The Effect of Health on Retirement

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The Social Security Amendments of 1983 provided that the age of first eligibility for full social security retirement benefits would gradually increase from age 65 to age 67 early in the next century. The amendments also called for a study of the implications of that change for persons who, because they are in ill health or in physically

demanding jobs, may not find their lifetimes increased as a result of general improvements in longevity.

This article, which is one of the background papers to that study, analyzes the influence of health on the timing of retirement. After reviewing the specific effects of the amendments on future retirement benefits, it presents a theoretical model of retirement timing that includes the influence of health and the effects of social security benefits. The author then reviews some recent empirical research on the role of health in the retirement decision, explores how health has been measured in these studies, and reviews the research on health and retirement that has explored differences in the effects of health based on occupation, race, and sex. The final section assesses research findings and draws some tentative conclusions.

I. Introduction

The Social Security Amendments of 1983 gradually will increase the age of initial eligibility for **full** social security retirement benefits from age 65 to age 67. This change, designed to help eliminate the projected long-term deficit in the social security program, is estimated to reduce future costs of the old-age and survivors insurance (OASI) program by an average of 6.3 percent per year over the next 75 years.

Given continuing gains in average life expectancies, a 2-year increase in the full retirement age is justified in part by the desire to maintain an approximately constant ratio of expected years of work to expected years of retirement.[1] The effect of the change will be to lower lifetime social security benefits for most workers. If longer life expectancy also reflects an increased capacity for work in a person's later years, workers may choose to postpone retirement by all or part of the 2-year increase in the full retirement age. Earnings from these additional years of work will offset some of the expected loss in lifetime benefits from social security. Because retirement benefits are increased for each year in which retirement is delayed, if receipt of benefits is delayed long enough, workers can receive nearly the same level of **annual** social security payments that they would have received absent the increase in the full retirement age. However, because the new system will be approximately neutral with respect to the age of retirement, it will not be possible for workers to maintain the same level of **lifetime** benefits from the system by delaying their retirement.

It is unlikely that all workers will be able to work for more years. In particular, workers in poor health may not share the gains in either life expectancy or work capacity. As a result, these workers could suffer larger-than-average reductions in social security retirement income compared to the benefits they would have received if the full retirement age had not been increased. Even if workers in poor health somehow are able to delay their retirement, the extra years of work may be especially burdensome for them.

This article considers the influence of health on the timing of retirement, defining retirement as complete or nearly complete withdrawal from the labor force, with coincident initiation of social security and pension retirement income receipt. The specific issues addressed are:

(1) Given what we know about the reasons for retirement, what will be the probable response of the average aged worker to an increase in the full retirement age?

(2) Will older workers in poor health adjust the length of their working careers to the same extent?

(3) Depending upon the answers to the previous questions, what changes can older workers expect in

their retirement incomes as a consequence of the increase in the full retirement age?

Section II reviews the specific effects of the Social Security Amendments of 1983 on future retirement benefits. Section III presents a simple theoretical model of the timing of retirement that includes the influence of health and the effects of social security benefits. The model is used to predict the effects of the changes in the full retirement age on the timing of retirement. Section IV reviews some recent empirical research on the role of health in the retirement decision with particular regard to what the results imply about the response of those in poor health to a change in the social security full retirement age. Section V explores the important issue of how health has been measured in these studies, and whether or not improper measurement has led to an overestimate of the effect of health on retirement. Section VI briefly reviews the scant research on health and retirement that has explored differences in the effects of health based on occupation, race, and sex. Section VII concludes with an assessment of the research findings and draws some tentative conclusions.

II. Changes in the Age of Retirement as a Result of the Social Security Amendments of 1983

The Social Security Amendments of 1983 significantly changed the relationship between the age of retirement and the percentage of full social security retirement benefits payable to a worker upon retirement. Full social security retirement benefits currently are payable to workers retiring at age 65. Early retirement benefits are available to those retiring prior to age 65, but benefits are permanently reduced by six and two-thirds percent for each year prior to age 65 in which benefits are received. The earliest age at which retirement benefits are available is age 62. At that age, retirees receive annual payments equal to 80 percent of the full benefit amount. If retirement is delayed beyond age 65, workers receive a permanent increase in benefits, called the delayed retirement credit (DRC), of 3 percent per year for each year retirement is postponed up to age 70. Beyond age 70 there are no further adjustments for additional years of delayed retirement.

The 1983 amendments will raise the age of full retirement to age 67 in two steps. Beginning with workers reaching age 62 in the year 2000, the age of full benefits will increase by 2 months per year for 6 years. It will remain at age 66 for workers reaching age 62 during the next 11 years, and then again increase by 2 months per year beginning with workers reaching age 62 in 2017. For workers reaching age 62 in 2022 or later, age 67 will be the age of full retirement.

Early retirement benefits still will be payable at age 62. However, the reduction factor of six and two-thirds

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[1] Calculations by Bayo and Farber (1981) and McMillen (1984) suggest that the full retirement age would have to be increased by more than 2 years to maintain an equivalent retirement age into the next century.

percent per year will apply only for the first 36 months prior to the age of full retirement. Retirement before that time will cause a reduction in benefits of 5 percent per year. Thus, age 62 retirees will receive payments equal to 70 percent of their full benefit.

The 1983 amendments also increased the rate at which benefits are permanently increased for each year retirement is delayed beyond the age of full retirement. Beginning with workers turning age 62 in 1987, the current rate of 3 percent per year will increase by one-half of 1 percent every 2 years for the next 19 years. It will reach an ultimate rate of 8 percent per year for workers turning age 62 in 2005 or later.

The effects of the increase in the age of full retirement and in the delayed retirement credit are illustrated in chart 1. This chart shows the percent of full benefits payable for retirement at any age between 62 and 70 under old law, the percent payable with just the increase in the delayed retirement credit, and the percent payable with both the increase in the delayed retirement credit and in the age of full retirement.[2]

The chart illustrates two major points. First, the increase in the delayed retirement credit greatly enhances the returns to postponing retirement beyond the age of full retirement. With just the increase in the delayed retirement credit, **annual** benefit levels (as a percentage of the full benefit amount) rise at a constant rate for retirement between ages 62 and 65, and at a slightly higher rate for retirement between ages 65 and 70. The effect of this increase is to make the system approximately neutral with respect to retirement between the ages of 62 to 70. That is, on average, expected **lifetime** retirement benefits from social security will be nearly the same no matter what age of retirement is selected. The loss from benefits not

received during years in which retirement is delayed will be compensated by the gain from higher annual benefit levels when retirement occurs.

Second, once the increase in the delayed retirement credit is fully in place, the increase in the age of full retirement is close to a proportional cut in retirement benefits of roughly equal magnitude at all retirement ages. For example, annual benefits for workers retiring at age 62 will be 12.5 percent less than if the retirement age had not been increased, annual benefits for workers retiring at age 65 will be 13.33 percent less, and annual benefits for workers retiring at age 68 will be 12.9 percent less.

