canada	P. Raina S. Dukeshire M. Denton L.W. Chambers A. Scanlan A. Gafni S. French A. Joshi C. Rosenthal
No. 9:	The Impact of Rising 401(k) Pension Coverage on Future Pension Income	W.E. Even D.A. Macpherson
No. 10:	Income Inequality as a Canadian Cohort Ages: An Analysis of the Later Life Course	S.G. Prus
No. 11:	Are Theories of Aging Important? Models and Explanations in Gerontology at the Turn of the Century	V.L. Bengtson C.J. Rice M.L. Johnson
No. 12:	Generational Equity and the Reformulation of Retirement	M.L. Johnson
No. 13:	Long-term Care in Turmoil	M.L. Johnson L. Cullen D. Patsios
No. 14:	The Effects of Population Ageing on the Canadian Health Care System	M.W. Rosenberg

Number	Title	Author(s)
No. 15:	Projections of the Population and Labour Force to 2046: Canada	F.T. Denton C.H. Feaver B.G. Spencer
No. 16:	Projections of the Population and Labour Force to 2046: The Provinces and Territories	F.T. Denton C.H. Feaver B.G. Spencer
No. 17:	Location of Adult Children as an Attraction for Black and White Elderly Migrants in the United States	K.-L. Liaw W.H. Frey J.-P. Lin
No. 18:	The Nature of Support from Adult *Sansei* (Third Generation) Children to Older *Nisei* (Second Generation) Parents in Japanese Canadian Families	K.M. Kobayashi
No. 19:	The Effects of Drug Subsidies on Out-of-Pocket Prescription Drug Expenditures by Seniors: Regional Evidence from Canada	T.F. Crossley P. Grootendorst S. Korkmaz M.R. Veall
No. 20:	Describing Disability among High and Low Income Status Older Adults in Canada	P. Raina M. Wong L.W. Chambers M. Denton A. Gafni
No. 21:	Parental Illness and the Labour Supply of Adult Children	P.T.Léger
No. 22:	Some Demographic Consequences of Revising the Definition of "Old" to Reflect Future Changes in Life Table Probabilities	F.T. Denton B.G. Spencer
No. 23:	Geographic Dimensions of Aging: The Canadian Experience 1991-1996	E.G. Moore D. McGuinness M.A. Pacey M.W. Rosenberg
No. 24:	The Correlation Between Husband's and Wife's Education: Canada, 1971-1996	L. Magee J. Burbidge L. Robb
No. 25:	The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1988 Tax Flattening in Canada	M.-A. Sillamaa M.R. Veall
No. 26:	The Stability of Self Assessed Health Status	T.F. Crossley S. Kennedy

Number	Title	Author(s)
No. 27:	How Do Contribution Limits Affect Contributions to Tax-Preferred Savings Accounts?	K. Milligan
No. 28:	The Life Cycle Model of Consumption and Saving	M. Browning T.F. Crossley
No. 29:	Population Change and the Requirements for Physicians: The Case of Ontario	F.T. Denton A. Gafni B.G. Spencer
No. 30:	Nonparametric Identification of Latent Competing Risks and Roy Duration Models	G. Colby P. Rilstone
No. 31:	Simplified Estimation of Multivariate Duration Models with Unobserved Heterogeneity	G. Colby P. Rilstone
No. 32:	Structural Estimation of Psychiatric Hospital Stays	G. Colby P. Rilstone
No. 33:	Have 401(k)s Raised Household Saving? Evidence from the Health and Retirement Study	G.V. Engelhardt
No. 34:	Health and Residential Mobility in Later Life: A New Analytical Technique to Address an Old Problem	L.M. Hayward
No. 35:	2 ½ Proposals to Save Social Security	D. Fretz M.R. Veall
No. 36:	The Consequences of Caregiving: Does Employment Make a Difference	C.L. Kemp C.J. Rosenthal
No. 37:	Fraud in Ethnocultural Seniors' Communities	P.J.D. Donahue
No. 38:	Social-psychological and Structural Factors Influencing the Experience of Chronic Disease: A Focus on Individuals with Severe Arthritis	P.J. Ballantyne G.A. Hawker D. Radoeva
No. 39:	The Extended Self: Illness Experiences of Older Married Arthritis Sufferers	P.J. Ballantyne G.A. Hawker D. Radoeva
No. 40:	A Comparison of Alternative Methods to Model Endogeneity in Count Models. An Application to the Demand for Health Care and Health Insurance Choice	M. Schellhorn
No. 41:	Wealth Accumulation of US Households: What Do We Learn from the SIPP Data?	V. Hildebrand
No. 42:	Pension Portability and Labour Mobility in the United States. New Evidence from SIPP Data.	V. Andrietti V. Hildebrand

