

SOCIAL SECURITY: REGRESSIVE OR PROGRESSIVE?

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ABSTRACT

There is growing evidence of a positive correlation between income levels and longevity. In short, high-income earners live longer. That also means that high-income earners get larger retirement-income security benefits from social security.

This correlation raises a number of questions: if social security contributions are a level percentage of earnings, and high-income earners live longer and receive larger social security benefits, then is social security regressive?

If higher-income actually **causes** enhanced longevity, then would providing more social security benefits enhance population life expectancy?

This paper analyzes both the OASDI system of the United States and the Canada/Quebec Pension Plans in Canada to see if these systems are 'a good deal' and whether they are regressive or progressive as defined above.

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I Introduction

It is becoming generally accepted that there is a correlation between income and life expectancy, that is, those with high incomes live longer. Studies that provide evidence of this are many and include: Kitagawa and Hauser (1973), Rosen and Taubman (1979), Caldwell and Diamond (1979), Hadley and Osei (1982), Duleep (1986), Rogers (1992), Sorlie et al. (1992), Wilkinson (1992), Feinstein (1993), and Menchik (1993). Research using Canadian data include Wilkins et al (1990), Wolfson et al (1990), and Adam (1995).

Recent research has found evidence of a widening gap in the life expectancy of high and low income persons (Duleep, 1989, and Pappas et al, 1993). The effect of income appears to be stronger than many other variables that can have an impact on mortality such as race and education level. Rogers (1992) and Menchik (1993) found that the effect of race on life expectancy was virtually eliminated when family income was accounted for. In addition, Menchik (1993) found no separate effect of education on life expectancy once income was taken into account.

The fact that income and life expectancy are positively correlated is important in the study of the social progressiveness of social security. If social security systems required contributions that were a flat percentage of earnings, and benefits were also a flat percentage of those earnings, then, given that higher income workers live longer, the resulting system would be regressive in that the ratio of lifetime contributions to lifetime benefits would be higher for low-income workers than for high-income workers (or

equivalently, the ratio of lifetime benefits to lifetime contributions would be lower for lower-income workers).

This paper looks at the existing income security systems in Canada (in particular the Canada/Quebec Pension Plans, or C/QPP) and the United States (Old Age, Survivors, and Disability Insurance, or OASDI---OASI if Disability Income is ignored) to see if they are regressive as defined above. This is done in the second section of the paper that follows: "Is Social Security Regressive?".

What if income had a causal effect on life expectancy (more income caused more life expectancy)? Would the provision of more retirement income from the social security system enhance the life expectancy of our retired population? If so, then perhaps it would be good public policy to expand our social security programs to achieve enhanced population life expectancy. This will be explored and analyzed in the third part of the paper entitled: "Would more income cause enhanced life expectancy?".

The paper starts with a short discussion of whether or not social security is a good deal.

The three sections of the paper, while all dealing in some way with the progressivity and regressivity of social security, are really independent papers. That is, the sections of the paper are not interdependent. The paper can be read and used as three distinct and disjoint sub-sections.

II Social Security: Do you get your money's worth?

With the discussion of more personal responsibility for the provision of retirement income security in both Canada and the United States, some commentators suggest that workers could do better by placing their money into private pension plans or other tax-preferred savings vehicles such as RRSPs in Canada or 401k plans in the United States. Sometimes these comparisons are incomplete in many important details.

First and foremost, social security is **not** designed to provide every participant a profit. It is designed to be a compromise between social adequacy (i.e. a floor of protection), and individual equity. Providing a floor of protection requires some cross subsidies within the system and is an important and intended part of the system. Those who appear to pay more, may also benefit, however. For example, by providing social security to all workers, and by providing larger benefits per dollar of contribution to low-income workers versus high-income workers, the system helps those who appear to pay more by lessening the cost of social welfare and public assistance programs which are paid for out of general tax revenues to which the wealthy generally pay more.

Second, a fair comparison between social security and a private pension plan must include the value of the ancillary benefits provided by social security. These include survivor benefits, orphans benefits, death benefits, and disability income benefits. For example, in the Canada Pension Plan, only 64 percent of the payments are for retirement income (OSFI, 1995, p8). This is often overlooked in comparing social security to a private pension scheme. In particular, defined contribution plans do not have ancillary benefits.

Third, social security benefits are indexed to the cost of living. Most private plan benefits are not, particularly defined contribution plans, which really can't be. Thus, any comparison should be adjusted for the impact of inflation.

Fourth, the rates of return advertised for private savings plans are often gross of administrative and sales expenses. Administrative expenses for social security are low (0.8 percent of cash flow for OASDI (Chen and Goss, 1997, p77), and 1.3 percent for the CPP (OSFI, 1995, p8). Comparisons should use rates of return net of expenses in any fair comparison.

Fifth, the risk associated with social security is low to non-existent. No matter how long one lives, and no matter what happens in the private marketplace, you can expect to receive your social security benefits. The risk associated with social security is that the legislation granting the benefits will be amended. This can happen if voters find reason to support such amendments. For example, the normal retirement age for OASDI will rise from 65 to 67 over the next 25 years, which is an effective reduction in benefits. Recent amendments to the C/QPP will reduce benefits on average by 9.3 percent. However, the worker, comparing social security to a private savings or a defined contribution pension plan, must factor in the risk of market fluctuations, and personal risks such as time-to-death before arriving at a fair comparison.

Several difficult questions arise in the analysis of whether social security is a good individual investment or not. For example, in determining the value of a worker's contributions to social security, should the matching employer contributions, that are a feature of both OASDI and the C/QPP, be included? Myers and Schobel (1992) and Goss (1995) do not include the employer contribution in the cost of social security in their analysis. They contend that the employer contribution cannot be attributed to any

particular worker and is there for everyone, just as general tax revenues would be pooled for the general benefit. Feldstein (1974) and Aaron (1982), on the other hand, argue that the employer contribution ends up being paid by workers in its entirety either through resultant lower wages or higher prices for the employers products and should be included. Outside of Myers and Schobel (1992) and Goss (1995), the studies referred to below include the employer contribution in the worker's 'cost' of social security.

Also, there are a variety of mathematical techniques that can be used to indicate whether or not social security is a good deal. The following methods have been used by more than one author:

- (1) determine the rate of return such that the present value of contributions are equal to the present value of benefits (present expected value);
- (2) determine the ratio of the present value of benefits to the present value of contributions (called the money's worth ratio);
- (3) determine the inverse of (2) which is called the tax-benefit ratio;
- (4) determine the length of time one must collect benefits to get your contributions back (with interest) (called the repayment time);
- (5) determine the net subsidy equal to the present value of benefits less the present value of contributions. This will show the dollar size of the profit or loss to the individual.

All of these techniques require the calculation of the actuarial value of contributions and benefits which, in turn, requires choosing a rate of interest (except for method (1)) and an estimate of the probability of receiving the benefits. This requires some assumptions on the part of the author, and can lead to differing results that can seem illogical at first glance.

For example, at a meeting of the Canadian Institute of Actuaries in November 1991, (see Proceedings, CIA, 1995, pp 238-271), the actuary of the QPP indicated that for future Canadian workers (born after 1980), the present value of their benefits would be less than the present value of their contributions. At the same time, the actuary of the CPP was claiming that no future Canadian worker would realize a rate of return less than 5.1 percent on their contributions. This equates to a net-of-inflation real rate of return of 1.6 percent since the calculation assumed an annual inflation rate of 3.5 percent (see also OSFI, 1995 p 101).

In effect, then, one actuary was predicting a net loss to future workers while the other was projecting continued positive returns. How can this happen? The answer is quite simple. In calculating the present value of contributions and benefits, the QPP actuary was using an assumption of a real rate of return of 2 percent, that is, higher than the rate of return promised in the projections of the CPP actuary (1.6 percent). Thus, taking all of the risks and costs into consideration, if one is happy with an after-inflation rate of return of less than 1.6 percent, then the CPP is a good deal as argued by the CPP actuary. However, if one expects to be able to earn more than 2 percent plus the rate of inflation, then social security is not a good deal, as demonstrated by the QPP actuary.

Because of the resultant ambiguity in the various methods of analysis, whenever possible, the rest of this section of the paper uses the internal rate of return as the key indicator of whether or not social security is a good deal.

One can also measure both *intragenerational* equity and *intergenerational* equity. In the former, the analysis attempts to compare the rates of return or ratios of benefits to costs of different subsets of today's participants. Thus, one might be interested in how men do compared to women, or low-income workers to high-income workers, for

example. In analyzing *intergenerational equity*, one is more interested in seeing if today's workers are doing as well as those of previous generations, and future generations. Thus, one is looking for year-of-birth equity.

A large number of papers and analyses have been published providing indications of whether social security is a good deal or not. For the United States, these include: Chen and Chu (1974), Burkhauser and Warlick (1981), Boskin et al (1987), Myers and Schobel (1992), Duggan et al (1993), Steuerle and Bakija (1994), Leimer (1995), Kollman (1995), Panis and Lillard (1996) and the OASDI Advisory Council (1997). For Canada, the main information available today comes from the C/QPP actuaries in their respective actuarial valuation reports (OSFI (1995), and Quebec (1995), and a recent C. D. Howe Institute report by Robson (1996).

There is a great deal of similarity in the findings of these various reports. With respect to *intergenerational equity*, all reports found that earlier cohorts (workers who retired in the early years of the system) have realized higher average rates of return. This is because the early retiring cohorts required only a small number of years of contributions to earn full benefits and paid small pay-as-you-go contributions, while today's workers require 40 years of higher (mature plan) contributions for full benefits. Leimer (1995, p12) indicates the following rates of return for OASI for various birth cohorts:

Table 1

**Rates of Return (net of inflation) under OASI
for Selected Birth Cohorts**

Birth Year	Rate of Return %
1876	36.5
1900	11.9
1925	4.8
1950	2.2
1975	1.9
2000	1.7

Source: Leimer, 1995, p12

Similar analysis in Canada indicated the following effective rates of return (gross of inflation) for the CPP:

Table 2

**Rates of Return under the CPP
for Selected Birth Cohorts**

Birth Year	Rate of Return % (gross of inflation)	Rate of Return % (net of inflation)
1911	31.1	27.6
1929	16.6	13.1
1948	9.0	5.5
1968	6.4	2.9
1988	5.2	1.7
2012	5.1	1.6

Source: OSFI 1995, p101

As indicated earlier, the projected future rate of inflation in the CPP valuation is 3.5 percent per annum. Thus, the net rate of return for future birth cohorts is 1.6 percent or almost exactly that indicated in the analysis of the OASI system.

Very little analysis has been done in Canada with respect to *intragenerational* equity except for some work on the effect of income on mortality which will be reviewed

in detail in the next section of the paper. However, much more has been published in the United States. Leimer (1995, p17) provides the following table based on work by Duggan, Gillingham and Greenlees (1993):

Table 3
Rates of Return (net of inflation) under OASI
for the 1895-1922 Birth Cohorts

Category	Rate of Return%
Household type:	
Individual	8.6
Couple	9.8
Gender	
Female	10.9
Male	8.5
Race	
White	9.1
Black	9.6
Other	10.7
All	9.1

Source: Leimer, 1995, p17

Many of these indications are not intuitively obvious, and require explanation.

Couples do better than individuals because of the significant survivor benefits available to the survivor of the worker after the worker's death. This also means that one-earner couples do better than two-earner couples. For the latter, the second wage earner contributes separately to the social security system, but only gains a marginal increase in benefits, namely the difference between individual benefits earned and the survivor benefits that would have been paid otherwise.

