What if Mortality Was to Diminish Much More than Was Forecast? Implications for Financing Social Security

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The changing age structure in industrialized countries is raising concern among policy-makers over the funding of social security programs, especially pensions and health care. The aging of the population, that is, the increased percentage of the elderly, appears at first glance to be the determining factor in the growth of costs. In Canada the most recent population forecasts suggest that the proportion of people aged 65 and over will reach 25.2 percent by 2051. In addition to these changes in the population age structure, governments are worried about increased public spending on health care. For example, in the United States the cost of the two major health-care plans, Medicare and Medicaid, topped $376 billion in 2001—over 13 percent of the GDP. In Canada health care accounted for 9.6 percent of the GDP in 2001—a growth of over 35 percent for the period 1980–2001 (Canadian Institute for Health Information 2003).

The age effect is evident when comparing various components of per capita public spending. For example, in 1998 public per capita spending on social security in Quebec represented less than CAN$3,000 for people under age 55 (excluding education) and then rose sharply to over CAN$25,000 for people aged 85 and over. In the latter group, health-care and social services costs represented 64.3 percent of total public spending on social security, compared with 25.3 percent for the 65–69 age group (Figure 1). So in 1998 health-care and social services costs in Quebec represented 28.1 percent of total spending on social security. Public per capita spending per age is not available for Canada, but we reasonably can assume that the age pattern for Canada is similar to the Quebec one.

<FIGURE 1 ABOUT HERE>

Given this context, it is important to examine the consequences of changes in cohort size and lower mortality when financing social security with pay-as-you-go (PAYG) systems, a managing mode favored by many governments. Population aging will accelerate in the near future, resulting in a heavier burden on the working population, which has to foot the bill. Accordingly, the implementation of complementary funded plans would appear necessary to lighten the load on future birth cohorts that are proportionally less numerous. With this in mind, the reforms made in the area of pensions could be used by policy-makers as a model for health care in its broadest sense.

Our study focuses on the situation in Canada. First, we will discuss the various factors behind rising health-care costs resulting from two unchallenged phenomena: variation in cohort size and lower mortality in the elderly. Second, we will examine the amplifying effects of a much lower than the officially forecast mortality on PAYG systems.

Some Considerations on Health-Care Costs for the Elderly

Numerous studies have tried to characterize the relationship between age and levels of health-care spending. Accordingly, if we separate out the main components of health-care spending, namely, medical, hospital, and pharmaceutical services (often called the health-care sector) and the home-care and long-term-care sector (often called the social services sector), we see a major difference in the age-spending issue. Many studies have shown there is a leveling off or decline in costs related to health-care services for the elderly (Demers 1998; McGrail et al. 2000), whereas spending on home care and long-term care increases steadily with age; this is particularly true in Quebec. For example, in 1999–2000 the growth in health-care and social services spending in Quebec as people get older was essentially due to the rising cost of home care and long-term care beyond age 70 (Figure 2). For Canada in 2001, the age-spending pattern per category for health is quite similar to Quebec (Figure 3).[1] Therefore, even if we do not have the data for social services, we can suppose that the cost of long-term care per age in Canada in 2001 is also rising as people get older.

<FIGURES 2 & 3 ABOUT HERE>

Medical and hospital spending on elderly patients has been widely studied, with particular attention being given to the costs incurred at the very end of life. Lubitz and Prihoda (1984) showed that in 1978, 27.9 percent of spending in the Medicare program—which covers the major portion of hospital and medical costs for the elderly in the United States—was attributable to a very small number of recipients: the 5.9 percent of the people who died during the year. Similarly, McCall (1984) showed that those in the 65 and over age group who die during a year incur costs 6.4 times higher than do survivors. Many authors have confirmed these results, demonstrating that health-care spending at the end of life is more a function of proximity to death than of age (Roos and Roos 1987; Zweifel et al. 1999; McGrail et al. 2000; O'Neill et al. 2000).

According to a conclusion by Zweifel et al. (1999), it is the number of deaths, not the increase in the number of elderly people, that determines the major portion of health-care costs. As we have seen, numerous studies have discussed the increase of per capita health-care costs as a function of age, whereas this phenomenon actually stems from the fact that more elderly people are in their last year of life.

Figure 4 shows the distribution of per capita health-care costs in the last year of life for people who died after age 65. Three samples from retrospective studies, two Swiss and one American, yielded similar trends: costs clearly increased in the final three months of life. Thus, some 60 percent of health-care spending by Medicare on Americans who died at age 65 and over

was incurred in the final three months of life. For the two Swiss samples, this figure was 49 and 42 percent.