The increase in the full retirement age also changes the rate at which benefits are increased for delayed retirement between ages 62 and 64. Once both the increase in the full retirement age and in the delayed retirement credit are in place, the rate of increase for each year of delayed retirement will rise in two steps from 5 percent between ages 62 through 64, to 6 and two-thirds percent between ages 64 through 67, and finally to 8 percent between ages 67 through 70.

Together, the two changes will reduce annual benefits for workers retiring up through age 68, but increase benefits for workers retiring after that age.[3] If current retirement patterns continue, most workers stand to suffer a loss. As table 1 shows, more than half of eligible workers begin receiving benefits before age 65, the current full retirement age. By age 69, almost 90 percent of eligible workers have begun to receive benefits.

In the next section we will consider how workers may adjust their lifetime earnings in response to the change in the full retirement age and the delayed retirement credit. Prior to that we first explore other potential responses to a reduction in expected social security benefits.

Many workers may make up the loss in retirement benefits through employer provided pensions and deferred compensation plans or through tax-advantaged retirement savings.[4] An estimated 19 percent of workers covered under private pension plans are in plans that are integrated

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[2]Because the increase in the normal retirement age overlaps the changes in the delayed retirement credit, the line depicting just the increase in the delayed retirement credit actually will not apply to any cohort of retirees. The figure is meant only to illustrate the separate effects of the two changes.

Chart 1

**Percent of
full benefits**

Retirement age

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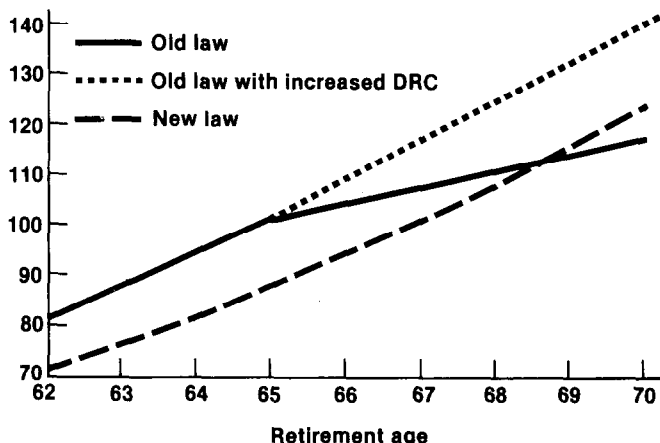
[3]In addition to provisions affecting coverage and benefits paid to Federal, postal, and nonprofit employees, and benefits paid to the spouse or survivor of a retired worker, the 1983 amendments contained the following other major provisions.
1. Delay automatic cost-of-living adjustments by 6 months in every year.
2. Subject one-half of benefits to Federal income taxes for persons with income above certain thresholds.
3. Raise payroll taxes on the self-employed to equal the combined employee/employer rate paid on all other earnings.
4. Move up the 1985 scheduled increase in payroll taxes to 1984, and part of the scheduled 1990 increase to 1987.
5. Liberalize the retirement test.
Provisions (1) and (2) will reduce lifetime benefits, the first for all retirees and the second for higher income retirees. Provisions (3) and (4) will not affect benefits but will lower the rate of return that retirees will receive on past payroll tax contributions, marginally for most retirees but significantly for the self-employed. Given the increase in the delayed retirement credit, provision (5) will have almost no effect on lifetime benefits.

[4]Kennell (1984) provides a detailed analysis of the likely response of private pensions to the 1983 Social Security Amendments.

This article was originally prepared as one of three background papers to the Retirement Age Study. The views expressed here are those of the author and not necessarily those of the Social Security Administration; any errors are the responsibility of the author. Another paper can be found on page 5 of this issue and the third appeared in the October 1986 issue along with the report itself.

Technical appendices describing the data bases and techniques used to derive the estimates in the report as well as the background papers commissioned as part of the study are available from the Publications Staff, Office of Research and Statistics, Social Security Administration, Room 921, Universal North Building, 1875 Connecticut Avenue, N.W., Washington, D.C. 20009 or by calling (202) 673-5579.

with social security through some form of offset formula. Payments from these plans are reduced by some fraction of the worker's full social security benefit available at age 65. Unless there is a change in the formula for these plans, private pension benefits will automatically increase in response to the changes in social security benefits from the 1983 amendments.

Under many private plans not explicitly integrated with social security, supplemental benefits are payable for retirement prior to the age of eligibility for social security retirement benefits. These supplemental payments stop when a retiree becomes eligible for social security payments. With a reduction in social security benefits for retirement prior to age 68, there will be pressure on private plans to extend, and in some cases initiate, supplemental payments to offset the loss in social security benefits.

Any change in private pension benefits is likely to involve additional costs. These costs will be born[e] by workers through increased pension contributions or lower wages during their working years, or passed along to future generations of workers. The shifting of current income into deferred compensation or tax-advantages savings will reduce Federal and State personal income tax revenues, shifting some of the cost to the public at large. Even

Table 1.—Estimated percent of workers aged 62 and older with benefits in current payment status, 1984

	Percent			
Sex	Aged 62-64	Aged 65-69	Aged 70-74	Aged 75 and older
Total	¹58	87	96	100
Men.........	²57	89	99	100
Women	³58	85	92	100

¹Includes 12 percent receiving disability benefits.
²Includes 14 percent receiving disability benefits.
³Includes 9 percent receiving disability benefits.
Source: **1983 Annual Statisical Supplement to the Social Security Bulletin.**

if overall pension costs remain constant, there will be pressures to shift the payment schedule of private pension benefits towards higher earlier payments at the expense of reduced benefits later on.

Some future retirees will automatically qualify for higher benefits under other Federal programs. A reduction in social security benefits will be fully offset for beneficiaries who also are eligible for payments under the supplemental security income (SSI) program. Other social security beneficiaries whose benefits would be just high enough to disqualify them from SSI in the absence of the 1983 amendments may also receive full or at least partial compensation from SSI if their social security benefits are reduced.

Because full benefits are available to qualifying workers at any age under the social security disability insurance (SSDI) program, we can expect more older workers to try to establish SSDI eligibility. In 1984, 12 percent of workers aged 62-64 insured under the social security program received of SSDI benefits. Regardless of the new financial incentives, the number of SSDI recipients will increase because disability benefits will be payable to those over age 65. Prior to the 1983 amendments, disability benefit recipients were automatically converted to retirement beneficiaries at age 65. The 1983 amendments changed the conversion age to the full retirement age, and thus, ultimately, disability benefits will be available until age 67.[5]

III. Theoretical Predictions of the Effect of Health and Social Security Benefits on Withdrawal From the Labor Force

The effects of health on the labor-force participation decision in a single period can be illustrated with the standard static labor supply model. However, because retirement is often a permanent decision to leave the labor force that depends upon past and expected future values for certain variables, it is not appropriate to model retirement in a static setting. To illustrate the effects of health on retirement, we employ a simple model of lifetime work and consumption. This model has been used by Crawford and Lilien (1981) and Burtless and Moffitt (1983), among others, to analyze the effects of social security on retirement.[6]

An individual is assumed to face certain limitations on total lifetime wealth that can be expressed in the form of a lifetime budget constraint:

$$A + Y^*R = N^*C \text{ or } C = A/N + Y^*(R/N)$$

[5]The Social Security Administration's Office of the Actuary estimated that offsetting increases in the SSDI program will average about 9 percent of program costs per year over the next 75 years.