Women do better than men because they collect benefits for their longer life expectancy for the same contributions and they tend to have lower earnings. According to Leimer, blacks and 'others' do better than whites but purely because they tend to have lower incomes, and, as will be seen in the next section, lower income workers do better than higher income workers in both Canada and the United States.

Those with the lowest rates of return tend to be single male workers with average or high earnings and two-earner couples with high earnings (Chen and Goss, 1997 p84).

Rates of return actually realized by future generations will depend on future birth rates, and future life expectancies.

III Is Social Security Regressive?

It has been argued in the literature that because of the positive correlation between income and life expectancy, that our social security system is regressive (e.g. Friedman, 1972, Aaron, 1977 and Wolfson et al, 1990). Clearly if social security contributions are a constant percentage of wages across a wide range of earnings, and high-income workers live longer, then the income distribution inherent in social security is perverse in that all participants in social security pay into the system at a level rate, but those with high incomes receive lifetime benefits that are worth relatively more. Thus the question is: do high-income workers do better than low-income workers?

This matter will be explored in this section in some detail, first for Canada, and then for the United States. In the discussion that follows, regressiveness will be defined as a system in which low-income workers pay more per dollar of actual benefit than high-

income workers or where low-income workers realize a lower effective rate of return than high-income workers.

a) In Canada

C/QPP records provide a great deal of information relevant to this question. For every Canadian who has ever earned more than the Year's Basic Exemption (YBE or \$3500 in 1997), the C/QPP files contain a complete career earnings record for every year where earnings exceeded the YBE. Also, because one's retirement income ceases upon death, and because there is a C/QPP death benefit, the exact date of death of all C/QPP participants is available. The C/QPP annual retirement income is (approximately) equal to 25 percent of one's career earnings (indexed to the average industrial wage), up to the Year's Maximum Pensionable Earnings (the YMPE which is close to the average industrial wage and equal to \$35,800 in 1997) over the best 40 years of work. Plan participants also are allowed to omit qualified years of disability and years at home raising children from the 40-year requirement. Using the C/QPP records, one is able to compare age at death with the level of the retirement income being paid to determine if there is evidence of enhanced longevity with larger social security income.

The findings of one such study follow. Mortality is presented, by gender, for retirement income beneficiaries stratified into four groups: those receiving 0 to 25 percent of a full benefit, those receiving 25 to 50 percent of a full benefit, those receiving 50 to 75 percent of a full benefit, and those receiving 75 to 100 percent of a full benefit.

Figure 1

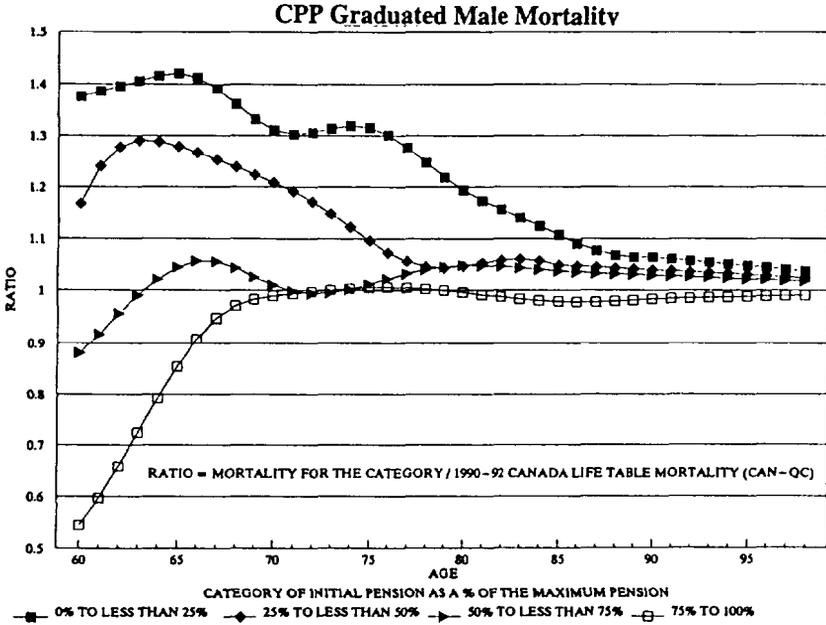
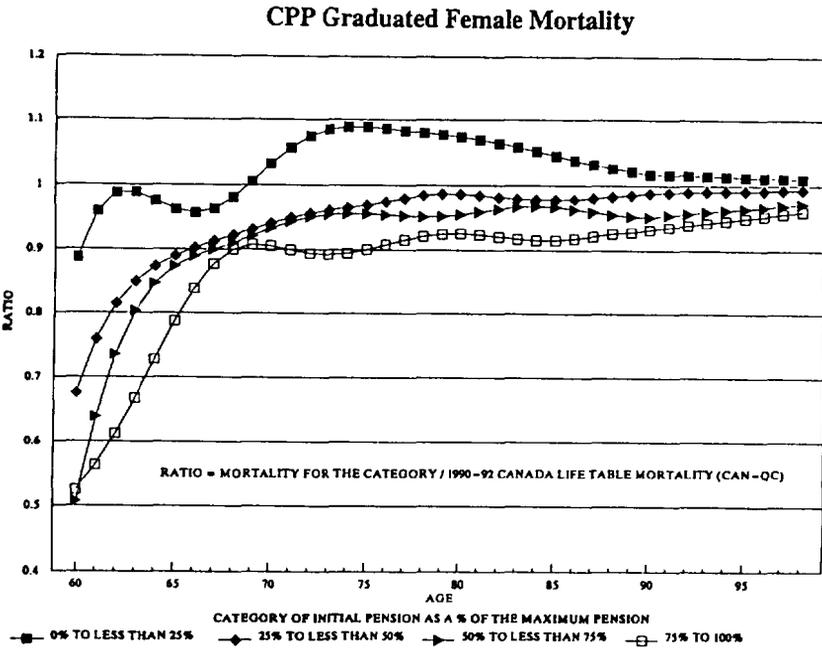


Figure 2



Clearly, those with higher incomes have lower mortality, and, thus, enhanced life expectancies. That is, they receive benefits for a longer period and thus have benefits worth more than the benefits provided to lower-income workers. As explained above, benefits in the C/QPP are simply 25 percent of career-average earnings regardless of the level of earnings (up to the YMPE). Thus, if contribution rates to the C/QPP were a level percentage of wages, then the C/QPP would be regressive.

However, there are three counter-arguments to this statement.

First, the C/QPP pays more than just retirement income benefits. In fact, only 64 percent of the dollars paid out of these plans goes to retirement income (OSFI, 1995, p8). The other one-third of cash flow is paid in benefits for disability (19 percent), survivors' benefits (14 percent), orphans benefits (1 percent), and death benefits (1 percent) (*ibid*). These benefits dampen to a great extent the regressive nature of the pure retirement income benefits. This is true for two reasons. Ancillary benefits are not purely wage related. For example, in 1996, a disabled contributor was able to receive a pension which was equal to \$325.61 plus 75 percent of the contributor's retirement pension (calculated as if the contributor attained age 65 as of the date of disability) to a maximum of \$870.92. The flat-rate portion of the benefit formula means greater relative benefits to the worker with lower earnings. Also, because both death and disability are negatively correlated with income and socio-economic status (Moore and Rosenberg, 1997, p135), low-income workers get more ancillary benefits than do high-income workers.

Second, while this paper focusses on the C/QPP plans, Canada's retirement income security system also pays benefits from Old Age Security (OAS), the Guaranteed Income Supplement (GIS), and the Spouse's Pension Allowance (SPA). None of these benefits are paid to high-income Canadians. In fact, the benefit schedule is highly

progressive since for every dollar of personal income beyond the OAS, one's GIS and/or SPA benefits are reduced by 50 cents. Add to that the fact that both OAS and C/QPP benefits are taxable income, while C/QPP contributions are not tax deductible, but receive only a tax credit at the tax rate for average income earners (17 percent federal) and the result is a highly progressive system in total. Finally, OAS/GIS/SPA are financed out of general tax revenues, which, to the extent that they are from income taxes, are considered progressive.

Third, even if one ignores the impact of OAS and GIS, there is a part of the C/QPP funding formula, that is often overlooked, that may mean that the retirement income portion of the C/QPP on its own has a progressive element. Workers do not contribute on all of their pensionable earnings. No worker contributes on the Year's Basic Exemption (YBE), which in 1997 is \$3500. Thus, if a worker earns \$3600 in 1997, contributions are made on only \$100, but benefits credits are assigned to \$3600 of earnings. Similarly, if a worker earns exactly half the YMPE (Years Maximum Pensionable Earnings), or \$17,900 in 1997, contributions would be made on \$14,400, while benefit credits would accrue on \$17,900. Finally, for the worker who earns the YMPE (\$35,800 in 1997), contributions would be made on \$32,300 and benefits would accrue on the full \$35,800. (This is also true for anyone earning more than the YMPE.)

Returning to CPP mortality analysis, there is more than a 50 percent differential in mortality rates (e.g. 0.027 versus 0.018) at the younger male ages, decreasing fairly regularly to nothing at the oldest ages (as found by Wolfson et al, 1990). However, a 50 percent differential in mortality rates does not result in a 50 percent differential in life expectancy. Life expectancy depends on survival. For example, if the mortality rates at a certain age are 0.018 and 0.027 respectively, that is a 50 percent differential. However, the survival rates at that age are 0.982 and 0.973 respectively, or less than a 1 percent

differential. Based on the CPP analysis, for men, there is a maximum 15 percent differential in life expectancy at age 60 for the highest incomes (75 to 100 percent of full benefits) versus the lowest incomes (0-25 percent of full benefits).

The differentials are much smaller for women. However, for the period of study, 1988 to 1994, CPP retirement income for women would be less indicative of family income, and women's true standard of living, than CPP retirement income for men. Only when women achieve full life-time earnings records, will statistics like those contained in Figure 2 be more indicative of the true standard of living of the individual woman being studied. Having said that, other studies have found less mortality differences by income levels for women than for men (Arber and Ginn, 1993).

However, assume that there is a full 15 percent advantage in the retirement income benefits paid by the C/QPP for anyone receiving a full benefit versus anyone receiving only a 25 percent benefit. Is the retirement income portion of the C/QPP thus regressive?

Given the YBE, the higher-income worker contributes on \$32,300 of earnings (indexed to wages) while the lower-income worker contributes on \$5,450 (indexed to wages). Ignoring differences in life expectancy for the moment, the 100-percent-YMPE worker gets a benefit credit four times that of the 25-percent-YMPE worker, but pays a contribution that is $32,300/5,450$ (or 5.93) as large. Thus there is a 48 percent advantage (1.4825) to the 25-percent-YMPE worker in the benefit/contribution formula. Because this 48 percent contribution formula advantage is greater than the 15 percent life expectancy advantage of the 100-percent-YMPE worker, one can argue that there is nothing regressive in the present C/QPP. That is, the C/QPP system as now structured (and with today's mortality by income class) is not regressive, even if we only consider the

retirement income benefits.

Tables 4 and 5 show that the CPP remains progressive for all cells except for age 60 male retirees whose earnings averaged between 50 and 75 percent of the YMPE. For them, the benefit-to-contribution advantage is exactly offset by the superior life expectancy of those at the 100 percent YMPE retirement benefit. Thus, one would conclude that, in total, the CPP is progressive, even if one considers only before-tax retirement income benefits (which, it has been argued, is unfair).

Table 4

Wage Band	Benefit-to-Contribution Advantage versus 100% YMPE Earner	1988-1994 Average Age 60 Life Expectancy		Relative Life Expectancy Advantage of 100% YMPE Earner	
		Male	Female	Male	Female
		0-25%	1.48	17.46	23.66
25-50%	1.12	18.42	24.37	1.09	1.02
50-75%	1.04	19.41	24.54	1.04	1.01
75-100%	1.00	20.13	24.80	1.00	1.00

Source: Author's calculation from CPP data.

