Health and capacity to work of older Canadians: Gender and regional dimensions

Kevin Milligan  
Vancouver School of Economics  
University of British Columbia  
kevin.milligan@ubc.ca

Tammy Schirle  
Department of Economics  
Wilfrid Laurier University  
tschirle@wlu.ca

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We address the health capacity to work among Canadian older workers with a specific focus on differences by gender and region. We find that men in 2012 would need to work more than five additional years between ages 55-69 to keep pace with how much men in 1976 worked, holding health capacity constant. For working women, the comparable result is only two years more work. Most of these gaps arose before the mid-1990s, as employment advances have offset mortality improvements since then. Regionally, more than half the Ontario-Atlantic employment difference among older men is rooted in health differences.

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1. Introduction

Life expectancy of older Canadians is expanding rapidly. Over the 50-year period from 1961 to 2011, the expected remaining years of life of a 65-year-old Canadian increased by over five years.\(^1\) In just the last decade, men have gained more than two years of expected post-65 life. At the national level, these trends continue to raise policy questions about the fiscal cost of greater public expenditures on both pensions and healthcare. But at the individual and family level the trend toward longer lifespans raises more pointed questions: how should any extra longevity be split between work and non-work? If more work is desired, is there capability to work longer?

In this study we explore how the relationship between older individuals’ longevity and their employment has changed over time. While lifespans have increased over time, it is an open question whether these increases in lifespan represent an equivalent increase in potential working lives. Importantly, we must recognize a distinction between life expectancy and more comprehensive measures such as health-adjusted life expectancy (HALE, see Wolfson 1996).\(^2\) Statistics Canada offers HALE estimates for 2000-2002 and 2005-2007, suggesting that over this period women’s HALE at 65 increased by 0.9 years while their life expectancy at 65

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\(^2\) See also the report by the Public Health Agency of Canada Steering Committee on Health-adjusted Life Expectancy (2012) for information in developing such measures.
increased by 0.8. For men over this same period, HALE at 65 increased by 1.2 years and life expectancy at 65 increased by 1.1 years. This would suggest general improvements in both mortality and morbidity. There is further evidence to suggest that the health of older Canadians has generally improved over time in Ramage-Morin et al. (2010). Consistent with improvements in health at each age, Carrière and Galarneau (2012) have shown that today’s older Canadians expect to work longer than older Canadians in the 1990s, even after accounting for events like illness that might push workers to retire involuntarily. Overall, the existing evidence indicates that at least some of the extra years of life are conceivably available for potential labour market activity.

To address the question of health capacity and work we employ an approach that focuses on age-sex specific mortality risk since 1976. While mortality is obviously a coarse measure of health, mortality data provide some value to this debate because they are available for long time periods and are also comparable across jurisdictions. While we would prefer more comprehensive age-sex specific measures of health, similar to HALE, the surveys required to form such measures are only available for more recent time periods.

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3 These estimates are found in Statistics Canada’s Cansim Table 102-0122.
4 Tabulations based on World Health Organization (2017) estimates for 2000 and 2015 would suggest HALE increases that are smaller than life expectancy increases. However, the details of how these estimates were obtained were less clear to us given available life tables.
5 Specifically, the 1994-5 National Population Health Survey (NPHS) introduced a health utility index that has been used in measuring HALE (see Wolfson 1996) and is also found in the 1996-7 and 1998-9 NPHS and the Canadian Community Health Surveys (beginning in 2001). Moreover, especially in early years, the surveys do not
Our work in this paper builds on the foundation set by Milligan and Schirle (2017). We go beyond that earlier work in several important ways. First, in our characterization of changes in the employment-mortality profile, we introduce an analysis of women’s employment and mortality. Second, we introduce regional comparisons of health capacity to work, allowing an assessment of regional tradeoffs between health capacity and employment that yield substantial insight into the determinants of cross-region employment differences at older ages. Third, we consider deeper measures of aggregate labour supply in our analysis by considering both employment and hours worked.6

We also contribute more generally to the literature on labour supply and health at older ages. There is an extensive U.S. empirical literature linking older individuals’ health and labour market attachment. Currie and Madrian (1999) offer an earlier review of this literature and point to the importance of social institutions such as the expansion of public pensions that mediate the relationship between health and work. Milligan and Wise (2015) and Coile et al. (2017) use similar methodology on employment rates and mortality risk to make international comparisons, finding large differences in the uptake of capacity to work across countries.

afford us a sample size adequate to obtain precise estimates of the health index at an age-sex level of observation.