[6]Mitchell and Fields (1982) review a number of other studies that have modeled retirement in a lifecycle context.

In the absence of social security, total wealth is the sum of assets at the beginning of the lifetime, A, and earnings from working R years at constant annual earnings of Y. While wealth can be transferred between periods, we will assume for convenience that the interest rate is equal to zero. All wealth is completely spent on average annual consumption, C, over the entire lifetime of N years and thus there are no bequests.

The budget constraint is shown in chart 2 as line **abf.** The slope of the budget line is equal to Y, the return from working an additional year, while the intercept, A/N, is the amount of average annual consumption that can be financed out of initial assets. The horizontal axis measures R/N, the proportion of years spent working.

The objective is to choose R and C to maximize total lifetime utility. Assuming that the utility function is separable in leisure and consumption we can write it as:

$$N{\cdot}U(C) + (N{-}R){\cdot}V$$

U(C) is the utility from consumption per period, and V is the utility from leisure per period. If we assume that the rate of time preference is equal to zero, consumption will be constant in every period. The person is assumed to work a fixed number of hours in each period, so leisure can only be consumed in annual units.

As yet there is nothing in the model that particularly pertains to retirement. Years of not working could come at any age. To make this a model of retirement, we will assume that all N–R years of not working come at the end of the lifetime.

An indifference curve, Q_1, representing equally preferable combinations of R and C also is shown in chart 2. The slope of the indifference curve is equal to the ratio of the marginal utility of an additional year of leisure to the marginal utility from an increase in average annual consumption. Given the position of the indifference curve
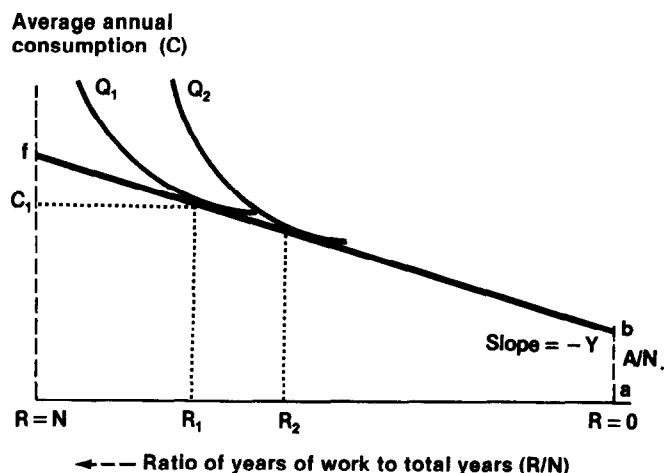
and the budget constraint in the figure, a person will maximize utility by working R_1 years and consuming C_1 each period.
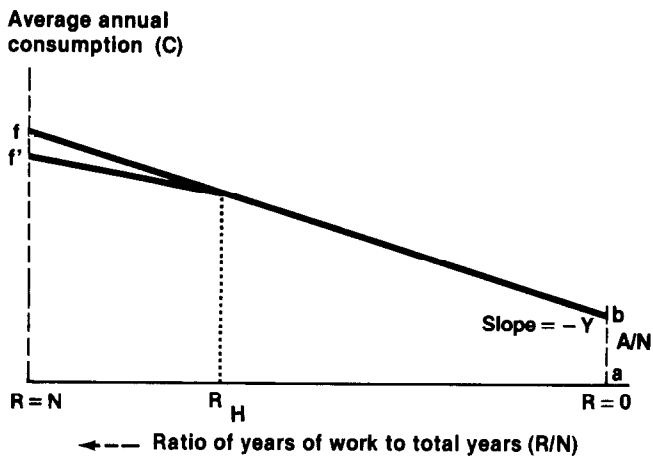
The Effect of Health

The effect of health on the timing of retirement can be seen by manipulating the diagram in much the same way as the traditional analysis of labor-leisure choices in a single period. We will consider three alternative effects of poor health. First, we will assume that poor health changes a person's preferences for leisure and consumption, but leaves market wage opportunities the same. Second, we will assume that market wages are reduced by poor health but preferences remain unchanged. Finally, we will assume that neither market wages nor preferences are changed but that poor health shortens a person's expected lifetime.

If the effect of poor health is to make working more onerous, a person will be willing to give up some consumption in each period for additional years of retirement. This effect is depicted in chart 2 by a clockwise rotation of the indifference curve to position Q_2. The new optimal point will be further to the right on the budget constraint, with retirement coming at $R_2 < R_1$. If poor health increased the relative utility of consumption, the indifference curve instead would rotate counter-clockwise, with retirement coming later than in the health-neutral case.

If poor health does not change preferences but instead reduces average annual earnings, the slope of the budget line rather than the shape of the indifference curves is altered. If poor health is a lifelong condition that depresses market wages, the slope of the budget line will be less at every point. A change in the slope of the budget line will have the same ambiguous effects as in a static model. Because the return to an additional year of work has fallen, there will be a substitution effect leading to an earlier age of retirement. However, because earnings over the entire working lifetime also have fallen, there will be a reduction in real wealth. This reduction in wealth will tend to induce a delay in retirement if both consumption and leisure are "normal" goods in the economic sense that they are positively related to increased wealth. The new tangency point may be at a higher or lower value of R_1. Someone who has received lower earnings over their entire lifetime because of poor health may retire earlier or later than they would have if their health had been good.

However, poor health may not be a lifelong condition but rather may come about abruptly later in life. In this case, potential earnings drop at the point where the health problem begins and the budget line looks something like line **abf'** in chart 3. The budget line has a convex kink at R_H, the age at which deteriorating health is reflected in a drop in wages. [Those] who would have worked beyond that age if they had remained in good health now will face lower earnings if they stay in the labor force beyond

Chart 2

Average annual consumption (C)

◄ – – Ratio of years of work to total years (R/N)

Chart 3

**Average annual
consumption (C)**

Slope = − Y
A/N

R = N   R_H   R = 0

◄── Ratio of years of work to total years (R/N)

Chart 4

**Average annual
consumption (C)**

Slope = − Y
A/N

R = N   R   R = 0

◄── Ratio of years of work to total years (R/N)

that point.

With a decline in expected annual earnings there is
the same substitution effect leading to earlier retirement
as before. However, because expected earnings fall only
late in life, there is only a small reduction in total wealth.
With a negligible offsetting wealth effect, the total effect
of health in this instance will be to induce earlier retire-
ment in most cases. Thus, while some workers facing
a sudden decline in wages may choose to postpone retire-
ment, most workers will choose to retire at the age at
which annual earnings begin to decline. We would expect
retirement ages to cluster at that point as that behavior
is consistent with a variety of indifference curves and
hence a variety of relative preferences for consumption
versus leisure.