Table 5

Wage Band	Benefit-to-Contribution Advantage versus 100% YMPE Earner	1988-1994 Average Age 65 Life Expectancy		Relative Life Expectancy Advantage of 100% YMPE Earner	
		Male	Female	Male	Female
		0-25%	1.48	14.12	19.56
25-50%	1.12	15.00	20.09	1.07	1.01
50-75%	1.04	15.65	20.17	1.02	1.01
75-100%	1.00	16.01	20.35	1.00	1.00

Source: Author's calculation from CPP data.

The tables show that the CPP remains progressive for all cells except for age 60 male retirees whose earnings averaged between 50 and 75 percent of the YMPE. For them, the benefit-to-contribution advantage is exactly offset by the superior life expectancy of those at the 100 percent YMPE retirement benefit. Thus, one would conclude that, in total, the CPP is progressive, even if one considers only before-tax retirement income benefits (which, it has been argued, is unfair).

One caveat needs to be stated at this time, however. The C/QPP has recently been amended. One of the amendments was to freeze the Year's Basic Exemption (YBE) at \$3500. Thus, as earnings rise, but the YBE remains frozen at \$3500, the benefit-to-contribution advantage to lower-income workers derived above will decrease and the C/QPP will become less progressive. Clearly, this subtle formula approach to some social subsidy within the C/QPP has a level of importance not appreciated by the public policy makers. Further monitoring of life expectancy differentials as the YBE decreases in importance seems worthy of time and effort.

b) The United States

Similar analysis can be done for the OASDI program in the United States. In fact, the U.S. literature is far more extensive than the Canadian literature on this topic. See, for example, Friedman (1972), Freiden, Leimer and Hoffman (1976), Aaron (1977), Hurd and Shoven (1985), Meyer and Wolff (1987), Steuerle and Bakija (1993), Duggan, Gillingham and Greenlees (1995), and Goss (1995).

Work was done by the Office of the Actuary in 1989 to determine if there existed a correlation between mortality rates and the OASDI benefit (expressed as the Primary

Insurance Amount or PIA). They analyzed a 1 percent sample from the Master Beneficiary Record (MBR). Mortality rates from the 1979-81 U. S. Life Tables (adjusted to an age-last-birthday basis) were used to calculate the expected number of deaths. The actual number of deaths was obtained from the December 1988 MBR.

The following table displays the ratios of actual deaths to expected deaths for Old Age Beneficiaries:

Table 6
OASDI Mortality Ratios by Income Level

Men	
PIA	Mortality Ratio to 1979-81 U.S. Life Table
<\$400	0.90
\$400-599	0.89
\$600-799	0.77
\$800+	0.60
Average	0.81
Women	
PIA	Mortality Ratio to 1979-81 U.S. Life Table
<\$400	0.86
\$400-599	0.79
\$600-799	0.71
\$800+	0.65
Average	0.82

Source: Barrick, 1989

The analysis noted that :

“Observation of this data reveals a trend toward lower ratios of actual deaths to expected deaths at higher PIA ranges. Mortality rates decrease as PIA levels increase for both male and female Old Age Beneficiaries. Thus the evidence obtained supports the hypothesis that mortality rates and PIA amounts are negatively correlated for Old Age Beneficiaries.”(*ibid*)

Hence, we can see the same negative correlation between career earnings (on which the PIA is based), and mortality as seen in Canada. Similar to Canada, the mortality rate differentials are about 1.5 to 1 at the extreme (male rates). Taking that differential at all ages and using the 1979-81 U. S. Life Tables as our base, it can be shown that the highest-income retiree analyzed has a life expectancy that is about 6.4 percent longer than the lowest-income worker studied. Does that mean that the OASDI system is regressive?

As stated above for the C/QPP, there are a number of counter-balancing features of the OASDI system. First, as in Canada, OASDI also pays disability benefits, and survivor benefits which offsets the regressive nature of the retirement income benefit to a great extent (see Aaron (1977) and Steuerle and Bakija (1993)). Second, for the higher earners, part of their OASI benefit post-retirement is taxed in a highly progressive tax system. One should compare after-tax benefits in determining progressivity, not before-tax.

However, what is far more powerful is the formula used to determine one's benefits under OASDI. Consider a worker attaining age 62 as at January 1, 1997 and retiring, with 35 years of earnings at the nationwide average wage. The Average Indexed Monthly Earnings (AIME) for this worker would equal \$2061. The Primary Insurance Amount would equal 90 percent of the first \$455, plus 32 percent of the next \$2286 and 15 percent of the AIME in excess of \$2741. This would equal \$923.40. The OASDI retirement benefit payable would be 80 percent of the PIA or \$738 per month.

For a similar worker who consistently earned exactly one-half of the nationwide average wage for 35 years, the AIME would be \$1030; the PIA \$593.50; and the retirement benefit would be \$474.

The ratio of these benefits is not two-to-one (which would be the ratio of their contributions), but only 1.56-to-one. Thus, there is a 28.2 percent advantage to the low-income worker (2.00/1.56).

Similar calculations for workers retiring at age 65 in 1997 would result in a PIA of \$936 for the worker at the nationwide average wage and \$599 for the worker at one-half the nationwide average wage (this is also the monthly benefit prior to adjusting for the impact of Medicare premiums).

Interestingly, the benefit ratio is again 1.56 whereas the contribution ratio would be two-to-one. Thus the low-income worker has gained an 28.2 percent advantage.

If an American worker retiring at age 65 earning twice the average industrial wage is compared to one earning half the average industrial wage, the ratio of contributions would be four-to-one, but the ratio of benefits is only 2.27. This creates a 76 percent advantage to the lower-income worker (Myers, 1996).

Hence, no matter what wage strata is considered, the benefit-to-contribution advantage to the poorer worker exceeds the life expectancy advantage to the wealthier worker.

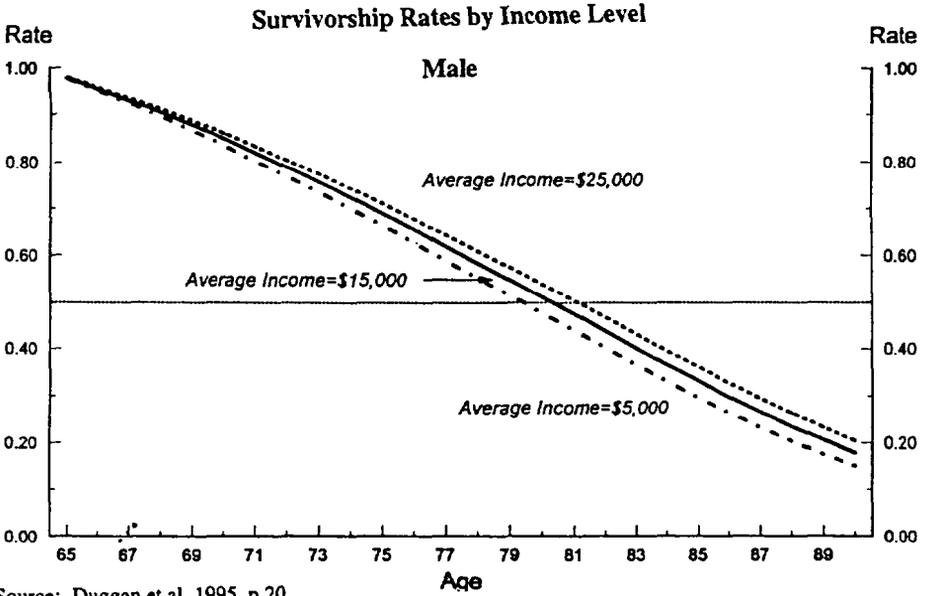
More sophisticated and more recent research supports this contention. In a 1995 paper, Duggan et al used the Social Security Administrations' 1988 Continuous Work

History Sample (CWHS), which is an earnings history sample for one percent of all Social Security records. It contains over 2.5 million records with actual earnings histories spanning the period 1951 to 1988. The file also contains month and year of death to allow the calculation of mortality rates. Further, it lists age, sex, and race.

The authors used a sample of 44,252 records from CWHS for persons born in the period 1895 to 1923 covering 205,549 male and 160,009 females person-years between ages 65 and 93 in the period 1960 to 1988.

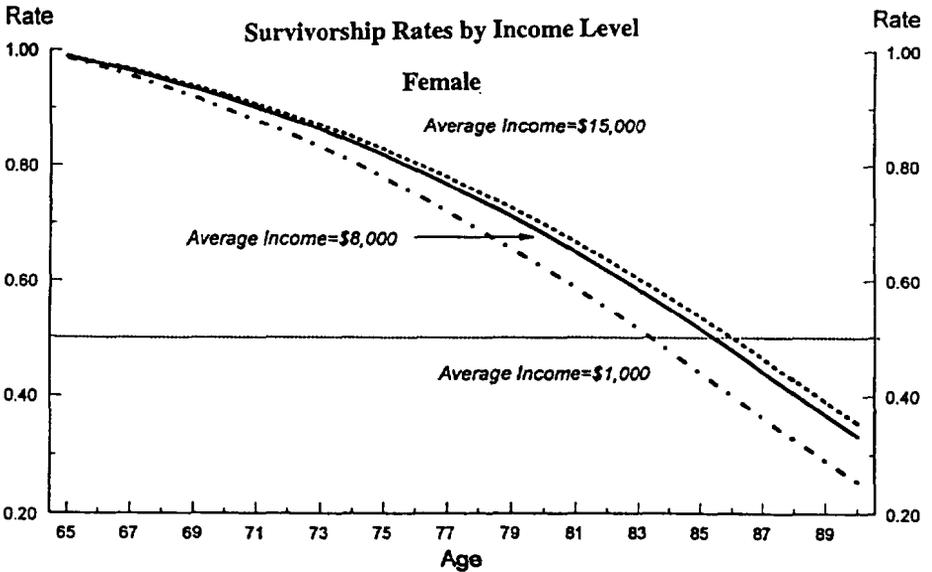
They found that survivorship was significantly correlated with income. In fact, they determined that much of the difference in life expectancy between blacks and whites could be attributed to income differences, a result consistent with Rogers (1992), and Menchik (1993). Further, much of the year-of-birth effect of improving life expectancy over time could be said to be due to increases in real income over time (Duggan et al, 1995, p9). Survivorship by income level is displayed in Figure 3 (Male) and Figure 4 (Female).

Figure 3



Source: Duggan et al, 1995, p 20

Figure 4



Source: *Ibid.*, p 21

The authors then found the rate of interest such that the present value of expected benefits was equal to the present value of expected contributions. This included spousal survivor benefits. They did the calculation twice. First, they calculated the values assuming equal mortality across all income classes. They then recalculated the values using the actual mortality displayed for each income class (i.e. lower mortality for the higher income classes and vice-versa). This is represented in Table 7 in the column headed: “Adjusted for Mortality” and in Table 8 by the concept of “Income-based Moratlity”. Rates of return are net of inflation. The results are as follows:

Table 7
Social Security Real Rates of Return (%)
By Income Class and Gender

Gender	Income Class	Unadjusted for Mortality	Adjusted for Mortality
Men	Low	6.23	6.17
	Medium	5.59	5.58
	High	4.99	5.04
Women	Low	9.24	9.19
	Medium	7.66	7.70
	High	6.02	6.12

Source: Duggan et al, 1995, p 14

A more recent analysis was done by Goss (1995) using data from a study by Rogot et al (1992). Goss’ results are as follows:

Table 8
Ratio of Expected OASDI Benefits to
Expected Employee Payroll Taxes (Present Value)

Class	Low Earner	Average Earner	High Earner
Single Male			
Standard Mortality	2.08	1.55	1.03
Income-Based Mortality	1.84	1.56	1.11
Single Female			
Standard Mortality	2.42	1.80	1.19
Income-Based Mortality	2.35	1.79	1.22
Married, One-Earner Couple			
Standard Mortality	4.27	3.20	2.12
Income-Based Mortality	4.42	3.27	2.10

Source: Goss, 1995, p4

Some explanation is required in reading Table 8. Progressivity exists if low earners have higher ratios than high earners in each category. The rows titled "Standard Mortality" have a common mortality assumption across income levels. However, the rows titled "Income-Based Mortality" use the mortality rates specific to each income strata in calculating the ratio of benefits to taxes paid in. Again, the system is progressive if low earners have higher ratios than high earners.