6 This paper presents a subset of the results previously circulated as an unpublished working paper in Milligan and Schirle (2016). That working paper presents extended and updated results from Milligan and Schirle (2017), which while published later, was written earlier when less data was available.
For Canada, a link between health and older individuals’ labour market attachment is also clear from available studies. For example, Au et al. (2005) have shown that health has a significant effect on employment probabilities for Canadian men and women aged 50-64, using longitudinal data from the National Population Health Survey. Schirle (2010) uses longitudinal data from the Canadian Survey of Labour and Income Dynamics to account for health and pension incentives, and finds that poor health significantly increases the likelihood of entering retirement among men and women aged 50-68. Available Canadian evidence, however, has not considered how the relationship between health and work has changed over the span of decades.

Our research follows two steps. First, we provide a brief descriptive summary of the improvements in mortality and the patterns of elderly employment. Second, we document the relationship between age- and sex-specific employment rates and mortality rates to characterize historical changes in this relationship and differences across sex and regions.

The analysis provides the following key insights. We show that older men and women in 2012 could work an additional 5 years and 2 years, respectively, if they worked at the same rate per unit of mortality risk as their counterparts in 1976. These increases in work in the 55-69 age window amount to gains over the status quo of 65 percent for men and 28 percent for women. The result is largely attributed to the evolution of the employment-mortality relationship before the
mid-1990s, as employment has increased to keep pace with mortality improvements since then. Regionally, we compare the mortality-employment relationship across regions for men. Men in Atlantic Canada work less than men in other regions, but we find that more than half the Ontario-Atlantic employment difference among older men is rooted in mortality risk differences, suggesting health differences may explain some of the inter-regional differences in older worker employment patterns.

The paper proceeds as follows. In section 2 we discuss the main data sources for this paper and justify the measures we use. In section 3 we describe general trends in older Canadians’ employment and mortality. In section 4 we assess the relationship between mortality and employment. Finally, we offer some concluding remarks.

2. Data

In this study we bring together data from various sources on employment and mortality.

The employment data for our analysis come from the Labour Force Survey (LFS). The LFS is a monthly household survey, collecting information on household members’ labour market activity and demographics. Methods for collecting the main labour market information have not changed substantially since 1976. In what follows, we primarily use the confidential files of the LFS, available through the Research Data Centre Program.
We use the LFS data up to 2012 to form age- and sex-specific employment rates, based on an indicator for whether an individual is currently employed. For women, a much larger proportion has never worked in the labour market. So, for women we use the same employment measure, but focus on a subsample of women who report having worked in the labour market since turning age 45. We make this adjustment to the female analysis because of the prevalence of women with little labour market history, particularly in earlier years analyzed. This is an innovation relative to other research using this employment-mortality analysis. In addition to the employment rates, we also measure average usual hours worked to examine a continuous and intensive measure of labour supply. This allows us to examine whether intensive-margin responses are in play alongside the extensive-margin responses examined using employment rates.

When measuring mortality risk, the bulk of our data come from the Canadian Human Mortality Database (2015), which offers temporally consistent series of key

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7 In the LFS, individuals who are not employed report whether they worked in the last year, more than one year ago, or never worked. Our subsample excludes women who report they never worked. For women that worked more than one year ago, we use individuals’ reported year last worked to exclude those who last worked before age 45. We do this to capture a group of women with at least some work history when their children are typically not infants, recognizing our inability to capture the degree of women’s long-term career attachment with the limited information in the LFS.

8 Milligan and Wise (2015) give the most comprehensive treatment to the mortality-employment relationship, but the analysis there was limited just to males.