<FIGURE 4 ABOUT HERE>

Moreover, Zweifel et al. (1999) decry what they call the *fallacy of composition* of studies on health care for the elderly: that the increase in health-care costs as a function of age stems from the fact that, later in life, there are more people in their last year of life than there are at an earlier age, given that the probability of dying increases with age.

The relationship between age, intensity of care, and type of care—hospital and home care or long-term care—has also been examined. The goal was to determine whether an inordinate portion of resources is allocated to people whose death is imminent. Accordingly, when both types of care are taken into account, the overall costs increase with age (Roos and Roos 1987; Scytovsky 1984; Rochon 1997) or remain basically the same when a period of more than one year prior to death is considered (Temkin-Greener et al. 1992). From this it has been deduced that the increase in costs goes hand in hand with an increase in the number of deaths. Last, studies that examined only the relationship between hospital care and age concluded that older age groups are not so much more expensive and often less expensive than younger ones (Scytovsky 1988; Lubitz and Riley 1993; Demers 1998; Felder et al. 2000; Hogan et al. 2000). This supports the hypothesis that physicians are less inclined to expend great effort on individuals perceived as having attained a fairly advanced age (Lubitz and Riley 1993; Felder et al. 2000).

We see, therefore, that the issue of health-care costs in a context of population aging is extremely complex. We know that the postwar birth cohorts will soon be reaching old age, and that they will live to increasingly advanced ages. What will be the respective effect of these two factors on the funding of health-care and social services spending?

The Effect of Cohort Size on Rising Health-Care Costs

With the arrival of large cohorts of baby boomers at ages at which they will need increasing hospital and medical care, as well as long-term care and home care, it is clear that, all things being equal, medical and hospital costs inevitably will spiral in the medium and long term, and the PAYG system will no longer be able to meet demand, since succeeding cohorts will not be up to the task. In effect, the population of 20- to 64-year-olds, who will be responsible for providing a large proportion of social security funding, is expected to increase up to 2011 in Canada, when the first baby boomers reach the age at which they will be eligible for public retirement programs. At that time

it should peak at around 63.1 percent of the total population, but then decline steadily until 2051 to represent 54.8 percent of the total population, based on the forecasts of the medium mortality assumption, which is similar to the Statistics Canada mortality forecasts.[2] Accordingly, when we take into account the evolution of the 20–64 age group, as presented in Figure 5, the demographic dependency ratio of the 65 and over age group to the working age population (the 20–64 age group) in Canada could reach 0.5 (or one elderly person for every two people of working age) by 2051.

<FIGURE 5 ABOUT HERE>

The Effect of Lower Mortality on Slowing Down the Rise of Health-Care Costs

Numerous studies have associated lower mortality beyond age 50 with a possible reduction in health-care costs because interventions at the end of life are more costly in the younger age groups (age 50–65)[3] since they are often related to the use of advanced technology at the approach of death. In fact, it was this formalized and medicalized approach to death, much more than the aging of the population, that led to the explosion in health-care costs observed at the end of the last century (Barer et al. 1995).

The three months preceding death are the period at which per capita medical and hospital costs are highest, thereby increasing spending on these services as a function of age. This stems from the fact that there are more people in their final years of life at age 75 than at age 50, and that the majority of deaths now occur and will occur above age 65 and even age 80. In 2001 in Canada, for example, as a proportion of the total, deaths at age 65 and over and at age 80 and over were 77.8 and 43.7 percent, respectively. According to the medium mortality assumption, in 50 years' time, these figures will reach 89.9 and 65.3 percent. The expected future reduction in the number of deaths in people under age 70 could lead to a reduction in health-care costs, provided that the higher number of deaths beyond age 70 due to the size of the aging cohorts does not cancel out these expected reductions in medical and hospital costs. However, the expected number of deaths at age 65 and over for a given year increases much more slowly than the number of elderly people for the same year (Figure 6) and is a more appropriate indicator for the projected cost of health-care services than is the number of elderly people for the said year. Accordingly, the proportion of people likely to die at an advanced age will enable us to better determine the health-care costs they will incur at the time of their death.

<FIGURE 6 ABOUT HERE>

We must, however, anticipate an increase in overall health-care and social services costs in the coming years, due in large part to home-care and long-term-care services, which will themselves increase steadily as the baby boomers reach advanced ages. However, the increase in health-care costs should be significantly lower than the increase due strictly to the increase in the number of elderly people and general population aging.

Pension Plan Funding: A Model for Keeping Social Gains in Terms of Health?