For single workers, both male and female, it can be seen that the impact of lower mortality among the high-income single workers depresses the progressiveness of the OASDI system somewhat, but that it still remains. For example, for single males, the ratio of 2.08 to 1.03 is more favorable than the ratio of 1.84 to 1.11, but the latter ratio still indicates progressivity. Clearly, even adjusting for lower mortality (and higher life

expectancy), low-income single workers achieve a superior benefit/cost ratio than do high-income single workers (note that only employee taxes are included).

For the one-earner couple, the moneysworth ratios actually show more progressivity when mortality variation by income is introduced. This initially surprising finding results from the fact that lower assumed mortality for the high earner produces (1) lower expected lifetime benefits for the spouse and children that largely offset the increase in expected lifetime benefits to the worker, and (2) an increase in expected lifetime payroll taxes that is somewhat larger than the relative increase in total benefits (Goss, 1995, p5).

Thus, even if one only analyzes the retirement income benefits of the OASDI system, there is still significant progressivity in the rate-of-return or benefit/contribution formula.

Hence, in total, one can conclude that both the Canada/Quebec Pension Plans and OASDI systems as now designed, are not regressive as some have suggested.

IV Would more income cause enhanced life expectancy?

To this point, the paper has studied the importance of the correlation between income and life expectancy, and the impact that has on the progressiveness of the existing social security systems in Canada and the United States. But what is more income **causes** enhanced life expectancy? This section looks at the relationship between the provision of social security and population life expectancy. In particular, it attempts to determine whether the payment of larger social security benefits might lead to enhanced population life expectancy.

It is clear from section III of this paper that there is a strong correlation between income and life expectancy. This relationship transcends gender, cause of disease, and geographic location (Canada, 1994, p5). Wolfson et al (1990) have shown that this is not just because healthy people normally earn higher incomes (this will be discussed in more detail later in the paper).

Using Canadian data, Wilkins and Adams (1978) state that men in the top 20 percent income bracket live an average six years longer than those in the bottom 20 percent, and can expect fourteen more years of life, free of activity restrictions. Women in the top 20 percent can expect three more years of life than those in the bottom 20 percent, and eight more years free of activity restrictions.

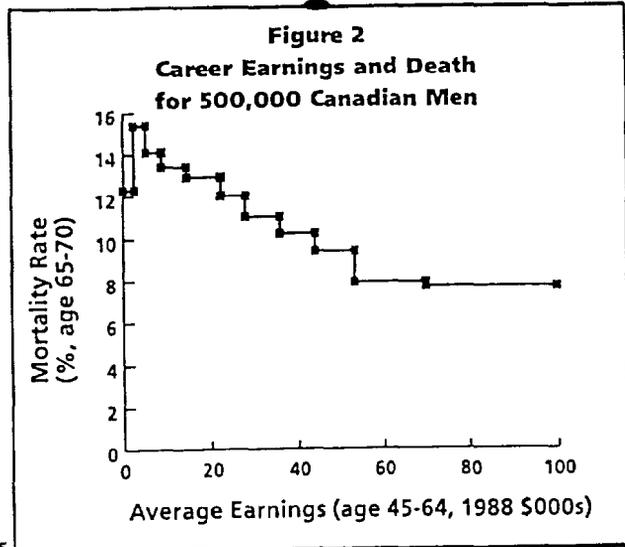
Wolfson et al (1990) have confirmed the positive correlation between income and longevity, but also connect this correlation to the concept that providing citizens with more income might improve their life expectancy. This paper is very powerful for two reasons. First, it is based on a longitudinal study of male mortality by income level which means that it is not subject to the problems associated with a cross-sectional study (i.e. a snapshot at a single point in time). Second, the data base is large. The data come from the Canada Pension Plan, and include 55,101 male deaths from September 1, 1979 to September 30, 1988 and corresponding earnings records from 1966 to 1988.

The authors graph mortality rates at ages 65 to 70 against pre-retirement income earned at ages 45 to 64 by the same people. The study shows that the mortality differentials by income level are maintained through the study period, that the curves do not cross, and the distances between them gradually become wider (see Figure 1, *ibid* p5).

Figure 5

Mortality Rates by Pre-retirement Income

Ages 65-70



Source: Wolfson et al, 1990, p5

As the authors note (*ibid* p6):

"It is difficult to imagine a clearer and more unequivocal result. These data cover over half a million individuals, and for each individual data from almost a quarter century of their lives have been drawn....It should be emphasized that these are not cross-sectional results."

The authors also argue that an assumption that poor health causes low economic status cannot be used to explain the results. They test this by looking at mortality rates for a sub-set of workers whose (real) earnings were generally increasing year after year prior to retirement. The authors state that this is clearly not a group where illness harmed employment and advancement. For this sub-set, the mortality differentials between high-income earners and low-income earners were maintained. So even in a sub-set of healthy workers, the correlation between income and longevity is maintained.

The authors state that if the entire population studied had experienced the mortality of the top 20 percent of earners from ages 65 to 75, the impact on life expectancy would be the same as removing cancer as a cause of death from ages 65 to 75 (*ibid* p8). Does this mean that money spent on trying to fight cancer might be just as effectively used to equalize the income of the bottom 80 percent of the population with the top 20 percent?

The authors then do a sophisticated multi-variant analysis including a marital-status variable, an age-at-retirement variable, an earnings variable (and some others including a disability-status variable).

The results show that married males have significantly higher survival probabilities at all retirement ages. Early retirees (who are not disabled) have higher mortality than late retirees (who are not disabled), and display a steeper gradient with earnings. There is a monotone increasing relationship between survival probability and age at retirement. Higher earnings always entail higher survival probabilities, but the magnitude of this earnings gradient tends to narrow for later retirement ages. The effect is similar but somewhat more variable among not-married men.

The authors conclude that an extra dollar of income offers decreasing 'protective effect' at higher income levels than at lower incomes (an intuitively plausible result). However, an extra dollar of income in any of the earning years has the same protective effect (i.e. whether earned just prior to retirement or from earlier years). This may fit with the notion that permanent rather than transitory earnings is the key variable. In turn, it suggests that there are long term effects of earnings on mortality, with lagged associations of as much as decades (which would be missed in a normal cross-sectional analysis).

While Wolfson's work correlates post-retirement mortality with pre-retirement income (earnings between 43 and 64), these are exactly the earnings that determine post-retirement income. CPP retirement benefits are a direct function of pre-retirement earnings (up to the Year's Maximum Pensionable Earnings--YMPE), as are retirement income benefits from private pension plans. The ability to save and earn investment income post-retirement is also a function of the level of pre-retirement income. Thus, it could be argued that Figure 5 could as easily indicate the relationship between post-retirement income and mortality.

In more recent studies, Adam (1995) and the CPP Actuary show the relationship between post-retirement income and mortality (see Figures 1 and 2) and confirm the strong correlation between income (post-retirement) and longevity.

Mustard and Frank (1994) have also indicated that there is a correlation between income disparity in a country, and the population life expectancy of that country (see also Wilkins and Adams, 1978, Frank, 1995, Hertzman, 1996, and Canadian Public Health Association, 1997).

"In general there are correlations between a nation's GNP per capita and health status measures such as life expectancy. But there are rather strong correlations between the degree to which national income is equitably distributed and health status (Mustard and Frank, 1994, p13).

Clearly, there is a correlation between income and longevity which cannot be explained away by confounding factors such as race or marital status. Thus, one might ask: "Is the income provision and income distribution present in social security a potential factor in actually creating enhanced life expectancy?"

The balance of this paper attempts to provide at least a partial answer to this important question by comparing and contrasting the provision of social security in Canada and the United States with the rate of improvement in mortality rates (and, hence, life expectancy) in the two countries.

It will be argued that between the early 1940s, when OASI was introduced, and the mid-1970s, the United States led Canada in the provision of social security benefits. However, because of the introduction of the Guaranteed Income Supplement and the Canada/Quebec Pension Plans in 1966/67, and universal health care gradually over the same decade, it will be argued that from the 1970s onward, Canada provided a more complete social security safety net than did the United States. Thus, if the hypothesis is true--that the provision of more social security is a factor in enhancing life expectancy--then the data would have to show a more rapid improvement in mortality rates at advanced ages between the 1940s and the 1990s in Canada than in the United States. If such improvement is found, then it will also be necessary to analyze competing factors that might also explain such an improvement. 1940 is chosen as the start of the study to coincide with the introduction of benefits under OASI and the lengthy time period used for the study is required because of the lagged association between income and life expectancy (see Wolfson, et al, 1990, p8).

It is not being argued here that having more social security would be the only cause of improved life expectancy, or even the primary cause. Instead, the analysis attempts to investigate whether or not there is any evidence at all that larger social security benefits might be a factor in enhanced life expectancy. If mortality rates for those close to receiving, or receiving, social security payments in Canada improved more rapidly than those in the United States in a period of time when social security was expanded more rapidly in Canada than in the United States, then one might conclude that enhanced

social security benefits are one factor leading to enhanced life expectancy. Obviously, there are a large number of other factors that might also have influenced life expectancy in this period, and they would have to be studied subsequently.

An understanding of the evolution of social security in these two countries is helpful at this stage. For those not familiar with this history, a lengthy summary can be found in Appendix A for Canada and Appendix B for the United States. A very brief description follows.

Social Security really began in the United States with the passage of the *Social Security Act* in 1935. The original act provided for a compulsory federal program of old-age benefits for workers in industry and commerce, unemployment insurance, and grants to the states for old-age assistance, aid to the blind, and aid to dependent children.

The original act provided only retirement benefits at age 65 for most workers in industry and commerce. Since then, the program has been changed and liberalized several times. In 1939, survivor benefits were added. In the 1950s, coverage was broadened to include most workers in the U.S.. In 1956 disability insurance was added, and in 1965 the Medicare program was enacted to provide hospital and medical insurance for the aged. In 1972, legislation was enacted that automatically increased benefits based on the Consumer Price Index, and extended the Medicare program to disabled beneficiaries who had been on the roll for at least 24 months.

OASDI provides a replacement ratio of about 41 percent for a worker with lifetime earnings at the Average National Wage. Medicare pays only about 45 percent of all personal health care costs incurred by the elderly. This low percentage can be explained by the numerous exclusions, deductibles, cost-sharing provisions, and limits on

approved charges. Also Medicare provides very limited coverage for long-term care and custodial care is excluded altogether.

Starting in 1927, Canada had paid a means-tested pension of \$20 a month to persons over age 70 who were eligible. In 1952, the *Old Age Security Act* provided OAS benefits of \$40 a month payable at age 70 regardless of need. A means-tested pension (also \$40 a month) would be available to those aged 65 to 69. These benefits remained in force for the next fifteen years, although benefits were increased several times.