9 We use the LFS variable for usual hours worked at all jobs, noting the sample of men includes those with zero hours when obtaining the average hours. For women, we use the sample that requires some work history after age 45, and include women with zero hours in the average presented.
mortality indicators up to 2011 by age, year, and sex. We augment this with recently released data from Statistics Canada (2016) lifetables to extend the analysis to 2012.\footnote{We checked our data construction for 2012 by imposing our methods on 2011 data and comparing to the available 2011 data from the Canadian Human Mortality Database. The match was extremely close.}

In the work below, we employ sex and age-specific death rates as a proxy for health, and mortality risk is clearly a very coarse proxy for health. However, Milligan and Wise (2015) argue that, while coarse, the mortality risk approach still provides an informative view on the health-employment relationship for two reasons, both relating to measurement. First, because both employment and mortality are relatively easy to measure, long comparable time series can be used. Second, the ease of measurement also enables international comparison. Even when detailed health surveys are available, question coverage and interpretation present serious challenges to comparability across countries and cultures (Juerges 2007, Kapteyn, Smith and Van Soest 2007). In contrast, mortality data is arguably not subject to measurement or cultural biases.

But, it is still worthwhile challenging how good the proxy is; do improvements in mortality capture improvements in health and possible capacity to work? To address this concern, we present here some correlations of more subtle health measures with mortality rates in order to build confidence in the merits of using mortality as a proxy for health.
In Figure 1 we present scatter plots of log death rates compared to four measures of self-assessed health. Each point is the mean of an age-year-sex cell. The four panels of the figure show four different self-assessed health measures against the log of the death rate. The four measures are: self-assessed health as being ‘fair’ or ‘poor’ (rather than good, very good, or excellent) in the Canadian Community Health Survey (CCHS) and the General Social Survey (GSS), an indicator for the prevalence of heart problems from the CCHS, and a self-reported scale of life satisfaction from the GSS.\textsuperscript{11,12} For the first three cases, there is a strong positive relationship between the self-assessed health measure and the log death rate. This suggests that the death rate is correlated with the subtler indicators of self-assessed health. The relationship in the fourth panel is not clear. While these scatter plots are suggestive, we still need to assess if movements through time in the health measures line up with movements in mortality. For this, we turn to regression analysis.

To dig deeper, we report in Table 1 further results using the same data. To begin, we show the raw correlation between the log mortality rate and each of the four self-assessed health measures. The results range from a very tight correlation of 0.945 for heart problems to 0.480 for life satisfaction. We then regress the log of the death rate with these health measures to estimate the relationship over time.

\textsuperscript{11} The data from the Canadian Community Health Survey are available for 10 years between 1995 and 2014. The data from the General Social Survey on fair-poor self-assessed health are available for 1985 and then most years between 1990 and 2012. The life satisfaction scale is available from 2003 to 2012, with the exception of 2004.

\textsuperscript{12} We have also examined patterns in the health utility index (HUI) over the 1994-5 to 2009-10 period. Between ages 55 and 69, we do not see evidence of a change in the mean values of the health utility index over time or across the ages in this range. These results are available from the authors.
rate on each of the self-assessed health measures along with a set of dummies for years, age groups, and sex. The goal here is to see if improvements through time in the self-assessed health measures within age groups line up with improvements in mortality. The results give strong support, with three of the four measures significantly showing the expected sign. We interpret this as supportive evidence for mortality improvements being in line with subtler indicators of health.

As further evidence, Milligan and Schirle (2016, 2017) used microdata from the Canadian Community Health Survey (2001-2014) to study much more granular measures of health and how they predict employment. The evidence presented there found very similar patterns of health and the capacity to work as we uncover with our mortality risk approach here. The disadvantage of that microdata-based approach is the limited comparability across time and place.

3. Trends

The first step in our analysis is to examine descriptive data on the trends in employment and mortality among the near-elderly and elderly. For employment we use the LFS, incorporating data from 1976 to 2015. For mortality, we use data up to 2012, the most recent year currently available.

In Figure 2 we plot the employment rates of men and women since 1976, at ages 60-64 and 65-69. Two distinct patterns emerge. For women, there has been a gradual increase in employment rates since the mid-1990s. For men, employment rates fell
substantially until the mid-1990s and then steadily rose thereafter, tracing a U-shape path. For these age groups, there is little business cycle fluctuation evident. For older women, the increase in employment rates in part reflects emerging cohort differences in lifetime employment patterns—women reaching older ages in the mid-1990s were much more likely to have had a substantial paid work career than earlier cohorts of women. No similar cohort effect influences men (see Schirle 2008).