Number	Title	Author(s)
No. 43:	Exploring the Effects of Population Change on the Costs of Physician Services	F.T. Denton A. Gafni B.G. Spencer
No. 44:	Reflexive Planning for Later Life: A Conceptual Model and Evidence from Canada	M.A. Denton S. French A. Gafni A. Joshi C. Rosenthal S. Webb
No. 45:	Time Series Properties and Stochastic Forecasts: Some Econometrics of Mortality from the Canadian Laboratory	F.T. Denton C.H. Feaver B.G. Spencer
No. 46:	Linear Public Goods Experiments: A Meta-Analysis	J. Zelmer
No. 47:	Local Planning for an Aging Population in Ontario: Two Case Studies	L.M. Hayward
No. 48:	Management Experience and Diversity in an Ageing Organisation: A Microsimulation Analysis	T. Wannell M. Gravel
No. 49:	Resilience Indicators of Post Retirement Well-Being	E. Marziali P. Donahue
No. 50:	Continuity or Change? Older People in Three Urban Areas	J. Phillips M. Bernard C. Phillipson J. Ogg
No. 51:	Intracohort Income Status Maintenance: An Analysis of the Later Life Course	S.G. Prus
No. 52:	Tax-Preferred Savings Accounts and Marginal Tax Rates: Evidence on RRSP Participation	K. Milligan
No. 53:	Cohort Survival Analysis is Not Enough: Why Local Planners Need to Know More About the Residential Mobility of the Elderly	L.M. Hayward N.M. Lazarowich
No. 54:	Unemployment and Health: Contextual Level Influences on the Production of Health in Populations	F. Béland S. Birch G. Stoddart

Number	Title	Author(s)
No. 55:	The Timing and Duration of Women's Life Course Events: A Study of Mothers With At Least Two Children	K.M. Kobayashi A. Martin-Matthews C.J. Rosenthal S. Matthews
No. 56:	Age-Gapped and Age-Condensed Lineages: Patterns of Intergenerational Age Structure Among Canadian Families	A. Martin-Matthews K. M. Kobayashi C.L. Rosenthal S.H. Matthews
No. 57:	The Relationship between Age, Socio-Economic Status, and Health among Adult Canadians	S.G. Prus
No. 58:	Measuring Differences in the Effect of Social Resource Factors on the Health of Elderly Canadian Men and Women	S.G. Prus E. Gee
No. 59:	APOCALYPSE NO: Population Aging and the Future of Health Care Systems	R.G. Evans K.M. McGrail S.G. Morgan M.L. Barer C. Hertzman
No. 60:	The Education Premium in Canada and the United States	J.B. Burbidge L. Magee A.L. Robb
No. 61:	Student Enrolment and Faculty Recruitment in Ontario: The Double Cohort, the Baby Boom Echo, and the Aging of University Faculty	B.G. Spencer
No. 62:	The Social and Demographic Contours of Contemporary Grandparenthood: Mapping Patterns in Canada and the United States	C.L. Kemp
No. 63:	Changing Income Inequality and the Elderly in Canada 1991-1996: Provincial Metropolitan and Local Dimensions	E.G. Moore M.A. Pacey
No. 64:	Mid-life Patterns and the Residential Mobility of Older Men	L.M. Hayward
No. 65:	The Retirement Incentive Effects of Canada’s Income Security Programs	M. Baker J. Gruber K. Milligan
No. 66:	The Economic Well-Being of Older Women Who Become Divorced or Separated in Mid and Later Life	S. Davies M. Denton