In January 1966, Canada introduced the contributory, earnings-related Canada/Quebec Plans (C/QPP). Full benefits were not paid until 1976. The C/QPP provides a replacement ratio of 25 percent of earnings up to the Average Industrial Wage. Also, in 1966, OAS became payable at age 65 (over a five year transition) without a needs test. Also the Guaranteed Income Supplement (GIS) was added to the OAS as a supplement to those who could pass an income test. Finally, in 1975, the Spouse's Allowance was added. It is payable to a OAS pensioners' spouse, widow or widower, aged 60 to 64 on an income-tested level. These households are thus guaranteed a minimum income equivalent to that of a GIS pensioner couple.

Without counting GIS, OAS plus C/QPP retirement income benefits provide an income replacement ratio of about 40 percent for a worker with lifetime earnings at the Average Industrial Wage (25 percent from C/QPP and 15 percent from OAS).

Finally, in the period from 1958 to 1972, the government introduced extensive programmes to cover hospital care and physician services. Coverage is universal, and is meant to pay for all services that are 'medically necessary'. It has been estimated that the incomes of elderly Canadians would have to be as much as one-third higher if they had to

pay for the various services covered under public health insurance (National Council of Welfare, 1984, p62).

The provision of income security programmes as outlined had a measurable impact on poverty among the elderly in Canada. Prior to the introduction of the OAS program in 1952, Canada's elderly had suffered relative economic hardship. But the position of the elderly steadily improved, especially since 1967, as shown in the following data from Myles and Street (1995, p343) (and confirmed in Burbidge, 1996, p29) which compares median family income of different age groups to the overall median family income.

Table 9

**Median Family Income as a Percent of Overall Median
1967-1991**

Age of Family head	Year			%Change
	1967	1981	1991	
20-26	114	95	78	-32
26-34	114	113	106	-7
35-44	106	117	115	+8
45-54	117	124	136	+16
55-64	114	110	109	-4
65-74	58	60	71	+22
75+	45	50	61	+35

Source: Myles and Street, 1995, p343

Measured poverty* among the elderly fell from 33.6 percent in 1980 to 16.9 percent in 1995 (National Council of Welfare, 1997, p13). For couples 65 and older, the poverty rate has fallen from 22.2 percent in 1980 to 7.5 percent in 1995 (*ibid*, p17). This

* Poverty is defined using Statistics Canada low income cut-offs. Whereas the average Canadian family spends 36.2 percent of gross income on food, shelter, and clothing, it is assumed that any family spending 56.2 percent or more on these necessities is poor.

compares to a poverty rate of 15.5 percent for those under age 65 (*ibid*, p1). Many of the rates for seniors in 1995 were record lows or near-record lows (*ibid*, p87). This significant improvement in poverty rates is mainly because of improved pensions (*ibid*, p13).

As Fellegi (1988, p4.8) states, the most important contributing factors are:

--the maturing of the Canada and Quebec Pension Plans (C/QPP)

--substantial increases in the Guaranteed Income Supplement being granted and the Spouse's Allowance program being introduced.

--a noticeable increase in private pension income because of more people either being covered by such plans or by Registered Retirement Savings Plans

--an increase in "other income" primarily from investments

Between 1971 and 1985, the proportion of the elderly receiving C/QPP increased from less than 15 percent to almost 60 percent; private pension recipients increased from one-fifth to one-third of the elderly; and the proportion receiving investment income grew from 44 percent to 57 percent (*ibid*, p4.33). For those elderly who do live in poverty, the National Council of Welfare (1997, p51) has shown that their income bring unattached men 65+ to within 82.3 percent of the poverty line; unattached women 65+ to within 83.8 percent and elderly couples to 87 percent of the defined poverty line.

Also, Canada provides greater tax-financed health care protection than exists in the United States. In 1991, 36.3 million people or 16.6 percent of the non-aged population of the U.S. were not covered by health insurance and did not receive publicly financed health

assistance (Rejda, 1994, p199). As stated earlier, despite 'covering' Americans aged 65 and over, Medicare still leaves a heavy financial burden on the aged. Medicare only pays 45 percent of personal health costs for the elderly (*ibid* p276).

Using U. S. Bureau of the Census criteria* for poverty (according to Rejda, 1994 p 392, a subsistence standard of living), in 1990, 12.2 percent of the American population aged 65 and over were living in poverty. The poverty rate for the aged is slightly less than for the total populations (12.2 versus 13.5 percent). However, the poverty rate is substantially higher for aged minority groups and for aged women who are divorced, separated, widowed, or never married (Rejda, 1994, p81/82).

In the United States, the elderly spend 8.3 percent of their incomes to pay for private health insurance versus the 4.9 percent of income that the non-elderly pay for private insurance (even though Medicare does not apply to those under 65, with some small exceptions). On top of that, elderly Americans spend another 8.3 percent of their incomes in out-of-pocket payments for health care (compared to 3.2 percent for the non-elderly) (Evans et al, 1995 p 365).

This has no parallel in Canada. In Canada, young families spend 1.5 percent of their incomes on health care and private health insurance. This rises to 3.2 percent of incomes for Canadian elderly (versus about 17 percent in the United States) (*ibid*, p366). In both countries, these costs are regressive in that they represent a larger percentage of income for the poor and a smaller percentage of income for the wealthier. Clearly, however, the impact in Canada is much less than in the United States.

*The Bureau of the Census computes several poverty thresholds for different-size families to determine the extent of absolute poverty in the United States. Individuals and families whose cash incomes are below the poverty thresholds are counted as poor. The poverty threshold in 1992 was \$7362 for an unrelated individual under age 65 and \$14,463 for a four-member family.

The hypothesis being tested here is that the provision of additional social security benefits should enhance life expectancy. In that regard, economic security for the elderly in Canada fell short of that in the United States in the period between the 1940s (when OASI started paying benefits) and the 1970s. However, after the mid-70s, with the advent of the C/QPP, GIS, and universal health care, economic security for Canadians improved rapidly and surpassed the level of economic security available in the United States.

This opinion is held by a number of authors (see Banting 1985 and 1997, Wolfson and Murphy, 1994, and Myles and Quadagno, 1994 and 1997). For example, Myles and Street (1995, p339) state:

“In the mid ‘70s, when the Great Pension Debate began, the economic status of the elderly had been in decline for almost three decades and Canadian seniors were decidedly worse off than their counterparts in the United States. ... Unlike the situation in the mid-’70s, by the end of the ‘80s the Canadian elderly were less likely to be poor or near-poor than the American elderly”.

Thus, it will be concluded that from the 1940s to the mid-70s (remember the first full C/QPP retirement benefits were paid in 1976, and Canadian publicly-funded health care was not fully in effect until 1972), that the United States led Canada in providing its elderly citizens with economic security. With all of the improvements in Canada between 1966 and 1976, however, it will also be concluded that by the mid-70s, and ever since, Canada has provided its elderly with more economic security than is available in the United States.

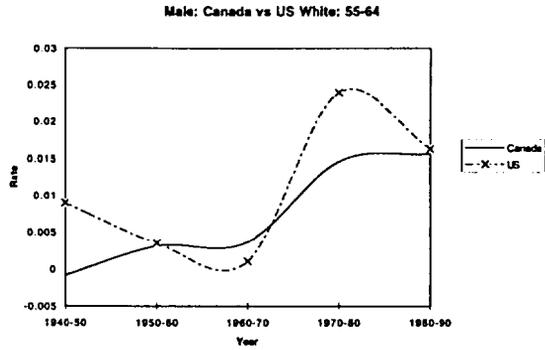
Can it be shown that this more rapid improvement in economic security for the elderly in Canada over this period resulted in more rapid improvement in mortality rates and life expectancy?

This question was answered by analyzing mortality data from the United States and Canada over the period 1940 to 1992. Because the United States takes its census on years ending in '0' (i.e. 1940, 1950, etc.), Vital Statistics Rates for those years were used for the U.S.. In Canada, similar data become available in census years which end in '1' (i.e. 1941, 1951, etc.). This one-year slippage should not affect the analysis, because we are not looking at absolute rates of mortality. Rather these base data were used to develop annual rates of mortality improvement (i.e. given the census-year mortality rates by age and sex, what annual rate of mortality improvement occurred over the decade to the next census?).

Were the hypothesis to be found correct, one would have to observe more rapid rates of mortality improvement in Canada than in the United States over the period of observation, in line with the more rapid rate of improvement in economic security for the elderly over the same period. Data were plotted for males and females aged 55 to 64; 65 to 74; and 75 to 84. This was done both for the entire population data, and separately for the Canadian population versus only the white U.S. population. The results are presented in the twelve graphs that follow. The 'Percentage Rate of Improvement' is the average per annum rate of improvement in mortality that produce the total decade improvements shown in the data.

Figure 6

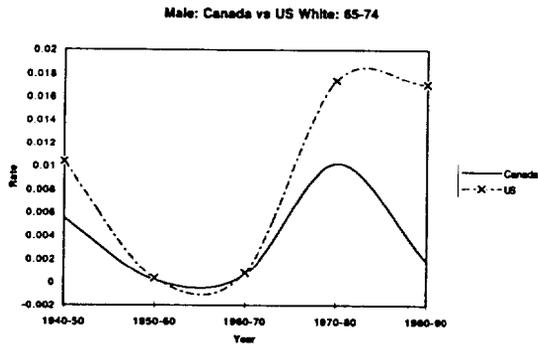
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 7

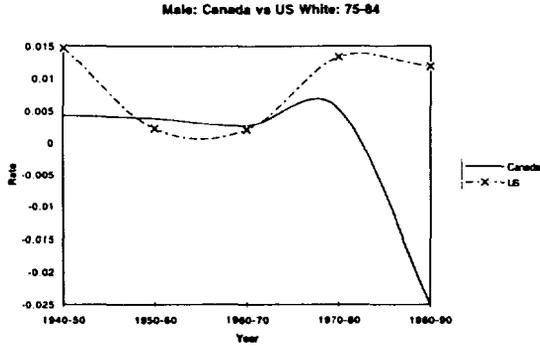
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 8

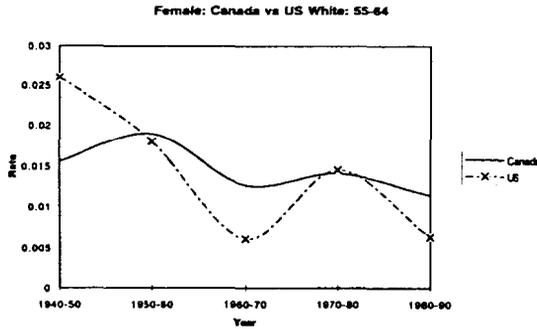
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 9

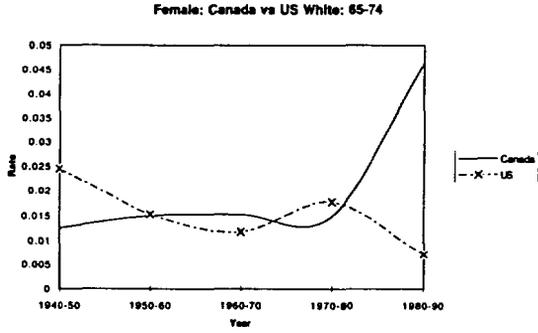
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 10

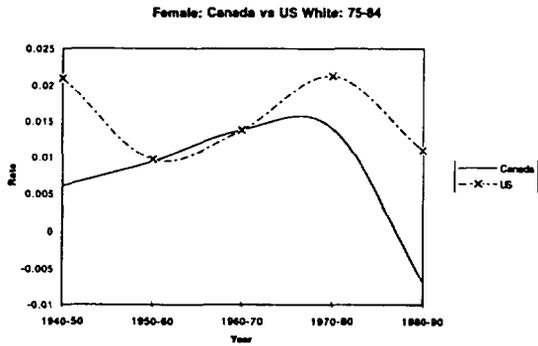
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 11