Studies have suggested several factors influence the retirement and employment decisions of older individuals, including public pensions (as in Baker et al. 2003, Baker and Benjamin 1999a, 1999b), employer-sponsored pensions (as in Stock and Wise 1990, Pesando and Gunderson 1988, 1991, Pesando, Gunderson and Shum 1992, and Schirle 2010), and preferences for leisure with one’s spouse in retirement (Schirle 2008). Health status also appears as an important factor in work and retirement decisions (Au et al. 2005, Schirle 2010). In addition, retirement patterns could be influenced by gains in productivity across generations, reflecting changes in lifetime wealth. Our work contributes here by quantitatively assessing how these factors affecting actual work decisions compare to the potential to work at older ages.

In Figure 3 we plot the death rates of men and women at each age from 50 to 75 in the years 1976, 1994, and 2012. The lines for men are solid; the lines for women are dashed. For both men and women, there are clear and large improvements in
mortality at each age over time. The death rates for men are much larger than for women, but men are catching up—by 2012 mortality for men had fallen below the rates observed for women in 1976. The changes in death rates are most stark for men at older ages—the death rate of men at age 70 fell from 4.3 percent in 1976 to only 1.9 percent in 2012, for a drop of 56 percent. For women, both the absolute and percentage drop in mortality are lower, but still substantial. At age 70, the drop in the death rate was one percentage point between 1976 and 2012, or 45 percent of the 1976 death rate.

In summary, Canadians have seen steady improvements in mortality for several decades, which has led to expanded lifespans. One way to fund the additional consumption requirements associated with the longer lifespans is through additional work at older ages. To some extent, this is happening. The employment rates of older Canadians—both men and women—have grown substantially since the mid-1990s. For the men, this represented recovery to employment rates previously seen in earlier decades while for women the growth in employment rates was breaking new ground. The interesting question that emerges is whether the observed increase in employment rates since the mid-1990s has been sufficient to offset the decrease in death rates—are Canadians responding to longer lifespans by working more? The next section offers a quantitative assessment of this question.
4. The Mortality-Employment Relationship

Having documented the employment and mortality trends, the second step in our analysis is to combine the age- and sex-specific employment and death rates to trace the evolution of the employment-mortality relationship. We adapt the methodology developed in Milligan and Wise (2015) and used in Milligan and Schirle (2017). The core of the strategy is to compare employment rates across years at given levels of mortality risk. That is, given the risk of mortality was 2.8 percent at age 65 for males in 1976, we find the age at which mortality risk in 2012 was also 2.8 percent and compare employment rates.

The choice of 1976 as our base time period is supported by the context of large expansions of Canada’s public pensions in the 1970s and early 1980s that had some contribution toward the trend for earlier retirement. (See for example the analysis and discussion in Baker, Gruber and Milligan 2003 and Schirle 2010). While our starting point does not predate the introduction of all important programs, it is the earliest year of the LFS available.

To note, changes in employment for a given level of mortality risk might not all reflect lost work capacity if health attributes important for employment do not change in line with mortality risk. If so, the extra years of potential work capacity would not be realizable because the health conditions present a barrier to extended employment. It is also possible that the earlier retirements resulting from a more
generous public pension system may improve mortality, similarly making this relationship more complex than presented here.13

Figure 4 presents the employment-mortality relationship for women and men between 1976 and 2012. For women, as mentioned earlier, we use a sample that conditions on previous employment (after age 45) in order to focus on women who have engaged in work outside the home. The upper line in each graph is 1976 and the lower line is 2012. Reading the gap between the years vertically, one can assess the change in employment rates at any given level of mortality risk.

These graphs can best be understood by following the lower 2012 line from age 55 to age 69. For men, the employment gap at age 55 in 2012 compared to the equivalent-mortality employment rate in 1976 directly above is 11.4 percentage points. By age 65, this gap grows to 49.2 percentage points, before closing somewhat at age 69. Table 2 summarizes these age-specific employment rate gaps, and presents the natural summary statistic—the sum of the gaps in employment rates across all ages from 55 to 69. For the comparison of 1976 to 2012, the total sums to 5 years for men and 2 years for women. This sum can be interpreted as the number of additional years those in 2012 would work if they worked at the same rate per unit of mortality risk as did their counterparts in 1976 over the 55-69 age range. When compared against the actual amount of work (in years) between ages

13 We thank an anonymous reviewer for highlighting this mechanism.
55 and 69, this represents an increase of 65.5 percent for men over the 7.8 year actual total for 2012, and a 28.0 percent increase for women.\textsuperscript{14}

In Figure 5, we repeat the analysis using an hours measure in place of the binary employment indicator. For women, we again condition the sample on having worked in the past. This continuous measure permits us to see if the pattern is different when allowing for an intensive margin response—for example, working fewer hours per week in a partial labour force withdrawal. The results in Figure 5 indicate a similar impact on hours as for employment for men and for women.