Number	Title	Author(s)
No. 67:	Alternative Pasts, Possible Futures: A “What If” Study of the Effects of Fertility on the Canadian Population and Labour Force	F.T. Denton C.H. Feaver B.G. Spencer
No. 68:	Baby-Boom Aging and Average Living Standards	W. Scarth M. Souare
No. 69:	The Invisible Retirement of Women	L. McDonald
No. 70:	The Impact of Reference Pricing of Cardiovascular Drugs on Health Care Costs and Health Outcomes: Evidence from British Columbia – Volume I: Summary	P.V. Grootendorst L.R. Dolovich A.M. Holbrook A.R. Levy B.J. O'Brien
No. 71:	The Impact of Reference Pricing of Cardiovascular Drugs on Health Care Costs and Health Outcomes: Evidence from British Columbia – Volume II: Technical Report	P.V. Grootendorst L.R. Dolovich A.M. Holbrook A.R. Levy B.J. O'Brien
No. 72:	The Impact of Reference Pricing of Cardiovascular Drugs on Health Care Costs and Health Outcomes: Evidence from British Columbia – Volume III: ACE and CCB Literature Review	L.R. Dolovich A.M. Holbrook M. Woodruff
No. 73:	Do Drug Plans Matter? Effects of Drug Plan Eligibility on Drug Use Among the Elderly, Social Assistance Recipients and the General Population	P. Grootendorst M. Levine
No. 74:	Living Alone and Living with Children: The Living Arrangements of Canadian and Chinese-Canadian Seniors	M.A. Pacey
No. 75:	Student Enrolment and Faculty Recruitment in Ontario: The Double Cohort, the Baby Boom Echo, and the Aging of University Faculty (Revised and updated version of No. 61)	B.G. Spencer
No. 76:	Gender Differences in the Influence of Economic, Lifestyle, and Psychosocial Factors on Later-life Health	S.G. Prus E. Gee
No. 77:	Asking Consumption Questions in General Purpose Surveys	M. Browning T.F. Crossley G. Weber
No. 78:	A Longitudinal Study of the Residential Mobility of the Elderly in Canada	Y. Ostrovsky
No. 79:	Health Care in Rural Communities: Exploring the Development of Informal and Voluntary Care	M.W. Skinner M.W. Rosenberg

Number	Title	Author(s)
No. 80:	Does Cognitive Status Modify the Relationship Between Education and Mortality? Evidence from the Canadian Study of Health and Aging	J.C. Brehaut P. Raina J. Lindsay
No. 81:	Agreement Between Self-Reported and Routinely Collected Health Care Utilisation Data Among Seniors	P. Raina V. Torrance-Rynard M. Wong C. Woodward
No. 82:	Age, Retirement and Expenditure Patterns: An Econometric Study of Older Canadian Households	F.T. Denton D.C. Mountain B.G. Spencer
No. 83:	Understanding the Relationship between Income Status and the Restrictions in Instrumental Activities of Daily Living among Disabled Older Adults	P. Raina M. Wong
No. 84:	Location of Adult Children as an Attraction for Black and White Elderly *Return* and *Onward* Migrants in the United States: Application of a Three-level Nested Logit Model with Census Data	K-L. Liaw W.H. Frey
No. 85:	Changing Income Inequality and Immigration in Canada 1980-1995	E.G. Moore M.A. Pacey
No. 86:	The Dynamics of Food Deprivation and Overall Health: Evidence from the Canadian National Population Health Survey	L. McLeod M.R. Veall
No. 87:	Quebec's Lackluster Performance in Interprovincial Migration and Immigration: How, Why, and What Can Be Done?	K-L. Liaw L. Xu M. Qi
No. 88:	Out-of-Pocket Prescription Drug Expenditures and Public Prescription Drug Programs	S. Alan T.F. Crossley P. Grootendorst M.R. Veall
No. 89:	The Wealth and Asset Holdings of U.S.-Born and Foreign-Born Households: Evidence from SIPP Data	D.A. Cobb-Clark V. Hildebrand
No. 90:	Population Aging, Productivity, and Growth in Living Standards	W. Scarth
No. 91:	A Life-course Perspective on the Relationship between Socio-economic Status and Health: Testing the Divergence Hypothesis	S.G. Prus
No. 92:	Immigrant Mental Health and Unemployment	S. Kennedy
No. 93:	The Relationship between Education and Health in Australia and Canada	S. Kennedy