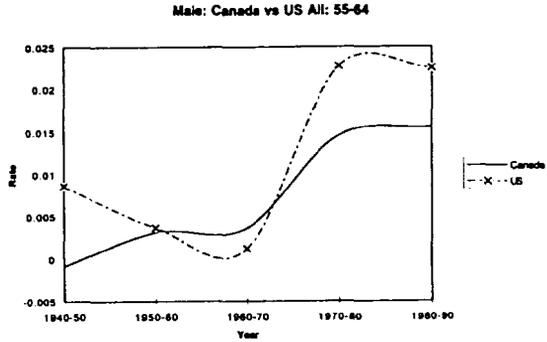
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 12

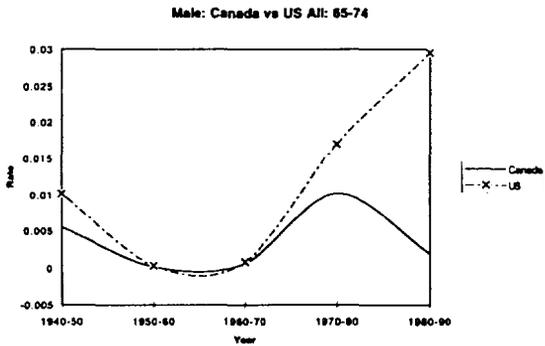
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 13

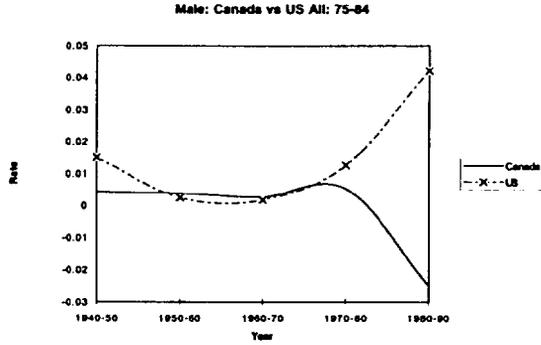
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 14

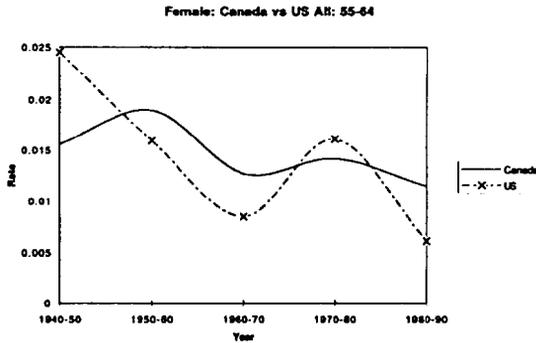
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 15

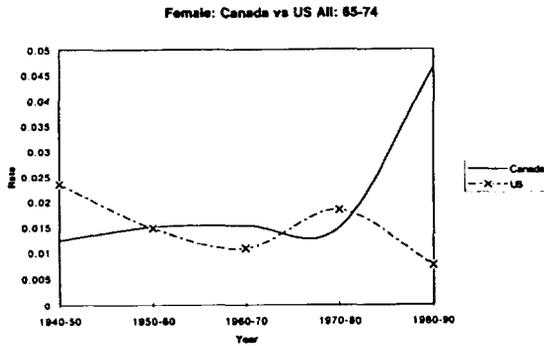
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 16

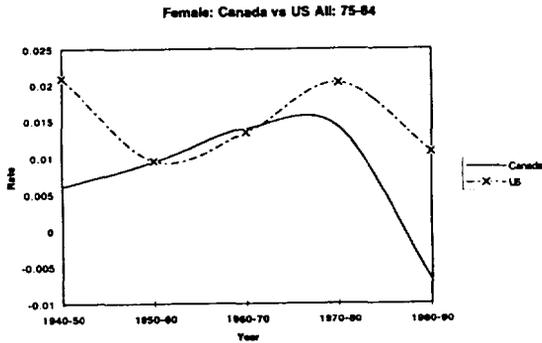
Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Figure 17

Canada versus United States
Mortality Rates of Improvement
1940-1990



Source: Life Tables, Canada and the United States and Author's calculations

Only four of the twelve graphs present mortality improvement patterns consistent with the hypothesis. Those correspond to females aged 55 to 64 (a relatively weak indication), and females aged 65 to 74 (a somewhat stronger indication). The other eight graphs portray results that do not support the hypothesis, in that recent rates of mortality improvement (and, hence, improvement in life expectancy) have been superior in the United States versus Canada (in three of the age groups, remarkably so).

Thus, these data do not support the hypothesis that improved government-sponsored economic security programs will result in improved population life expectancy.

V Conclusion

This paper has discussed three important questions. First: "Is social security a good deal?" The paper concludes that for past generations it was, and for future generations it will be if all of the attributes of social security, especially its inherent lack of risk, are included in any comparison with private sector alternatives.

Second, the paper presented arguments about whether or not social security is regressive. It was found that even if only the income security benefits of social security are analyzed separately, that social security is not regressive. It was noted, however, that in the case of the C/QPP, this depended on the existence and size of the Year's Basic Exemption, which has been frozen in recent legislated amendments.

Finally, the paper attempted to find a causal relationship between the provision of social security and population life expectancy. The data indicate that such a causal relationship does not exist. In fact, there is not even a positive correlation between the creation of enhanced social security and longevity in Canada versus the United States.

Why might this be the result?

Hertzman (1996, p2) provides one possible explanation.

“But in recent decades the relationship between health and wealth has become more complex as rich nations have grown richer. By 1970, the world’s richest nations had reached unprecedented levels of national wealth and a distinct ‘flat of the curve’ had begun to emerge, such that increasing increments of income among those countries with per capita incomes greater than \$10,000 US (in 1991 dollars) were no longer associated with further increases in life expectancy. By 1990 all of the countries of the Organization of Economic Co-operation and Development, the world’s wealthiest nations, found themselves on their ‘flat of the curve’ (World Bank 1993:34). At the same time, the traditional monotonic relationship between health and wealth persisted among the world’s poorer countries; a pattern referred to here as the ‘steep incline’, to distinguish it from the ‘flat of the curve’.

Thus, it seems that given the level of income security now provided to our citizens plus their personal income, that further enhancement of social security benefits in Canada and the United States cannot be expected to **cause** measurable improvements to population life expectancy.

Clearly, this is an area that is ripe for further research. Given that just providing more money to the elderly cannot be expected to cause their life expectancy to improve, what is the driving force that could be used to improve population life expectancy for those 65 and over? What would the results of the above analysis be if one analyzed mortality rates only for low-income elderly? What would a ‘cause-of-death’ analysis reveal? Many questions remain unanswered. The bibliography provides a long reading list of historic literature on this topic. It is hoped that this introductory probe will create the impetus for further work.

Appendix A

A Summary of the Evolution of Canadian Social Security

The first retirement income security offered in Canada came with the *Old Age Pension Act* of 1927. Under this act, the federal government offered to pay 50 percent (later raised to 75 percent) of the cost of means-tested pensions to be paid and administered by the provinces (in Canada, pensions are constitutionally a provincial power). The maximum pension would be \$20 a month to persons over age 70 who met certain citizenship and residence requirements and who could pass a needs test. Individuals were not required to contribute. By 1951, benefits had risen to \$40 a month (about 17 percent of the average industrial wage).

The *Old Age Pensions Act* was replaced by the *Old Age Security (OAS) Act* in 1952. OAS benefits of \$40 a month would be paid at age 70 regardless of need. A means-tested pension, also \$40 a month, would be available to those aged 65 to 69. This plan remained in force for the next fifteen years, although benefits were increased several times. Because of several ad-hoc increases, the replacement ratio represented by the OAS went from 17 percent of the average industrial wage to a high of 20 percent in 1965.

With the introduction of the C/QPP in 1966, the age of eligibility for OAS was reduced from 70 to 65 over a five year period. However, because wages were rising faster than inflation, the ratio of the OAS benefit fell to about 14 percent of the average industrial wage by 1983. OAS benefits are now indexed to inflation, and, recently, wages have not risen as fast as the cost of living. Thus, for the past five years, the OAS benefit has replaced about 15.7 percent of the average industrial wage.

The next major reform came into effect on January 1, 1966, when the contributory, earnings-related Canada/Quebec Pension Plan (C/QPP), was introduced, although the first full retirement income benefits were not paid until 1976. The C/QPP pays retirement benefits at age 65 equal to 25 percent of credited earnings (up to the Years Maximum Pensionable Earnings (approximately the average industrial wage and equal to \$35,800 in 1997)). Equal contributions are paid by the worker and the employer on wages between the Years Basic Exemption (\$3500 in 1997) and the Years Maximum Pensionable Earnings (YMPE).

There are also ancillary benefits similar to OASDI in the United States. Virtually all of the labour force earning more than 10 percent of the average industrial wage (i.e. more than the YBE) participate in the C/QPP. Early and late retirement are allowed between ages 60 and 70, with benefit adjustments of 0.5 percent per month (6 percent a year) in either direction. C/QPP benefits are taxable income. Contributions are given a tax 'credit' which is equivalent to a tax deduction for a worker earning average wages.

At the same time (1966), several other changes were also put into effect. The universal OAS system qualification age (without need) was lowered from age 70 to age 65 over a five-year period. This meant that OAS was available to any Canadian who satisfied a residency requirement. OAS was (and is) taxable income.

Effective January 1, 1967, the Guaranteed Income Supplement (GIS) was added to OAS as a temporary measure to cover the ten-year transitional period of C/QPP implementation, providing income-tested benefits for those with no or low C/QPP benefits. However, this temporary add-on is still with us and has remained an essential element of the government income security system. At the same time, several provinces also introduced supplements (e.g. Ontario GAINS) for their residents. These were all

needs or income tested (based on joint spousal income), and the benefits are non-taxable. The GIS supplement is reduced \$1 for every \$2 of monthly income the recipient has beyond the OAS. About 55 percent of OAS recipients receive at least a partial GIS.

When the GIS was introduced it provided, in combination with the OAS pension, an income guarantee to single pensioners equal to about 25 percent of the average wage. A pensioner couple were guaranteed an income equal to about half the average wage.

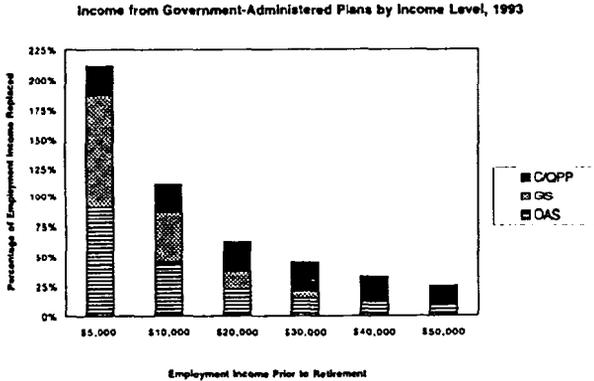
In 1975, the Spouse's Allowance (SPA) was added. It is payable to OAS pensioners' spouses, of either sex, aged 60-64 on an income-tested level. These households are thus guaranteed a minimum income equivalent to that of a GIS pensioner couple.

Since 1972, all of these systems have had benefits fully indexed to the cost-of-living (except for two years in the mid-1980's during a period of wage and price controls). While the C/QPP have earmarked contributions, the other systems are paid for out of general tax revenues.