Looking at calculations like those in Table 2, the increase in hours worked over ages 55 to 69 for men would be 85 percent, and 35 percent for women. So, allowing for an intensive response raises the percentage increase in work if people in 2012 worked as much as those in 1976 conditional on health. This suggests that the response we observe is not just people pulling out of the labour market entirely, but also includes some adjusting from more to fewer hours worked.

To examine the time path of the mortality-employment relationship, we repeat the calculations made in Table 2 for employment for every year between 1976 and 2011, using 2012 as the base comparison year each time. For example, the male 1985 calculation tells us how much more men in 2012 would work over ages 55-69

\textsuperscript{14} The total of the age-specific employment rates across the age 55-69 span gives a measure of the take up of work capacity over this age range. Full capacity would be characterized by a 1.0 employment rate in each of the years; adding to 15 years of total work. So, the 7.76 actual total years for 2012 means that 52 percent (7.76/15) of the available capacity was being used in 2012.
if they worked as much as the men in 1985 for each level of mortality risk. By repeating this analysis for each year between 1976 and 2011, we form and graph a time series separately for men and women in Figure 6.

The downward slope of the graph in Figure 6 from 1976 to the mid-1990s reflects the fact that mortality was improving at the same time as employment rates were declining (for men) or staying flat (for women). So, the employment trends were reinforcing the mortality trends on the employment-mortality relationship. In contrast, since the mid-1990s, the relative flatness of the lines in Figure 6 reflects the fact that employment expansions have almost completely offset the impact of mortality improvements over this era in their impact on the employment-mortality relationship. Consistent with results in Carrière and Galarneau (2012, who estimated expected working lives over the 1998-2009 period), this offset is one of our major findings in this paper.

To provide a deeper context for these results, we now make use of this analytical framework to compare men and women directly, to look across Canadian provinces, and to compare to the United States. We do this by starting with Ontario males in the 2000s as the base case. We use the entire decade of the 2000s in order to provide sufficient sample sizes for the provincial analyses. For each of the comparisons, we take the comparison group and ask how much more (or less) Ontario males in the 2000s would work between the ages of 55 and 69 if they worked the same as the comparison group, at each level of mortality risk. We
perform calculations like in Table 2 and then plot the result in Figure 7 for each comparison group. Positive values indicate that Ontario males would have to work more to meet the employment-mortality standard of the comparison group; negative values indicate that Ontario males would work less to meet the employment-mortality standard of the comparison group. The intention of this exercise is to assess how much of observed differences in employment at older ages might be attributed to health differences, as opposed to other factors that differ across regions.

The first comparison in Figure 7 is to 1970s Ontario males. We find that 2000s male Ontarians would have to work 5.59 years more between ages 55 and 69 to match the employment-mortality relationship of 1970s Ontario males. This is similar to the 5.08 years we found in Table 2 for 2012 vs 1976 for all Canadian males. Next we compare our 2000s Ontario males to females, also drawn from 2000s Ontario using our ‘previous work’ criterion to form the female sample. We find that males work 4.98 years more in Ontario in the 2000s compared to females, at comparable levels of mortality risk. This suggests that older female workers have more unused work capacity using this measure than older male workers.\textsuperscript{15}

\textsuperscript{15} We remind readers that mortality risk does not fully capture gender differences in health at these ages. While women have lower mortality rates and higher health-adjusted life expectancy, there is evidence that women tend to have lower health using other common measures. See for example Denton, Prus, and Walters (2004) and references therein.
We next look at differences between Ontario and other Canadian provinces in the next four bars, all for 2000s males. This is an interesting comparison because there are substantial differences in employment rates across regions in Canada. For 60 year old males in the 2000s, the employment rate was 0.676 in the Prairies but just 0.459 in the Atlantic provinces. Our analysis allows us to examine how much of this difference is driven by health differences compared to other determinants (for example policy differences or preference differences).