Pensions represent a unique type of spending, since the benefits paid to the elderly do not generally increase as a function of age. However, this spending sector is highly sensitive to cohort size and an increase in longevity (Gauthier 2004; Blanchet 2002). It is very simple to illustrate this phenomenon. In 1959, at the peak of the baby boom, there were 479,275 births in Canada; then, because of lower fertility, this number fell to just 333,744 in 2001 even though the population of women of child-bearing age was much larger. When the first generations of baby boomers retire, the succeeding cohorts stemming from a period of lower fertility will be unable to support the costs of the plan, unless certain forms of funded pension plans have been introduced. Furthermore, as people are living much longer thanks to progress in lowering mortality at more advanced ages, this increase in life expectancy leads to much larger state transfers, given that the phenomenon results in a much longer period of eligibility for pension plan benefits.

It is useful to briefly examine how the income security system works for retirees in Canada. The system is based on *the four pillars* of income model (Association Internationale pour l'Étude de l'Économie de l'Assurance 1996). The public old-age pension system is run jointly by the federal government (Canada Pension Plan) and the provincial government (Régie des Rentes du Québec), both on a PAYG system. Individuals' pensions are bolstered by income from registered retirement savings plans,[4] income from employers' pension plans, savings, and income the elderly draw eventually from continuing to work. This plan, therefore, is based in large part on a funded system, which reduces the burden that population aging imposes on PAYG systems. This therefore is complementary to the PAYG system and attenuates the Bismarckian approach of risk mutualization, with an aim of achieving intergenerational balance, especially when the burden appears heavier for the smaller generations following the baby boom.

But, as suggested by Chen (1996), the proportion of each of these income sources in the total income of elderly people has varied with time. For example, in the United States in 1994, the largest portion came from the public Social Security system, in this

case 42 percent. However, the proportion of pensions derived from the public sector in the income of the elderly is much larger in some Western European countries, while aging in these counties is generally more marked than in North America. These countries already dedicate a large portion of their GDP to retirees and will have to dedicate an even larger amount in the future.[5]

The evidence suggests that age structure changes have major implications on the cost of pensions to be assumed by public administrations. With respect to the calculation of pensions to be paid to the elderly, these are made on the basis of various hypotheses on future demographic changes (fertility, migration, and, of course, mortality). An overestimation of future fertility or an underestimation of the change in mortality at advanced ages can lead to significant errors. In this respect the Canada Pension Plan, which increased contributions from 6.0 percent in 1997 to 9.9 percent in 2003, assumed that the total fertility rate would rise to 1.64 children per woman by 2007 (Office of the Chief Actuary 2000). Some authors decry these government actuarial practices and criticize demographers who are often too optimistic as to fertility rates in the coming years.[6]

Even though imperfect, a funded pension plan system that enables each cohort to accumulate in a reserve a good portion of its income for the retirement years is clearly more likely to leave room to maneuver for future administrators of the social security system than solely a PAYG system.

Given the explosion in health-care and social services costs, both current and anticipated, is it not time for Canadian authorities and others to consider a similar solution for health care, namely, the implementation of a complementary system based on a funded plan? As with pension management, this diversity would ensure more intergenerational fairness in the funding of social programs.

Social Security Systems Confronted with a Much Lower Mortality: A Bold Scenario for the Future

Imagine now a situation where mortality might be substantially lower than the level expected by official organizations. What would be the implications of such an increase in longevity on PAYG pension plans, but especially for health care and social services? The second part of this paper takes up the challenge of imagining a world where not only survival at age 65 would be quasi-universal, but also survival at age 85 would be the norm.

The data used here to present this bold scenario of a much lower mortality are the 2000 life-table death rates of Canada provided by the Canadian Human Mortality Database. To simulate lower mortality, we have artificially accentuated the drop in mortality by doubling the rhythm of the decrease in the life-table death rates forecast by the medium mortality assumption, which is similar to the medium scenario of Statistics Canada, from one year to the next, at each age, and for each sex. This will not only accentuate aging but also reduce the number of annual deaths of people aged 65 and over for the period in question.

The Implications of Lower Mortality on Pension Expenditures

Changes in mortality, as well as the changes in fertility, lead to consequences of an unexpected magnitude for public pension plans. Since the increase in life expectancy occurs more at advanced ages, and the effective retirement age has not changed at the same rate as the projected life expectancy in the cohorts, the period of eligibility of individuals in the plan tends to increase.[7] This observation stems from the fact that in industrialized countries, except in Sweden,[8] administrative, institutional, and societal rigidities have prevented a rise in retirement age parallel to the rise in individual life expectancy (with or without disability).