More recently, the government has decreased the value of some of these benefits, especially, for example, the OAS benefit by introducing a claw-back of benefits from wealthy Canadians (those whose incomes beyond OAS were in excess of \$50,000 a year, that limit only being partially indexed to the cost-of-living). While these cuts are important, they do not effect the thesis of the analysis of this part of the paper since the effect is both progressive, and should not have a serious impact of the sense of security of the Canadian population.

For a worker earning the average industrial wage throughout his or her career, the government funded retirement income security schemes will provide a replacement ratio of approximately 40 percent (25 percent from C/QPP; 14 percent from OAS; and small amounts from other programs). Workers at lower wages realize a higher replacement ratio and workers with higher wages realize a lower replacement ratio as shown in the following figure.

Figure 18
Income Replacement Provided by Government Programs
One-Earner Couple



Source: Author' graphic

The period between 1957 and 1972 was also important as it saw the introduction of a system of universal health care in Canada.

Because health care is also constitutionally a provincial matter, the first legislation to provide government-sponsored health care was at the provincial level (Saskatchewan, 1946 and British Columbia, 1949).

In 1957, the federal government introduced the *Hospital Insurance and Diagnostic Services Act* whereby the federal government would pay approximately 50 percent of the cost of provincial health care plans that qualified under defined criteria. By 1961, all provinces and territories had joined the national program, which focused on prepayment of hospital in-patient care and diagnostic services. This was followed by the *Medical Care Act* (1966-67) which added universal coverage of physician services from 1968. All provinces and territories joined the medical care arrangements by 1972.

In the early 1980s, the federal government became concerned that certain of the original basic standards, such as universal access, were being eroded. In particular, they objected to some provinces allowing hospitals to charge user fees and doctors to extra-bill. Their answer was the *Canada Health Act*, 1984, which imposed financial penalties on provinces that did not allow reasonable access to health services without financial or other barriers. By late 1980, all provinces had passed legislation eliminating extra-billing and user fees.

Elderly Canadians benefit from the Canadian health care delivery system. It has been estimated that incomes of elderly Canadians would have to be as much as one-third higher if they had to pay for the various services covered under public health insurance (National Council of Welfare 1984, p62).

Appendix B

A Summary of the Evolution of Social Security in the United States

In 1935, what is now the Old Age, Survivors and Disability Insurance (OASDI) system was legislated into existence. Initially, OASDI covered only some workers for monthly benefits after retirement and after age 65 (the status of 'retired' was based on an earnings test). At first, federal, state and local civil servants were not covered as they had superior plans of their own. Workers with extremely low incomes (e.g. migrant farm workers and domestics) were (and are) not covered. However, over the years, OASDI has come to cover the vast majority of workers in the United States.

After the 1935 Act, a series of modifications (mainly expansionary) were made to OASDI. The following is a list of highlights, but should not be construed as a complete list of all amendments.

1939 Act: Added benefits for family members and survivors (female)

1950 Act: Broadened "survivors" to include equal coverage and benefits for males

1952 Act: Added a disability freeze so that retirements were not negatively affected because of periods of qualified disability (similar to a waiver-of-premium benefit in a private insurance plan).

1956 Act: The eligibility age for retirement benefits for women was reduced from 65 to 62 with an actuarial reduction in benefits (no benefit reduction for widows). The Act also added disability benefits for workers aged 50 to 64 and children aged 18

and over if disabled before 18 (increased to 22 in 1972). OASDI is generally second-payor to Workers' Compensation. The Act also changed the benefit calculation formula so that retirement benefits were ultimately to be based on the best 35 years of coverage.

1960 Act: The age 50 requirement for disability benefits (see 1956 Act) was dropped. Thus, OASDI now provides insurance for qualified disabled contributors regardless of age.

1961 Act: Men were allowed to retire at age 62 but with a greater reduction in benefits than for women because of computational differences (full equality was achieved in 1972).

1965 Act: The minimum age for the widow's benefit was reduced from 62 to 60, but with an actuarial reduction in the benefit. For widows who remarry after age 60 (widowers, after age 62 until the 1972 Act), benefits were not terminated. The definition of disability was liberalized from "permanent and total" to "expected to last at least 12 months or prior death".

1967 Act: Widow's and dependent widow's benefits were provided beginning at age 50 if the beneficiary is disabled (with a large early-retirement reduction factor).

1972 Act: The Act increased widow's and dependent widower's benefit, with the same age requirements by sex. It introduced delayed retirement credits (1 percent per year of delay up to age 72 raised to 3 percent per year in 1977).

1977 Act: Since 1977, the earnings record used to compute the PIA has been indexed to national wages. Since such indexation, a worker consistently earning the national average wage will realize about a 42 percent replacement ratio from OASDI retirement benefits at the normal retirement age. From age 62 on, the PIA is indexed to the CPI.

1981 Act: Some small decreases were legislated to balance the short-term cash-flow to the OASDI Trust Funds.

1983 Act: All remaining gender differences were eliminated as were some other anomalies. Remarriage is no longer a cause of termination of widow(er)'s benefits for surviving divorced spouses and disabled widow(er)s as was the case previously for widow(er)s aged 60 or over. The delayed retirement credit will rise to 8 percent per annum by 2009, and will take effect at the normal retirement age and stop at age 70. This is considered a full actuarial adjustment. The normal retirement age will rise to age 66 for those born in 1938 and to age 67 for those born in 1960 (in 2029 for widow(er)s). Also 50 percent of OASDI benefits become taxable income for about 8 percent of today's (wealthiest) beneficiaries. The taxation formula is not indexed, so more recipients will pay tax over time.

1993 Act: A second tier allowing for 85 percent of the benefit to become taxable income was introduced.

Table 9**Replacement Ratios for Workers Retiring at Normal Retirement Age**

Act	Earnings Level		
	Low	Average	Maximum
1935 (Minimum Coverage)	30.0%	20.0%	10.0%
(Maximum Coverage)	73.0	58.0	34.0
1939 (Minimum Coverage)	41.2	28.8	16.5
(Maximum Coverage)	57.2	40.0	22.9
1950	44.7	30.0	26.7
1952	45.2	30.3	28.2
1954	47.6	34.0	31.0
1958	46.7	34.2	31.8
1965	44.2	33.5	30.5
1967	46.9	36.3	33.5
1969	51.7	40.3	38.6
1971	53.5	43.0	39.4
1972	62.7	51.2	42.7
1975	70.2	55.9	42.6
1977 and on	55.5	41.1	27.4

Source: Robert J. Myers (1993), page 363.

The Social Security Act of 1935 authorized federal grants to states to pay part of the costs of aid in the form of cash to aged persons, blind people, and needy children. In 1950, a fourth program was added for the permanently and totally disabled. However, in 1974, the character of the three programs for adults was considerably changed when they were brought under the Supplemental Security Income (SSI) program. SSI can be viewed as a guaranteed-annual-income for certain categories of the population. SSI is paid based on the individual's means, being reduced generally for other income. It is a federal program.

Since 1974, SSI payments amounts are automatically adjusted for inflation. The basic SSI monthly payment (in 1993, \$434 single and \$652 couple) represented about 74

percent of the poverty standard for a single recipient and 88 percent for a couple. When 'other income' and foods stamps are also considered, these proportions rise to 85 percent single and 100 percent couple (Myers, p 801). SSI payments are reduced one-third if the recipient is living in the household of another person and not paying room and board.

A state may supplement the federal SSI. The state is permitted to require a residence period for these supplementary payments. In 1992, 44 percent of those receiving SSI (federal) received state supplements (Rejda, 1994, p 437). The receipt of food stamps has no effect on the amount of the SSI payment. At the end of 1990, a total of 4.8 million persons were receiving federal SSI payments (1.5 million aged, 3.3 million disabled, and 84,000 blind). About 70 percent of the aged recipients were also receiving OASDI benefits.

With respect to medical care, despite many early attempts to introduce universal medical care to the United States, the first substantive government legislation took effect in 1965. The 1965 amendments to the *Social Security Act* established a basic compulsory hospital insurance plan for the aged (HI) and a related voluntary supplementary medical insurance plan (SMI). These are often referred to a Medicare Part A and Part B, respectively.

Hospital Insurance or Medicare Part A covers people aged 65 and over if eligible for OASDI or RR (Railroad Retirement) retirement benefits; disabled beneficiaries of OASDI under 65 if entitled to OASDI disability benefits for at least 24 months; qualified persons who need maintenance dialysis or a kidney transplant. Persons not insured for HI can voluntarily enrol and pay a monthly premium.

HI benefits include: inpatient hospital care; skilled nursing facility care; home health care; and hospice care. There are deductibles, coinsurance, and limits to these benefits (both in terms of duration (days) and dollars). Custodial care is not covered.

Supplementary Medical Insurance (SMI or Medicare Part B), is a voluntary program that pays for physicians services and other services and supplies not covered by HI. Most people join at age 65 or disability. You are automatically enrolled if you are entitled to HI benefits, but you can refuse coverage. SMI benefits include: doctor's services; outpatient hospital services; home health visits; and other medical and health services. SMI pays 80 percent of the approved charges for covered medical services after the patient pays a \$100 calendar-year deductible (there are several exceptions to this general rule).

There are several exclusions to Medicare Coverage: most chiropractic services; custodial care; dentures and routine dental care; eyeglasses and routine eye examinations; the first three pints of a blood transfusion; hearing aids; immunization and vaccinations; prescription drugs and medicines taken at home; private-duty nursing; private room; routine physical check-ups.

HI is financed largely by a payroll tax plus a relatively small amount of general revenues. SMI is financed by monthly premiums (which cover 25 percent of the cost) paid by covered individuals and by general tax revenues.

Medicare pays about 45 percent of the health care costs of those 65 and over (Rejda, 1994, p276).

Medicaid was also enacted in 1965. It is a joint federal-state program that provides medical assistance to low-income persons who are aged, blind, disabled, or members of families with dependent children. Benefits vary from state to state, although there are federal minimum guidelines.

Medicaid applicants must meet a needs test to receive benefits similar to other Public Assistance programs (e.g. Aid to Families with Dependent Children and Supplemental Security Income). According to Rejda (1994, p 430), qualifying is not easy.

Medicaid is financed by general revenues, jointly by the federal and state government (federal grants are higher for poorer states).

Bibliography

- Aaron, Henry J. (1977). Demographic Effects on the Equity of Social Security Benefits in M. Feldstein and R. Inman (editors), *Economics of Public Services*, Macmillan Press, pp 151-173.
- _____ (1982). *Economic Effects of Social Security*. Studies of Government Finance. The Brookings Institute, Washington, D. C..
- Adam, Louis (1995). *Canadian Pensioners Mortality Table 1983-1992*. A Report on the Construction of a Mortality Table based on C/QPP Experience Data. Draft. University Laval, Quebec.
- Arber, S., and J. Ginn (1993). Gender and inequalities in health in late life. *Social Science and Medicine*, Vol. 36, pp 33-46.
- Banting, Keith (1985). Institutional conservatism: federalism and pension reform. In J. Ismael (Ed) *Canadian Social Welfare Policy: Federal and Provincial Dimensions*. McGill-Queen's University Press. Kingston and Montreal.
- _____ (1997). Degrees of Freedom: Canada and the United States in a Changing World. In George Hoburg and Richard Simeon (Eds). *The Social Policy Divide: The Welfare State in Canada and the United States*. pp 267-309. McGill-Queen's University Press. Montreal.
- Barrick, Nettie J. (1989). *Correlation Between Mortality Rates and PIA*. Memo S3NS, Office of the Actuary, Social Security Administration, Washington, D. C..
- Boskin, Michael J., Laurence J. Kotlikoff, Douglas J. Puffert, and John B. Shoven, (1987). Social Security: A Financial Appraisal Across and Within Generations, *National Tax Journal*, March, Vol. 40, pp 19-34.
- Burbidge, John (1996). *Public Pensions in Canada*. IESOP Research Paper No. 1, Program on the Independence and Economic Security of the Elderly Population.