The differences across provinces are fairly small compared to the first two bars on Figure 7. The 1.93 year difference for Ontario compared to the Prairie provinces shows Ontarians would have to work about two years more over the 55 to 69 age range to match the employment-mortality pattern of the Prairies. For the Atlantic provinces, the small -0.7 year difference is of interest since the employment rates for Ontarian men are much higher. Over the 55 to 69 age range, the average Ontarian in the 2000s worked 7.28 years, 1.61 years more than in Atlantic Canada. The -0.7 difference in Figure 7 shows that only 42 percent of the 1.61 year gap would be closed if Atlantic Canadian men in the 2000s worked as much as Ontarian men, conditional on mortality rates. The reason that less than half of the gap would be closed is that mortality rates are higher in the Atlantic provinces. This suggests more than half of the gap in employment rates in the Atlantic provinces at these ages reflect differences in underlying health, leaving only 42 percent to be explained by policy or other factors.
The final bar in Figure 7 repeats the analysis with a comparison to males from the United States in the 2000s, finding that Ontarians would need to work 2.39 more years between ages 55 to 69 to match American male work effort, given mortality risk. The actual gap in work between ages 55 and 69 is only 0.74 years, so the better health of Ontarians compared to Americans over these ages would allow the Ontarians to out-work Americans, if they worked as much as Americans conditional on mortality risk.

These comparisons in Figure 7 reveal several interesting features of the employment-mortality relationship in Canada. First, the differences through time are much larger than the differences in Canada across regions. Second, females—even when excluding those who have never worked—work substantially less per unit of mortality risk than do males. Third, health is a strong determinant of the variation in employment rates observed across regions in Canada. Finally, older American males work more than older Canadian males in spite of having worse health as measured by mortality risk.

Overall, the employment-mortality analysis in this section has yielded three important insights. First, through time there have been substantial drops in employment rates when holding mortality risk constant. Taking mortality risk as a proxy for health, this suggests a substantial increase in the health capacity to work at older ages compared to the 1970s. But, most of this increase in capacity happened

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16 U.S. employment rates are constructed from the Current Population Survey (March Supplements) and the Human Mortality Database (2015).
up to the mid-1990s. While employment and mortality trends worked against each other in the period up to the mid-1990s, the period since the mid-1990s has shown remarkable stability in the employment-mortality relationship as employment rates rose to match the improvements in mortality rates. Finally, comparing across different groups reveals that health differences across regions are important determinants of regional differences in employment rates.

5. Conclusion and Policy Implications

In this study we have explored the relationship between older Canadians’ labour market activity and their health, in an effort to gauge the health capacity to work among older men and women in recent years. We approached the problem by examining the relationship between employment rates and mortality risk. We considered how this has changed over time and differs across sex and regions.

We find evidence that suggests a substantial health capacity to work among older men and women in Canada. Our results suggest that if men’s 1976 relationship between employment and mortality still held in 2012, men’s employment rates would be higher in 2012, implying a 65 percent increase in the years of work between the ages of 55 and 69. Regionally, health differences appear to be a substantial driver of observed employment differences for older men across provinces in Canada. Taking Ontario and the Atlantic provinces as an example, more
than half of the employment gap is accounted for by differences in health as measured by mortality risk.

For women, our estimates suggest historical increases in employment at older ages (conditional on reporting some employment after age 45) have not kept pace with the mortality improvements. Our assessment of changes in the employment-mortality relationship since 1976 suggest women in 2012 could work 2 more years between the ages of 55 and 69, a 28 percent increase on the status quo.

It is important to emphasize the limits of our study. Unfortunately, we are unable to observe individuals’ true ability to work at older ages. To the extent that improvements in mortality do not represent improvements in morbidity at older ages, this leads us to overstate capacity for work. Moreover, we do not incorporate the diversity of health experiences at older ages into our analysis. Many elderly individuals face activity limitations that prevent them from working, for example. More generally, there may be heterogeneity in the growth of work capacity across education or lifetime-income groups. We do not have the data to address this important element here, which limits us to the aggregate analysis we present. Still, this aggregate analysis is useful for examining aggregate labour market and pension trends.