Finally, if poor health changes neither earnings nor
preferences but rather reduces the expected length of the
lifetime, both the indifference curves and the budget line
are unchanged from the health-neutral case. This effect
is more difficult to show in the present diagram because
the horizontal axis is partially measured in units of N.
If initial assets are equal to zero, the figure will look the
same as chart 2, because neither the slope of the budget
line nor the indifference curve depends upon N. Thus the
same **ratio** of working years to total years will be chosen.
However, because total years are less, this implies fewer
years of work, fewer years of retirement, and retirement at
an earlier age.

With a positive value for A, the entire budget line will
shift upward, because with N' < N, the ratio of initial assets
to total years is larger. This is shown by line **ab'f"** in chart
4. If consumption and years of retirement are both normal
goods, the person will consume more of both and thus
years in the labor force will decline.

In the face of a shorter expected lifetime, a person with
a positive amount of initial assets will retire earlier than
is necessary to maintain a constant value of R/N, because
by allocating a fixed A over a fewer number of years,
average annual consumption will increase, thus making
an additional year of leisure relatively more valuable.
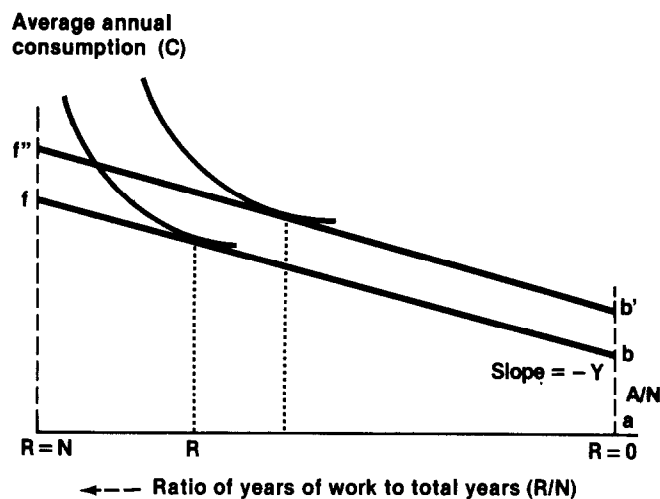
The Effect of Social Security

We now consider how retirement benefits from social
security enter into this model and what this implies for
the timing of retirement. While a full treatment of these
issues is beyond the scope of the article, we can illustrate
some simple implications.[7]

Retirement benefits from social security can change
the intercept of the budget line. If over a person's expected
lifetime the value of benefits exceed[s] the value of
payroll tax contributions, then expected benefits from the
program represent a **total** increase in net wealth. The
budget line will shift upward reflecting this increase in
wealth once a person has worked long enough to become
insured under the program. An evaluation of whether life-
time benefits exceed lifetime taxes depends upon critical
assumptions such as whether to include employer payroll
tax contributions, how to value survivor, disability, and
health insurance for young workers, and the appropriate
rate of discount for future benefits. While it is certain
that on average the current generation of retirees can ex-
pect to receive benefits far in excess of the value of their
payroll tax contributions, it is not clear that the same will
hold true for future generations of retirees.[8]

Social security also can increase the slope of the budget
line. This may occur for two reasons. First, social security
benefit payments are determined by past earnings. If in
each year the addition to expected lifetime benefits from
that year's earnings exceeds payroll tax contributions made
that year, then social security benefits represent a **margi-
nal** increase in wealth. If so, the slope of the budget line
will rise beginning at the point where a worker becomes
insured for benefits. Each year of work returns not only Y

[7]For a more complete treatment of social security, see Crawford and
Lilien (1981), Burtless and Moffitt (1983), and Fields and Mitchell
(1984).

[8]For examples of studies that have looked at the question of whether
or not social security is a poor investment for young workers, see Schreit-
mueller and Nichols (1978), Myers (1982), and Pellechio and Good-
fellow (1983).

in annual earnings, but some additional amount in expected future benefits in excess of payroll tax contributions in that year.[9]

Second, once a person reaches age 62, the year of initial eligibility for retirement benefits, the slope of the budget line also may change because annual benefits are increased for each year retirement is postponed. If the value of the increase in expected future benefits for delayed retirement exceeds the value of the benefits foregone during the year in which retirement is delayed, the returns to working an additional year will be positive.

The current system results in an increase in benefits of eight and one-third percent at age 62 but only 3 percent age 65. These adjustments are such that the increase in future benefits is roughly equal to the value of foregone benefits if retirement is delayed up to age 65, but delayed retirement beyond age 65 results in a net decrease in wealth.

These two effects are shown in chart 5. Assuming the person becomes insured for benefits after working R_0 years, and that the adjustment for retirement prior to age 65 is roughly fair, the new budget constraint can be represented by line **abcdef'**. For simplicity, the new budget line is drawn with a declining slope $Y' > Y$ through age 62, representing a positive but diminishing marginal increase in net social security wealth from working in each of those

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[9]While payroll taxes are a fixed percentage of earnings in each year up to a maximum amount, benefits are a much more complex function of earnings. The benefit formula translates average indexed monthly earnings (AIME) into a primary insurance amount (PIA) which becomes the basis for monthly payments. The AIME is computed by averaging earnings over a fixed number of years after earnings have been indexed to reflect prevailing wage levels in the year a person turns age 60. Once a person works the minimum number of years required to become insured for benefits, each additional year of earnings adds to expected future benefits but at a declining rate. After a person has worked the number of years used in the averaging period, additional earnings can add to future benefits only if they exceed the indexed value of earnings from some previous year. Thus additional earnings for a person who has worked more than the number of years may add little or nothing to future benefits, resulting in negative net marginal social security wealth. Blinder and Gordon (1980, 1981), Burkhauser and Turner (1981, 1982), Gordon (1983), and Sammartino (1982) address this issue in more detail.

Chart 5

Average annual
consumption (C)

◀── ── Ratio of years of work to total years (R/N)
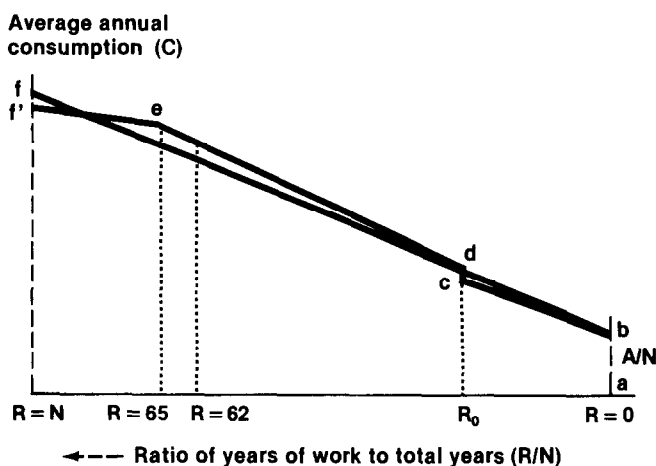
years and a constant slope, Y, through age 65 representing no marginal change in social security wealth for earnings during those years and a neutral adjustment in benefits between ages 62 and 65. Because the adjustment to future benefits is less than fair beginning at age 65, the returns to working an additional year fall at that point and the slope of the budget line is reduced. Because the value of past payroll tax contributions is lost if retirement never occurs, at some point the new budget line will fall below the line representing the budget constraint in the absence of the social security program.