McMaster University, Hamilton.

- Burkhauser, Richard V. and Jennifer L. Warlick, (1981). Disentangling the Annuity From the Redistributive Aspects of Social Security in the United States, *Review of Income and Wealth*, December, Vol. 27, pp 401-421.
- Canada (1994). *Strategies for Population Health: Investing in the Health of Canadians*. Federal/Provincial/Territorial Advisory Committee on Population Health.
- Canadian Institute of Actuaries (1991). *Proceedings*, Vol. 23 No. 1.
- Canadian Public Health Association (1997). *Health Impacts of Social and Economic Conditions: Implications for Public Policy*. March, Ottawa.
- Caldwell, S. and T. Diamond (1979). Income Differentials in Mortality: Preliminary Results Based on IRS-SSA Linked Data, in L. Delbene and F. Scheuren, editors, *Statistical Uses of Administrative Records with Emphasis on Mortality and Disability Research*. Social Security Administration: Washington, pp 51-59.
- Chen, Yung-Ping and Kwang-Wen Chu (1974), Tax-Benefit Ratios and Rates of Return Under OASI: 1974 Retirees and Entrants, *Journal of Risk and Insurance*, June, Vol. 41, pp 189-206.
- Chen, Yung-Ping and Stephen C. Goss (1997). Are Returns on Payroll Taxes Fair? in Eric R. Kingson and James J. Schulz (editors). *Social Security in the 21st Century*. pp 76-90, Oxford University Press. New York.
- Denton, Frank T. and Byron G. Spencer (1995). Demographic Change and the Cost of Publicly Funded Health Care. *Canadian Journal on Aging*. Vol. 14, No.2, pp 174-192.
- Duggan, James E., Robert Gillingham, and John S. Greenlees (1995). *Progressive Returns to Social Security? An Answer from Social Security Returns*. Research Paper No. 9501. Office of Economic Policy, U.S. Department of the Treasury, Washington, D.C..
- Duleep H. (1986). Measuring the Effect of Income on Adult Mortality Using

- Longitudinal Administrative Record Data, *The Journal of Human Resources*, XXI (2), Spring, pp 238-251.
- Duleep H. (1989). Measuring Socioeconomic Mortality Differentials Over Time, *Demography*, vol. 26, no. 2, May, pp 345-351.
- Evans, R. G., M. L. Barer, and G. L. Stoddart (1995). User Fees for Health Care: Why a Bad Idea Keeps Coming Back (Or, What's Health Got to Do with It?). *Canadian Journal on Aging*. Vol. 14, No. 2, pp360-390.
- Feinstein, J. (1993) The Relationship Between Socioeconomic Status and Health: A Review of the Literature, *The Millbank Quarterly*, Vol. 71, No. 2, pp 279-322.
- Feldstein, Martin S. (1974). Tax Incidence In a Growing Economy With Variable Factor Supply, *Quarterly Journal of Economics*, November, Vol. 88, pp. 551-573.
- Fellegi, Ivan P. (1989). Can We Afford an Aging Society? *Canadian Economic Observer*. October.
- Frank, John W. (1995). Why Population Health? *Canadian Journal of Public Health*, May-June, Volume 86, No. 3, Toronto.
- Freiden, Alan, Dean Leimer, and Ronald Hoffman (1976). Internal Rates of Return to Retired Worker-Only Beneficiaries Under Social Security, 1967-70, *Studies in Income Distribution*, No. 5, Office of Research and Statistics, Social Security Administration, October.
- Friedman, M. (1972). Second Lecture, in W. Cohen and M. Friedman, *Social Security: Universal or Selective?* American Enterprise Institute: Washington, D.C..
- Goss, Stephen C. (1995). *Analysis of Relationship Between Mortality and Income Level: Implications for a Money's Worth Analysis*. Social Security Administration memo, March.
- Government of Canada (1986). *Achieving Health for All: A Framework for Health Promotion*. Health and Welfare Canada, November.
- Hadley, J. and A. Osei (1982). Does Income Affect Mortality? An Analysis of the

- Effects of Different Types of Income on Age/Sex/Race-Specific Mortality Rates in the United States, *Medical Care*, XX (9), September, pp 901-914.
- Havens, Betty and Marcia Finlayson (1996). *Income and Prosperity as Determinants of Health Among Older People*. Draft, Under Review. University of Manitoba.
- Hertzman, Clyde (1996). *What's Been Said and What's Been Hid. Population Health, Global Consumption, and the Role of National Health Data Systems*. Centre for Health Services and Policy Research, UBC, February.
- Hirdes, John and William F. Forbes (1989). Estimates of the Relative Risk of Mortality Based on the Ontario Longitudinal Study of Aging. *Canadian Journal on Aging*. Vol. 8, No. 3, pp 222-237.
- Hurd, Michael D. and John B. Shoven (1985). The Distributional Impact of Social Security, in David A. Wise (editor), *Pensions, Labor, and Individual Choice*, Chicago: University of Chicago Press, pp 193-215.
- Kitagawa, Evelyn and Philip Hauser (1973). *Differential Mortality in the United States: A study in Socio-Economic Epidemiology*. University of Chicago.
- Kollman, Geoffrey (1995). How Long Does It Take New Retirees to Recover the Value of Their Social Security Taxes? *CRS Report for Congress*, Congressional Research Service, Library of Congress, January.
- Leimer, Dean R. (1995). A Guide to Social Security Money's Worth Issues. *Social Security Bulletin*. Vol. 58, No. 2, Summer, pp 3-20.
- Menchik, P. (1993). Economic Status as a Determinant of Mortality Among Nonwhite and White Older Males: Or, Does Poverty Kill? *Population Studies*, vol. 47, pp 427-436.
- Meyer, Charles W. and Nancy L. Wolff (1987), Intercohort and Intracohort Redistribution Under Old Age Insurance: The 1962-1972 Retirement Cohorts, *Public Finance Quarterly*, July, Vol. 15, pp 259-281.
- Moore, Eric G. and Mark W. Rosenberg (with Donald McGuinness) (1997). *Growing*

Old in Canada. Statistics Canada, Catalogue No. 96-321-MPE, No. 1, Nelson, Canada, Toronto.

Mustard, J. Fraser, and John Frank (1994). The Determinants of Health. In *The Determinants of Population Health: A Critical Assessment*. Edited by M. V. Hayes, L. T. Foster. University of Victoria.

Myers, Robert J. and Bruce Schobel (1992). An Updated Money's-Worth Analysis of Social Security Retirement Benefits. *Transactions of the Society of Actuaries*. Vol. 44, pp 47-70.

Myers, Robert J. (1993). *Social Security (fourth edition)*. University of Pennsylvania Press, Philadelphia.

_____ (1996). Privatization of Social Security. *Journal of the American Society of CLU and ChFC*. July.

Myles, John and Debra Street (1995). Should the Economic Life Course be Redesigned? Old Age Security in a Time of Transition. *Canadian Journal on Aging*. Vol. 14, No. 2, pp 335-359.

Myles, John and Jill Quadagno (1994). The politics of income security for the elderly in Canada and the United States. In Ted Marmor, Tim Smeeding and Vernon Greene (Eds). *Economic Security and Intergenerational Justice: A look at North America*. pp 61-90. The Urban Institute, Washington, D.C..

_____ (1997). Recent Trends in Public Pension Reform: A Comparative View. In Keith Banting and Robin Boadway (Eds). *Reform of Retirement Income Policy: International and Canadian Perspectives*. pp 247-271. School of Policy Studies, Queen's University, Kingston.

National Council of Welfare (1984). *Sixty-Five and Older*. Minister of Supply and Services Canada, Ottawa.

_____ (1996). *Poverty Profile, 1994*. Minister of Supply and Services Canada, Ottawa.

- Office of the Superintendent of Financial Institutions (1995). *Canada Pension Plan: Fifteenth Actuarial Report as at 31 December 1993*. Ottawa.
- Ontario (1984). *Proposals for Pension Reform*. Queen's Printer for Ontario, Toronto.
- Panis, Constantine W. A. and Lee A. Lillard (1996). *Social Security: Equity, Adequacy, Reforms*. RAND Labor and Population Working Paper.
- Pappas, G., S. Queen, W. Hadden, and G. Fisher, The Increasing Disparity in Mortality Between Socioeconomic Groups in the United States, 1960 and 1986, *New England Journal of Medicine*, vol. 329, no. 2, July, pp 103-109.
- Quebec (1995). *Actuarial Report of the Quebec Pension Plan as at December 31, 1994*. Regie des rentes du Quebec.
- Rejda, George E. (1994) *Social Insurance and Economic Security (fifth edition)*. Prentice Hall, Englewood Cliffs, New Jersey.
- Robert Stephanie, and James S. House (1996). SES Differentials in Health by Age and Alternative Indicators of SES, *Journal of Aging and Health*. Vol. 8, No.3.
- Robson, William B. P. (1995). *Putting Some Gold in the Golden Years: Fixing the Canada Pension Plan*. C. D. Howe commentary, No. 76, Toronto.
- Rogers, R. G. (1992), Living and Dying in the U.S.A.: Sociodemographic Determinants of Death Among Blacks and Whites, *Demography*, 29(2), May, pp 287-303.
- Rogot, R., P. Sorlie, and N. Johnson (1992). *Life Expectancy by Employment Status, Income and Education in the National Longitudinal Mortality Study*. Public Health Reports, July/August.
- Rosen, S. and P. Taubman (1979). Changes in the Impact of Education and Income on Mortality in the U.S. in L. Delbene and F. Scheuren, editors, *Statistical Uses of Administrative Records with Emphasis on Mortality and Disability Research*. Social Security Administration: Washington, pp 61-66.
- Simons, Ronald L. and Gale E. West (1985). Life Changes, Coping Resources, and Health Among the Elderly. *International Journal on Aging and Human*

- Development*. Vol. 20 No. 3, pp 173-189.
- Sorlie, P., E. Rogot, R. Anderson, N. Johnson, and E. Backlund (1992). Black-White Mortality Differences by Family Income, *Lancet*, 340, August, pp 346-350.
- Steuerle, C. Eugene, and Jon M. Bakija (1994). *Retooling Social Security for the 21st Century*, The Urban Institute Press, Washington, D. C..
- Wilkins, Russell, and Owen Adams (1978). *Healthfulness of Life*. Institute for Research on Public Policy. Montreal.
- Wilkins, Russell, O. Adams, A Brancker (1990). *Changes in Mortality by Income in Urban Canada from 1971-1986*. Health Reports, Vol. 1, No. 2.
- Wilkinson, R. G. (1992). Income distribution and life expectancy. *British Medical Journal*. Vol. 304, pp 165-168.
- Wolfson, Michael, G. Rowe, J. F. Gentleman, M. Tomiak. (1990). *Earnings and Death Effects Over a Quarter Century*. Statistics Canada, Analytical Studies Branch, Social and Economic Studies Division, No. 30.
- Wolfson, Michael, and B. Murphy (1994). Kinder and gentler: income security for the elderly in Canada and the United States. In *Economic Security and Intergenerational Justice: A Look at North America*. Ted Marmor, Tim Smeeding, and Vernon Greene Editors. The Urban Institute. pp 227-251, Washington.
- World Bank (1993). *World Development Report. Investing in health. World development indicators*. Oxford University Press, New York.
- World Health Organization (1986). *Ottawa Charter for Health Promotion*. Ottawa.