Accordingly, mortality assumptions used for projecting the future costs of pension plans appear somewhat conservative, given past trends in life expectancy and in the reduction of mortality. For example, the CPP predicts life expectancy in 2050 at age 65 to be 19.1 years for men and 22.1 years for women (Office of the Chief Actuary 2000). Conversely, according to the medium mortality forecasts, life expectancy at age 65 for the same year are 21.5 and 23.6 years, respectively. However, when we consider our lower mortality simulation, life expectancy at age 65 in 2050 becomes 26.9 years for men and 27.1 years for women—a situation that would cause serious problems for the public funding of retirement programs.

Improvements in longevity are likely to significantly increase the burden of pension benefits, especially those provided by the PAYG system. Based on a lower mortality, people aged 65 and older could represent 27.0 percent of the population in 2051, compared with only 23.7 percent in 2050 based on CPP estimates.

Furthermore, should mortality drop more significantly than expected, the demographic dependency ratio of the 65 and over age group to the 15–64 age group could be more significant and cause funding problems for the entire social security system, all things being equal. In effect, the simulation of lower mortality shows the population of people aged 65 and over increasing 2.7-fold between 2001 and 2051,

whereas the population of people aged 15–64 would benefit only marginally from such a decline in mortality, it already being very low at these ages (Figure 7).

<FIGURE 7 ABOUT HERE >

The Implications of Lower Mortality on Health Care and Social Services

A more significant than expected increase in longevity could have much greater than expected consequences in the areas of health care and social services. It could lead to higher morbidity, a tendency toward comorbidity, and a greater chronicity of pathologies. Such an escalation of costs is even more likely, since inflation in medical technology costs and extensive use of technology could lead to funding problems of unparalleled scale in health-care systems. The essential condition for curbing this trend is to stop funding the health-care sector solely on a PAYG basis. In summary, the major portion of future health-care costs will be determined by the incidence of morbidity and prevention efforts in the area of chronic disease. However, cohort phenomena, such as better education, healthier lifestyles, and a higher standard of living, could somewhat slow the trend toward inflated health-care costs.

a. Health-Care Services Expenditures

With the fine-tuning of studies on the subject of health-care costs at the end of life, policy-makers are more able to make informed choices. The implication of mortality declining at a faster rate than expected would be the following: increased aging, but a lower number of annual deaths of 65 and over in the simulation than is obtained with the forecasts of the medium mortality assumption (Figure 8). In fact, a lower number of deaths of people aged 65 and over each year in the medium term could slow the rate of expected health-care spending. The number of annual deaths of people aged 65 and over increases 2.3-fold between 2001 and 2051 based on the medium mortality assumption compared with 2.0 for an assumption of lower mortality. However, this assumption causes an accentuation of population aging, since it delays the death of its members. The number of elderly people increases 2.5-fold over the period 2001–2051 according to the estimates of the medium mortality assumption, compared with 2.8-fold for the assumption of lower mortality. Such a lowering of mortality could appear as good news for health-care-services costs for the reasons given earlier. However, although it may alleviate the situation in the medium term, let us not forget that costs related to death are simply put off to a later date.

<FIGURE 8 ABOUT HERE>

b. Social Services Expenditures

In such a context, social services costs would rise sharply following an increase in aging, unless there is a net reduction in disability among the elderly.

This sector is, in fact, very sensitive to a decline in mortality, given that associated spending increases with age: The very old are then at a time in life when the use of this type of service is at its most intensive. After age 75, home care and long-term-care services gradually become the most significant item of expenditure. Conversely, spending on medical services and medications tends to stabilize within the very old, and the same could also be true of hospital services, at least up to age 75.[9] The effects of a changing age structure for retirement as shown above also apply to home care and long-term-care services.

Spending on home care and long-term care inevitably poses a challenge to public administrations. Can the PAYG system actually support the onset of large baby-boom cohorts at an age where a great many of them will require these services? It is legitimate to question whether the informal support networks of these individuals in the future, in particular the family, will suffice to prevent an overly extensive use of formal services in a context of very low fertility (Carrière et al. 2003). Also, is it not likely that the growing instability of couples will increase recourse to institutionalization, given that the presence of a spouse or partner is a primary factor in keeping people at home (Trottier et al. 2000)?

Being closely related to functional status, which alters with advancing age, the use of social services could also intensify with an increase in longevity. Accordingly, changes in morbidity and life expectancy without disability versus life expectancy for all health statuses take on major importance,[10] since disability determines the use of these services.

Conclusion: The Unavoidable Complement to the PAYG System—The Health Fund

Out of concern for intergenerational fairness, we believe, as demographers, that public administrations must rapidly set up measures designed to create health funds. For Canada this would involve setting up a plan similar to that implemented for pensions so as to ensure a fair distribution of costs related to the health-care sector. Such a plan could, as for retirement, be based on several pillars and comprise public- and private-sector components, while retaining its universality, the cornerstone of the Canadian health-care system.