The effect of social security on retirement involves competing income and substitution effects. At all ages prior to the cross-over age the increase in wealth from social security benefits tends to induce earlier retirement. For years in which marginal changes in net social security wealth are positive, there is an offsetting substitution effect tending towards later retirement. For years in which marginal changes in net social security wealth are negative, the substitution effect re-enforces the wealth effect tending toward earlier retirement. Because the returns from working an additional year fall sharply at age 65, there is a kink in the budget line at that point making retirement much more likely at that age.

The effect of social security will be somewhat different, however, for persons in poor health. First, for persons less than age 62, if poor health translates into a shorter expected lifetime, the value of lifetime social security payments will be lower compared to persons in good health. This will weaken the wealth effect of social security which tended to induce earlier retirement. However, a shorter expected lifetime also will reduce the gain in net expected benefits from working an additional year, thereby lessening the substitution effect which tended to induce postponed retirement. Thus, there may be no net difference in the effect of the program between workers in good and bad health.

At age 62, things are quite different. If the returns in expected future benefits from delaying retirement past age 62 are roughly fair for the average older worker, then they necessarily are less than fair for a worker in poor health facing less than the average life expectancy. This will cause a convex kink in the budget constraint at that age, and hence a clustering of retirement at that point. Thus, unless wealth effects are very strong, the substitution effects against continuing to work should re-enforce any other tendencies for older workers in poor health to retire at age 62.

The Effect of a Higher Social Security Retirement Age

We can use the diagram to analyze the expected effects of the increase in the full retirement age and in the delayed retirement credit from the 1983 Social Security Amendments. Chart 6 compares the budget line under current

Chart 6

Average annual consumption (C)

← - - Ratio of years of work to total years (R/N)
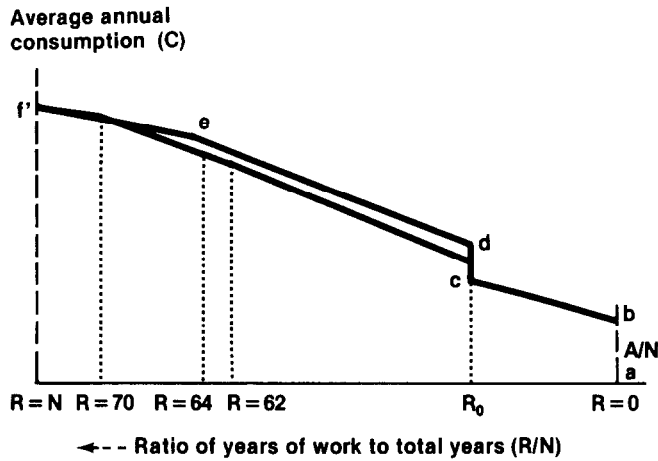
rules with a new budget line that incorporates these changes. First, for someone with the same earnings history, benefits at age 62 will be lower under the new law and, thus, the height of the budget line at age 62 is reduced. Second, by delaying retirement beyond age 62, benefits are permanently increased by less than under the law prior to the changes. Thus the new budget line will have a **reduced** slope from ages 62 to 64. At age 64, the slope of the budget line will be the same as under prior law. Third, at age 65, the budget line will not drop off but will continue to have roughly the same slope until age 67. While the rate at which benefits increase for each year retirement is postponed rises slightly at age 67, it is likely that, considering expected survival probabilities at that age, this increase roughly is enough to just offset the value of foregone benefits. As a result, the budget constraint will have an approximately constant slope from ages 64 to 70. Fourth, because at age 70 future benefits are no longer increased if retirement is postponed there is a convex kink in the budget constraint at that point.

By reducing expected lifetime social security benefits for most workers compared to what they would have received absent the changes in the retirement age, the 1983 amendments will create a wealth effect tending towards postponed retirement. However, because the returns to postponing retirement beyond age 62 will be less under the new law, there will be an offsetting substitution effect at that age. Workers who would have retired at age 62 are likely not to change their behavior a great deal. Indeed, if substitution effects are strong enough, some workers who would have postponed retirement for an additional 1 or 2 years may now retire at age 62.

At age 65, however, the wealth effect in favor of postponed retirement will be re-enforced by the increased returns from working an additional year under the new law. Thus there will be incentives for workers who would have retired at age 65 to remain in the labor force longer. Finally, those few workers who would have retired after age 65 under the current rules will now have much stronger incentives to continue to work.

Summary

To summarize, while not completely unambiguous, the model implies that poor health will lead to earlier retirement in most cases. Second, as long as the value of benefits exceeds the value of payroll tax contributions, social security creates an incentive to retire earlier. These incentives are offset if the marginal value of benefits is less than the marginal value of payroll taxes in any year, but re-enforced if the net marginal value is negative. Third, because older workers in poor health may perceive less value from future social security benefits, the earlier retirement incentives from social security are stronger for those in poor health. Finally, the increase in the full retirement age will lower expected lifetime benefits for all workers, creating an incentive to postpone retirement. The decrease in the rate at which benefits are increased for delayed retirement between ages 62 and 64 will create [an] offsetting effect for early retirees. However, the increase in the delayed retirement credit will be an inducement for workers who would have retired at age 65 to delay retirement. In the next section, we look at empirical research on retirement to see if these implications are supported by the data, and if so, if the effects are likely to be large.

IV. Empirical Evidence of the Effect of Health and Social Security Benefits on Retirement

Empirical assessment of the effect of health on the decision to leave the labor force begins with the simple statistic that, when asked, many people cite health as the reason for retirement prior of age 65.[10] While health is no doubt an important factor in the retirement decision, some analysts believe that it is not quite as important as retirees seem to indicate. They argue that because of social pressures, people will rationalize a retirement decision made for other reasons by citing failing health. The significance attributable to health may mask the effect of economic variables, especially retirement income. Persons may retire because of bad health only when they have sufficient retirement income to allow them to do so.

This suspicion seems to [have been borne] out by changes over time in labor-force participation and social security acceptance rates. Both indicate a continuing trend towards earlier retirement in the face of an apparent trend

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[10]Data from the 1969 wave of the Retirement History Study, a longitudinal survey conducted by the Social Security Administration, showed that for men aged 58–63, 65 percent of the non-labor-force participants cited health as the reason for not working (Schwab, 1974). Fifty-seven percent of the nonworking men aged 62 also cited health as the reason for leaving their last job in the 1968–70 Survey of Newly Entitled Beneficiaries (Reno, 1971). However, in the 1982 New Beneficiary Survey, 32 percent of nonworking men aged 62 cited health as the reason for leaving their last job, compared with 36 percent who cited a desire to retire (Sherman, 1985).

towards improving health among older workers.[11]

Numerous econometric studies have explored this issue using survey data on individuals to determine if those in ill health are more likely to retire. These studies avoid using **ex-post** reasons given for retirement, but generally rely on respondent statements concerning self-assessed health status. In the next section, we take up the issue of the "objectivity" of these health status measures. For now, we merely accept that these studies include some measure of an individual's health.