Number	Title	Author(s)
No. 94:	The Transition from Good to Poor Health: An Econometric Study of the Older Population	N.J. Buckley F.T. Denton A.L. Robb B.G. Spencer
No. 95:	Using Structural Equation Modeling to Understand the Role of Informal and Formal Supports on the Well-being of Caregivers of Persons with Dementia	P. Raina C. McIntyre B. Zhu I. McDowell L. Santaguida B. Kristjansson A. Hendricks L.W. Chambers
No. 96:	Helping to Build and Rebuild Secure Lives and Futures: Intergenerational Financial Transfers from Parents to Adult Children and Grandchildren	J. Ploeg L. Campbell M. Denton A. Joshi S. Davies
No. 97:	Geographic Dimensions of Aging in Canada 1991-2001	E.G. Moore M.A. Pacey
No. 98:	Examining the "Healthy Immigrant Effect" in Later Life: Findings from the Canadian Community Health Survey	E.M. Gee K.M. Kobayashi S.G. Prus
No. 99:	The Evolution of High Incomes in Canada, 1920-2000	E. Saez M.R. Veall
No. 100:	Macroeconomic Implications of Population Aging and Public Pensions	M. Souare
No. 101:	How Do Parents Affect the Life Chances of Their Children as Adults? An Idiosyncratic Review	J. Ermisch
No. 102:	Population Change and Economic Growth: The Long-Term Outlook	F.T. Denton B.G. Spencer
No. 103:	Use of Medicines by Community Dwelling Elderly in Ontario	P.J. Ballantyne J.A. Marshman P.J. Clarke J.C. Victor
No. 104:	The Economic Legacy of Divorced and Separated Women in Old Age	L. McDonald A.L. Robb

SEDAP RESEARCH PAPERS

Number	Title	Author(s)
No. 105:	National Catastrophic Drug Insurance Revisited: Who Would Benefit from Senator Kirby's Recommendations?	T.F. Crossley P.V. Grootendorst M.R. Veall
No. 106:	WAGES in CANADA: SCF, SLID, LFS and the Skill Premium	A.L Robb L. Magee J.B. Burbidge
No. 107:	A Synthetic Cohort Analysis of Canadian Housing Careers	T.F. Crossley Y. Ostrovsky
No. 108:	The Policy Challenges of Population Ageing	A. Walker
No. 109:	Social Transfers and Income Inequality in Old-age: A Multi-national Perspective	R.L. Brown S.G. Prus
No. 110:	Organizational Change and the Health and Well-Being of Home Care Workers	M. Denton I.U. Zeytinoglu S. Davies
No. 111:	Stasis Amidst Change: Canadian Pension Reform in an Age of Retrenchment	D. Béland J. Myles
No. 112:	Socioeconomic Aspects of Healthy Aging: Estimates Based on Two Major Surveys	N.J. Buckley F.T. Denton A.L. Robb B.G. Spencer
No. 113:	An Invitation to Multivariate Analysis: An Example About the Effect of Educational Attainment on Migration Propensities in Japan	A. Otomo K-L. Liaw
No. 114:	The Politics of Protest Avoidance: Policy Windows, Labor Mobilization, and Pension Reform in France	D. Béland P. Marier
No. 115:	The Impact of Differential Cost Sharing of Non-Steroidal Anti-Inflammatory Agents on the Use and Costs of Analgesic Drugs	P.V. Grootendorst J.K. Marshall A.M. Holbrook L.R. Dolovich B.J. O'Brien A.R. Levy
No. 116:	The Wealth of Mexican Americans	D.A. Cobb-Clark V. Hildebrand
No. 117:	Precautionary Wealth and Portfolio Allocation: Evidence from Canadian Microdata	S. Alan

Number	Title	Author(s)
No. 118:	Financial Planning for Later Life: Subjective Understandings of Catalysts and Constraints	C.L. Kemp C.J. Rosenthal M. Denton
No. 119:	The Effect of Health Changes and Long-term Health on the Work Activity of Older Canadians	D. Wing Han Au T.F. Crossley M. Schellhorn