The goal of this presentation is clearly not to criticize the PAYG system for health care, but rather to provide strong arguments in favor of adding a funded health-care plan that would be fairer for future generations. The PAYG funding of health care is inherited from a period in time where each cohort was larger than its predecessor; it is now outmoded in a world where demographic dynamics are quite different. The phenomenon of imbalance between succeeding cohorts in terms of aging and increased longevity, together with the use of costly technologies at the end of life, could seriously impede our ability to fund public pension plans and the health-care and social services sectors. Therefore, this analysis is meant to be far more than simply a simulation exercise—it is intended as a modest tool for public policy-makers so that they can make informed decisions. Implementing a health fund that keeps social gains and ensures intergenerational fairness is becoming one of the most pressing issues for today's policy-makers in industrialized societies.

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[1]Results concerning public expenditure by age group as presented in Figures 2 and 3 are estimations based on assumptions specified by the authors of these studies.

[2]Population projections based on the medium mortality assumption and produced using DEMPROJ software are very close to Statistics Canada projections under their medium scenario. According to our medium mortality assumption, 2000 life-table death rates were decreased by 1.11 percent per year and age for males and by 0.79 percent for female.

[3]This is confirmed by many studies on health-care costs at the end of life; the probability of making costly interventions to keep a person alive is inversely proportional to the person's age beyond about age 65. See Demers (1998), Scitovsky (1988), and Roos and Roos (1987).

[4] RRSP is a tax credit program offered by financial institutions with the support of the federal and Quebec governments to promote savings for retirement in capitalization funds. The amounts set aside (capped at a fixed amount) are tax-free at the time of deposit, as is the interest they generate.

[5] For example, if the trends continue, *ceteris paribus*, France, which spent 12.1 percent of its GDP on retirement pensions in 2000, anticipates that this figure will rise to 15.9 percent by 2040. Similarly, the figures for Germany are 11.8 and 16.8 percent for 2000 and 2050, respectively; for Belgium, 8.8 percent for 2000 and 14.1 percent for 2050.

Conversely, the figures are 5.1 and 10.9 percent for Canada, and 4.4 and 6.2 percent for the Unites States. See OECD (2001), p. 26.

[6] "Actuaries were rather puzzled when they had to apply the very conservative hypotheses they used for future mortality to pension schemes! If you estimate too early an age at death for older persons, insufficient funds will be available to pay pensions! The same applies to demographers who were still projecting a quick return to replacement level fertility, irrespective of the fact that cohort fertility behaviour was changing completely, and was always on the decline" (Légaré 1999, p. 3).

[7] Many industrialized nations have adopted legislation aimed at delaying the age for drawing a pension. The increase in retirement age is a convenient way for public administrations to save money; accordingly, the retirement age in the United States will rise from 65 to 67 by 2022. In the United Kingdom the retirement age for women will gradually rise from 60 to 65 between 2010 and 2020. In Japan the retirement age will rise from 60 to 65 between 2001 and 2013 for men, and between 2006 and 2018 for women. Also, many other measures have been implemented to ensure future public funding for retirement: pension indexation of net revenue, incentives for workers to stay in the labor market after the official retirement age and penalties for retiring too early, extending the qualifying period to receive full benefits, increased contributions, incentives for individual retirement savings, incentives for a greater distribution of private pension funds, etc. On this topic, see OECD (2001), pp. 35–37.

[8] See Blanchet (2002).

[9] Scitovsky (1988, p. 649) is very clear on this issue: "By contrast, those aged 80 years and over, constituting 43% of all decedents, accounted for only 28% of all hospital expenses and 23% of all physician expenses; they were responsible, however, for almost ¾ of total nursing home and home healthcare expenditures." Spillman and Lubitz (2000, p. 1409) also address this situation: "Increases in longevity after the age of 65 years may result in greater spending for long-term care."

[10] The work of the International Network on Health Expectancy (REVES), which brings together numerous researchers in the field of aging, suggests that life expectancy without disability does not increase as quickly as life expectancy. Accordingly, Légaré (2001, p. 115) addressed this issue: "The experience of the last 30 years in industrialized countries (Canada and many UN/ECE countries, Japan, Australia and New Zealand) supports the first scenario . . . : disability-free life expectancy has stagnated, if not worsened, while life expectancy has improved greatly, a situation which reflects the worst scenario, namely pandemic disabilities. However, if only severe disabilities are taken into account . . . , both indices improve."