These studies conclude that persons in ill health are more likely to retire than those reporting no health problems, a quite firm if hardly surprising finding.[12] Answers that are harder to pin down, however, are those to the questions of "How much more likely?" and, more importantly for our current purpose, "Are persons in ill health likely to respond to changes in retirement income in the same way as workers in good health?".

To assess what is known about these questions, we shall consider the results from three of the more recent studies just cited. These studies were selected because they estimated the effects of both health and expected social security benefits on retirement, and they did so in a framework consistent with a lifecycle model of retirement.[13]

Gordon and Blinder (1980) estimated the probability that an individual was no longer in the labor force for a sample of white males aged 58–67. They employed a reservation wage framework in which health status affected both the relative marginal utility of leisure and consumption and the expected market wage rate. Health status was measured by three separate variables in the equation used to estimate market wages: whether or not respondents claimed to have a short-term or a long-term health problem, or if they had left their last job because of poor health. Having either a long-term or a short-term health problem accounted for about a 10 percent drop in wages.[14]

In the reservation wage equation, health was measured by asking whether respondents considered their health to be worse than others of the same age.

Overall, Gordon and Blinder found poor health to be a moderately important cause of retirement. For a typical member of their sample the range of predicted retirement probabilities from their model was 14 percent at age 58, 37 percent at age 62, 65 percent at age 65, and 75 percent at age 67. They found that for workers aged 60 to 67, poor health increased the probability of retirement by fourteen to eighteen percentage points, depending on the age of the worker. The effect was greatest for workers aged 62–64, and the least for workers at either end of the age range.

In contrast, an increase of about 14 percent in their measure of social security benefits had almost no effect on the probability of retirement. This is not to say that all economic variables were unimportant. An increase in the expected wage rate of about 40 percent decreased the probability of retirement by four to thirty-five percentage points, depending on age.

In a study that estimated the joint decision of when to retire and the number of hours of work after retirement, Burtless and Moffitt (1983) found that for sample members with otherwise average characteristics, those reporting themselves in poor health were predicted to retire approximately 1.1 years earlier than those reporting normal or above-average health. In contrast, raising the average social security payment by over 20 percent would cause the average age of retirement to decline by just under 3 months.

Gustman and Steinmeier (1983a) developed a model in which health affected the probability of a worker being in one of three categories: working full-time, partially retired, and fully retired. Health variables, specified in the same way as in the Gordon and Blinder study, were included in the equation for market wage rates and in the preference function for work versus retirement. A long-term health problem beginning at age 55 was estimated to decrease the average age of full retirement by 2.8 years. Gustman and Steinmeier decomposed this effect into the component operating through the wage equation and the component operating through the preference function. The

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[11]This trend may be more apparent than real. Mortality rates clearly have been improving over time. Yet in a recent study, Baily (1985) reports that trends in both health survey data and social security disability program data indicate that health as measured by ability to work may be declining for persons over age 45. In comments on an earlier draft of this paper, Wayne Vroman indicated that data from the Current Population Survey showed that, in 1973, 10.2 percent of men aged 55–59 did not work during the year and 6.9 percent said [it] was due to poor health, while, in 1983, 17.6 percent of men in the same age range did not work, with 9.7 percent citing poor health.

[12]This is a consistent result in recent retirement research. See, for example, Boskin and Hurd (1978), Burkhauser (1979), Burtless and Moffitt (1983), Clark and Johnson (1980), Cullinan (1979), Diamond and Hausman (1983), Gordon and Blinder (1981), Gustafson (1982), Gustman and Steinmeier (1984), Hanoch and Honig (1983), Hausman and Wise (1983), Hurd and Boskin (1981), Quinn (1977), and Reimers (1977). Only Boskin (1977) produced a contradictory result. He found that poor health, as measured by reported hours ill in that year, had a statistically insignificant but negative effect on the probability of retirement.

[13]Danziger, Haveman, and Plotnick (1981) and Mitchell and Fields (1982) present a more complete review of recent research on retirement.

[14]The third health variable had an extremely large effect. However, Gordon and Blinder felt that because this variable was so highly correlated with non-participation in the labor force, the estimated effect was biased by the problem of **ex-post** rationalization of retirement.

preference function component accounted for 2.7 years of the total decrease.

The effect of health on the probability of full retirement was found to vary by age. The greatest effect was for workers aged 62–64, with the probability of being fully retired at those ages increasing by over 31 percent on average for persons with poor health. In contrast, a long-term health problem increased the probability of being retired by 20 percent at either age 60 or age 67.[15]

Response to an Increase in the Social Security Retirement Age

These studies suggest the likely response to changes made by the 1983 amendments.[16] Evidence for Blinder and Gordon suggests that for the average worker there will be almost no adjustment in retirement age if health status remains constant. The results from Burtless and Moffitt suggest that there will be some adjustment, but considerably less than even a full year's delay in retirement. According to their model a 10-percent decrease in expected social security benefits would cause a postponement of retirement by about 1 month.

Gustman and Steinmeier (1983b) explicitly simulated the effects of the 1983 Social Security Amendments. They found that the combined effects of all the changes made by the amendments would be to increase the average age of full retirement by just under 2.5 months. The effects were found to differ by age. The simulations indicated that the percentage of workers fully retired would decrease by about one percentage point at ages 62–64 and 67–69, but by about four percentage points at ages 65 and 66.[17]

There is some evidence to suggest that the response of older workers in poor health to these changes in expected retirement income will be different than the average response. Surprisingly, studies of the hours-of-work decisions of older workers suggest that wage and income elasticities may be higher for workers in poor health. Using data from the 1967 Survey of Economic Opportunity, Garfinkel and Masters (1977) estimated labor supply parameters for older men and women. They found that, as expected, labor supply elasticities with respect to changes in wages and income levels were greater for older workers than for prime aged males. They also found that the elasticities were even greater for unhealthy older males.

Lambrinos (1982) found the same results. Using the 1972 Social Security Survey of Disabled and Nondisabled Adults, he estimated separate labor supply equations for groups of healthy and unhealthy individuals. His results indicated that the unhealthy sample had much higher income and wage elasticities than the health sample.

These results suggest that older workers in poor health may be more price and income sensitive than healthy older workers. However, Lambrinos has argued that his results were obtained for different reasons. First, because unhealthy workers generally work fewer hours than healthy workers, they may have more flexibility to adjust their hours in response to price and income changes. Second, because there likely is more variation in health status among the unhealthy, the wage variable may have captured some additional effects of poor health.

Some retirement studies have shown that older workers in poor health are more responsive at least to the availability of retirement income. Quinn (1977), who was one of the first to explore this issue, found that:

> ... health status is important for the retirement decision for two reasons. It has a significant effect on its own, and it also interacts with other explanatory variables. White married men who are healthy are very likely to be in the labor force (and 95 percent of this sample are) and are relatively insensitive to the variables analyzed here. Those with health limitations, on the other hand, have much lower participation rates (73 percent) and are much more likely to respond to financial conditions that are favorable to retirement, such as the presence of asset income or eligibility for retirement benefits.