Our work has implications for long-run pension policy and older-worker labour market policy in Canada. Discussions in these areas should accommodate the
possibility, reinforced with our evidence here, that the bounty of longer lifespans brings with it some capacity to work longer. There are a number of policy approaches that could engage this capacity. Below we close the paper with a discussion of three.

First, eligibility ages for public pension programs could be adjusted. For example, in 2012 the Government of Canada announced the age of eligibility for Old Age Security would move to 67 from the current 65, starting in 2023. However, that change was cancelled in 2016 before it was put into action. Moving the age of eligibility would certainly have an impact on work at older ages and lower the public pension cost for governments. Indeed, most other OECD countries have now advanced the age of eligibility for their pension programs. On the other hand, the possibility of higher poverty for those unable to work should not be dismissed.\footnote{Milligan (2015) finds that about one quarter of Canadians not working at ages 55-64 are at risk of falling into low-income. Schirle (2013) documents the importance of public pensions in avoiding poverty for seniors.}

A second policy area that could help facilitate more work is the actuarial adjustments for public pensions. When workers receive a bigger pension in return for delaying retirement, they effectively receive a bonus for working longer, should they survive. These actuarial adjustments can have an impact on retirement decisions, as shown through simulations in Laurin, Milligan, and Schirle (2012). Actuarial adjustments for the Canada Pension Plan were adjusted between 2011 and 2016, and an option to defer Old Age Security was introduced in 2013. If there were
a desire to provide incentives to continue work, these actuarial adjustments could be made more generous—even beyond the point of actuarial fairness. The induced work could make up the extra fiscal cost through higher tax revenue on employment income.\\(^{18}\)

Third, broader liberalizations of employment and pension rules could allow more flexibility for those who wish to work longer. As one example, Milligan and Schirle (2008) show there is a strong preference for part-time work among near-retirees. Also, in some circumstances receiving a pension while still working can be difficult under existing workplace rules (Milligan and Schirle 2008). In these areas and others, greater flexibility around work at older ages could help facilitate longer working lives.

These are just three examples of policy areas that might be reconsidered in light of the health capacity for further work among Canadians. As with any policy question, there are difficult trade-offs to be taken into consideration. But, the evidence in this paper suggests that all policy discussions of pensions, work, and retirement should take place in the context of the possibility of longer working lives.

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\\(^{18}\) See Baker, Gruber, and Milligan (2007) for a simulation analysis of the fiscal benefit of providing incentives to extend work lives.
References


Canadian Human Mortality Database. (2015). Department of Demography, Université de Montréal (Canada). Available at www.demo.umontreal.ca/chmd/


Figure 1: Death rates and other health indicators
Notes: Shown are means by year-sex-5-year age group cells for several self-assessed health measures against period death rates. Sources are: Canadian Community Health Survey, General Social Survey, Canadian Human Mortality Database and Statistics Canada (2016).
Figure 2. Employment rate by age group, 1976-2015
Source: Authors’ tabulations using the Labour Force Survey.
Figure 3. Mortality by age and sex select years.
Source: Tabulations by authors using Canadian Human Mortality Database and Statistics Canada (2016).
Figure 4: Mortality and Employment
Notes: Sources are Canadian Human Mortality Database and Labour Force Survey
Figure 5: Mortality and Hours
Notes: Sources are Canadian Human Mortality Database and Labour Force Survey
Figure 6. Counterfactual work compared to 2012
Notes: Authors’ tabulations using Canadian Human Mortality Database, Statistics Canada (2016) life tables, and Labour Force Survey. For each year we calculate how many years of work would result if those in 2012 worked the same amount as those in the year shown, at each level of mortality risk. This is calculated as the sum across ages 55-69 in the difference between the lines in graphs like Figure 4. More detail on the calculation is provided in the text.
Figure 7. Potential years of extra work for Ontario males in 2000s
Notes: Authors’ tabulations using Statistics Canada (2016) life tables and Labour Force Survey. For each bar we calculate how many extra years of work would be needed by Ontario males in the 2000s if they worked the same at each level of mortality as the indicated group. This is calculated as the sum across ages 55-69 in the difference between employment-mortality lines in graphs like Figure 4. More detail on the calculation is provided in the text.
### Table 1: Mortality and Self-Assessed Measures of Health