Gustafson (1982) also found that eligibility for a pension or social security benefit reduced the probability of labor-

[15]Studies of the labor-force participation of prime-aged males have found similar results regarding the effect of poor health on the decision to leave the labor force. See, for example, Berkowitz and Johnson (1974), Grossman and Benham (1974), Haveman and Wolfe (1981, 1983), Luft (1975), Parsons (1977, 1980), and Scheffler and Iden (1974). There is less unanimity here about the relative importance of health as compared to the growth in transfer payments, particularly social security disability benefits, in explaining the declining trend in labor-force participation rates for this age group. Parsons (1980) found that health was an important factor, but concluded:

> The recent decline in labor-force participation of prime-aged males can be largely explained as the response of prime-aged males in poor health and with low income potential to increasingly attractive welfare opportunities.

Haveman and Wolfe (1981, 1983) contend that while the increasing generosity of disability transfer payments has had an effect on the work choices of older workers, the effect has been small. They found that during the period from 1968 to 1978, increases in average real social security disability payments accounted for at most 1.8 percentage points of the 12 (4.5) percentage point decline in the participation rate for males ages 55–64 (45–54).

[16]The predictions from these studies concerning the effects of changes made by the 1983 Social Security Amendments should be viewed with some caution. These models were all estimated with the same data source, the Longitudinal Retirement History Survey, which contains information on retirement behavior during the early 1970's. Because of the large, unanticipated increases in social security benefits during that period, including an increase of 20 percent in 1972, this behavior may be atypical. In addition, there have been many changes in the rules governing benefit payments since that time. Benefits were not indexed for inflation until 1975, past earnings were counted in nominal terms for workers reaching age 62 before 1979, and retirement benefits were increased by only 1 percent for each year retirement was delayed past age 65, also for workers reaching age 62 prior to 1979.

[17]Fields and Mitchell (1984) simulated the effect of separate changes similar to those included in the 1983 Social Security Amendments. They found that raising the age of full retirement from 65 to 68 without any changes in the way benefits are adjusted for early or delayed acceptance would increase the average retirement age by 1.6 months. The model upon which these simulations are based, however, did not include any direct effects of health status on the probability of retirement.

force participation and that this reduction was even greater for workers in poor health. However, because so many sample members were eligible for social security benefits in both studies (at least 94 percent of those who had reached age 62 in Quinn's sample), these results are not conclusive.

Studies that have estimated retirement elasticities reached different conclusions. Burkhauser (1979) segmented his sample into those in ill health and those not and estimated the effect of assets and earnings, among other variables, on the probability of accepting an early pension. He found that there [were] no significant differences in the set of estimated coefficients for the two separate equations.

However, Gustman and Steinmeier (1985) found a generally more inelastic response to retirement income changes by those in poor health. They found that the effect of changes in social security benefits from the 1983 amendments was to decrease the probability of full retirement for unhealthy individuals aged 65–69 by about one-half the percentage point decrease for those in good health. Because a higher percentage of the unhealthy were fully retired, the percentage decrease for those in poor health was only two-fifths as large as the change for those in good health.

Summary

In summary, retirement research has established a significant effect of health on the probability of retirement. Those in poor health, but whose health problems are not severe enough to keep them bedridden or completely unable to work, are likely to retire from 1 to 3 years earlier than workers in good health with similar economic and demographic characteristics. Some of this research also indicates that the labor supply response to the changes in the 1983 Social Security Amendments is likely to be small. Assuming no change in the health status of the retirement age population, retirement ages are likely to increase by between zero and 3 months on average. These effects will differ by age, with the largest response by workers who would have retired at ages 65 and 66 and the smallest response by workers who would have retired between ages 62–64.

There is much less consistent evidence upon which to predict the response by those in poor health. Among the limited number of studies in which different effects of earnings and retirement income were estimated for those in good and poor health, the Gustman and Steinmeier results suggest that the response of older workers in poor health to the changes in the 1983 amendments will be minimal, perhaps one-half as large as the average response.

V. Measuring Health Status

Much of the research on the effect of health on labor supply, including its effect on labor-force participation,

has been criticized for not adequately measuring "objective" health status. The variables that have been used to measure health vary from study to study. Studies by Boskin and Hurd (1978), Diamond and Hausman (1983), Gordon and Blinder (1981), Hanoch and Honig (1983), Quinn (1978), and Reimers (1977) all have used the response to the question "Does health limit the amount or kind of work you can perform?" Johnson (1977) has criticized this measure because it is not independent of labor supply. Persons whose health limits the amount of work they can do are more likely to be observed out of the labor force at any particular point in time. Moreover, as Cullinan (1979) pointed out, the question asks about people's attitude toward work as well as their ability to work. Individuals with identical physical limitations may not have identical answers if they view their limitations differently.

Studies by Boskin (1977) and Burkhauser (1979) have used a different approach, measuring health status by reported hours ill last year. If hours ill last year captures a long-term health problem, this measure is subject to the same criticism as the activity limitations question. Those who consistently work fewer hours each year are definitionally more likely to be out of the labor force at any particular point during the year. If hours ill captures instead a one-time limited duration health problem, then it is not an effective measure of current health status.

Studies by Burtless and Moffitt (1983) and Clark and Johnson (1980) have avoided the endogeneity problem by using a health status variable that does not ask about work limitations but rather asks respondents to rate their health compared to other persons of the same age. Clark and Johnson used the Fillenbaum-Maddox health index, which combines responses from this self-rated health question, the previously discussed activity limitation question, and additional information on the number of hospital stays and incidences of postponed medical treatment.

Myers (1982) argued that the use of any survey response to questions concerning self-evaluated health is invalid because people have strong incentives to misrepresent their true health status. While he does not offer any evidence, there is little doubt that these incentives exist, particularly if the respondent believes that the information may be used in determining health-related benefits. However, to note that these incentives exist does not establish that they bias estimates of the effects of health in a meaningful way.

The assertion that self-reported health status is an inappropriate measure of true health has become an accepted fact in the retirement literature. Starting with Campbell and Campbell (1976), most research in the retirement area has duly taken note that, because of social pressures, most people have an incentive to misrepresent their health status, and has left the issue at that. Yet public health research does not seem to support the claim that self-reported health is a biased measure of objectively measured health

status. Studies by Nagi (1969), Maddox and Douglas (1973), LaRue **et al.** (1979), and Ferraro (1980) all find that self-reported health status is highly correlated with medically determined health status.[18] Research by Mossey and Shapiro (1982) even found that self-rated poor health was a slightly better predictor of subsequent mortality than objectively determined health status.

Moreover, it is possible that self-evaluated health is actually a better measure of a particular person's ability to work. Objective measures of health status do not control for the specific physical demands of the person's job environment, factors that certainly play a role in self-evaluation. The severity of certain medical conditions may be impossible to measure through objective tests. Individuals may be the only ones who can truly evaluate whether their back pain, for example, is severe enough to keep them from working.