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<tr>
<td>Standard deviation</td>
<td>(0.047)</td>
<td>(0.055)</td>
<td>(0.058)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Raw Correlation</td>
<td>0.877</td>
<td>0.644</td>
<td>0.945</td>
<td>0.480</td>
</tr>
<tr>
<td>Regression Coefficient</td>
<td>1.257***</td>
<td>0.256**</td>
<td>0.374</td>
<td>-0.445***</td>
</tr>
</tbody>
</table>

Notes: The analysis uses cells of five-year age groups between 45-49 and 70-74, separately by sex and year. Each column shows the results for a different variable that is compared to death rates. The raw correlation shows the correlation of the indicated variable with the log death rate. We also report the regression coefficient for the indicated variable from a regression of the log death rate on the indicated variable, and a set of dummies for years, age groups, and gender.
Table 2: Mortality and Employment Rates, 2012 and Comparable Employment Rates 1976, by Age

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>55</td>
<td>0.0051</td>
<td>0.791</td>
<td>0.905</td>
<td>0.114</td>
<td>0.0033</td>
<td>0.791</td>
<td>0.774</td>
<td>-0.017</td>
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<tr>
<td>56</td>
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<td>0.770</td>
<td>0.905</td>
<td>0.135</td>
<td>0.0037</td>
<td>0.768</td>
<td>0.759</td>
<td>-0.008</td>
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<td>0.743</td>
<td>0.908</td>
<td>0.164</td>
<td>0.0039</td>
<td>0.736</td>
<td>0.734</td>
<td>-0.002</td>
</tr>
<tr>
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<td>0.890</td>
<td>0.186</td>
<td>0.0043</td>
<td>0.698</td>
<td>0.675</td>
<td>-0.024</td>
</tr>
<tr>
<td>59</td>
<td>0.0071</td>
<td>0.672</td>
<td>0.885</td>
<td>0.213</td>
<td>0.0043</td>
<td>0.654</td>
<td>0.672</td>
<td>0.018</td>
</tr>
<tr>
<td>60</td>
<td>0.0079</td>
<td>0.600</td>
<td>0.892</td>
<td>0.292</td>
<td>0.0049</td>
<td>0.584</td>
<td>0.641</td>
<td>0.057</td>
</tr>
<tr>
<td>61</td>
<td>0.0081</td>
<td>0.572</td>
<td>0.890</td>
<td>0.318</td>
<td>0.0053</td>
<td>0.530</td>
<td>0.630</td>
<td>0.100</td>
</tr>
<tr>
<td>62</td>
<td>0.0090</td>
<td>0.525</td>
<td>0.863</td>
<td>0.338</td>
<td>0.0059</td>
<td>0.473</td>
<td>0.626</td>
<td>0.153</td>
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<tr>
<td>63</td>
<td>0.0101</td>
<td>0.509</td>
<td>0.859</td>
<td>0.349</td>
<td>0.0061</td>
<td>0.463</td>
<td>0.622</td>
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<tr>
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<td>0.858</td>
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<td>0.394</td>
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<td>0.288</td>
<td>0.567</td>
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<tr>
<td>66</td>
<td>0.0125</td>
<td>0.316</td>
<td>0.836</td>
<td>0.521</td>
<td>0.0078</td>
<td>0.231</td>
<td>0.567</td>
<td>0.336</td>
</tr>
<tr>
<td>67</td>
<td>0.0141</td>
<td>0.247</td>
<td>0.804</td>
<td>0.557</td>
<td>0.0091</td>
<td>0.213</td>
<td>0.464</td>
<td>0.251</td>
</tr>
<tr>
<td>68</td>
<td>0.0157</td>
<td>0.251</td>
<td>0.781</td>
<td>0.530</td>
<td>0.0103</td>
<td>0.171</td>
<td>0.437</td>
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<tr>
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<td>0.232</td>
<td>0.727</td>
<td>0.495</td>
<td>0.0114</td>
<td>0.155</td>
<td>0.401</td>
<td>0.246</td>
</tr>
<tr>
<td>Total</td>
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<td></td>
<td>5.082</td>
<td></td>
<td>7.149</td>
<td></td>
<td>2.004</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Shown is the data corresponding to Figure 3. For each employment-mortality pair at a given age in 2012, the corresponding (comparable) employment rate in 1976 is found by going up to the 1976 line and recording the employment rate at that mortality rate level.