The issue is not whether self-reported health is a biased measure of true health status, but whether it is **systematically** biased. If self-reported health status is an imprecise measure of true health status but uncorrelated with other factors affecting retirement, it still would be a useful predictor of retirement behavior. At issue is whether people assign different values to their health status depending upon their economic situation. A number of studies have tried to determine if using more objective measurements of health in place of self-assessment changes the estimated effect of various other factors on the probability of retirement. The hypothesis tested in these studies is that self-reported health status introduces a bias into the estimation of labor supply equation because self-assessment of health depends upon values of certain economic variables. This bias can be exacerbated if eligibility for certain types of income, such as social security disability benefits, depends upon the determination that an individual is in poor health.

At least four different measures of ''objective'' health status are available from survey data: (1) subsequent mortality, (2) self-assessed health measured prior to retirement, (3) physician ratings according to a functional limitation index, and (4) receipt of disability benefits.

Comparing Self-Reported Health and Subsequent Mortality

Parsons (1982) looked at the effects of poor health and the level of potential social security disability benefits on the labor-force participation of men aged 48–62. Because of the panel nature of the data, he was able to use information on subsequent mortality of sample members as a more objective measure of the health status in the survey year chosen for analysis. Potential social security benefits, as measured by the ratio of expected monthly benefits to the person's monthly earnings, had a strong and statistically significant effect on the probability of nonparticipation, with an elasticity at the mean of the variables equal to 0.63. However, when self-reported health was

used in place of subsequent mortality, the effect of social security was greatly reduced and was no longer statistically significant. Parsons then estimated the effect of potential social security benefits on the probability that an individual reported a health problem, finding a strong, positive effect. Parsons concluded that the simultaneity problem between potential social security benefits and reported health status was severe enough to warrant the use of more objective measures of health status wherever possible.

Parson's findings are less compelling when one more closely considers the variable used to measure the effect of potential social security benefits. The variable was constructed as the ratio of potential monthly benefits to the person's monthly earnings. Because the social security benefit formula is explicitly designed to provide a declining replacement ratio for higher levels of earnings, this variable will be negatively correlated with earnings. Thus, it is likely to pick up both the negative effect of lower wages on the probability of nonparticipation in the labor force, and the negative effect of poor health on wages.

Anderson and Burkhauser (1983) also used subsequentt mortality as a more objective measure of health status. In their study, they estimated a joint model of labor-force participation and health status and found that health status and the probability of retirement were correlated. They reported that, while wages did not have a statistically significant effect on the probability of working when a self-reported measure of health status was used, the effect of wages was positive and statistically significant when mortality was used as a measure of health. They also found that the effect of potential social security benefits on the probability of working was higher when health was measured with a self-reported variable, although the effect in all cases was positive and significant. They concluded that, because low-income workers are more likely to self-report poor health, the inclusion of self-reported health measures biases the estimated effect of variables in retirement models.

The positive effect of potential social security benefits suggests that the way in which the variable was constructed may cause their model to pick up the influence of potential earnings more than the influence of retirement income. The difference in the effect of wages on the probability of working may again reflect the probable negative effect of poor health on wages. If health status was left out of the probability of work equation entirely, it would not be unreasonable to include that a resulting strong positive coefficient on wages would be picking up some of the effect of the omitted health variable. The issue, then, is whether including a measure of subsequent mortality is an adequate control for health status.

The use of subsequent mortality as a measure of health has become a possibility with the availability of longitudinal data that follow cohorts of retirees for many years. Analysis of mortality data for social security recipients by Baker **et al.** (1982) has shown that, among men, age 62 retirees have lower survival rates than men who do not

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[18]Cullinan (1979) offers a strong criticism of Nagi's study, however.

take benefits at that age. There is no significant difference in survival rates among women between those who did and did not take benefits at age 62. Even for men, however, the differences in survival rates were only 3 to 5 percent, much smaller than differences in reported health status.

The use of mortality experience may be a questionable substitute for data on health status. Some people in good health die suddenly while others in poor health may survive for a long time. In testimony before the National Commission on Social Security Reform, Feldman (1982) stated:

> I suggested earlier that a decline in mortality rates can be connected with an increase in morbidity rates. ... the prevalence rate of disabling heart diseases has been increasing throughout the recent period of rapidly declining heart diseases mortality rates. People with disabling heart disease may be surviving longer. This could result in an increase in the size of the disabled population.
> A second point of confusion involves equating of life-threatening conditions with disabling conditions. While there is obviously some overlap between the two sets of conditions, a great deal of disability is caused by conditions that are not lethal. Musculoskeletal conditions are the cause of a large proportion of work disability. Arthritis, for instance, does not appear to shorten one's life to any great extent.

Feldman's first point was addressed in a recent study by Baily (1985). Using age specific mortality rates for males aged 25 to 44 in 1960, Baily calculated the proportion of that cohort that survived until 1980. He then calculated what that proportion would have been if mortality rates had stayed at their 1960 levels. Taking the difference between these two fractions, Baily calculated that only 1.35 percent of the cohort would not have survived if mortality rates had remained constant. Even assuming that all the persons kept alive were disabled in 1980 would add only marginally to the disability rate among males aged 45–67.

Poterba and Summers (1985) also addressed this issue of what they termed "marginal survivors." Using cohort life tables, in which a single birth cohort is followed throughout its life, they calculated that over 9 percent of men and 16.9 percent of women over age 60 in 1980 would not have been alive if everyone had faced the life table of the cohort born 30 years before them. Using cohort rather than age specific life tables, an older population and 30 rather than 20 years of mortality rate improvements account for the differences between their estimates and Baily's.

Comparing Self-Reported Health Before and After Retirement

Other studies have addressed the problem of self-reported health measures without relying on subsequent mortality as a more objective measure. Bazzoli (1985)

estimated the probability of retiring prior to age 65. She examined the possible bias in self-reported health measures by comparing the effect of self-reported health measured in the period prior to early retirement, or reaching age 65 if the person did not retire early, to the effect of self-reported health measured in the period subsequent to retirement or reaching age 65.[19] She found that self-reported health measured after retirement had a greater effect on the probability of retirement than self-reported health measured in periods prior to retirement, suggesting that some self-reported poor health was actually an **ex-post** rationalization for retirement.

Bazzoli also found that expected social security benefits had a statistically significant positive effect on the probability of early retirement, while wages had a statistically significant negative effect. However, both estimated effects were virtually the same whether a prior or subsequent self-reported health variable was included in the equation.

Comparing Self-Reported Health to Independently Measured Health

Chirikos and Nestel (1983) also presented evidence concerning possible biases from using self-reported health status. They looked at the determinants of self-reported health status to see if economic factors were important determinants of reported health. Expected wage rates were found to have a positive and significant effect. A 10-percent drop in the expected wage rate raised the probability of reporting a disablement by 1.3 percentage points for white women and by about twice that for black women and white males. The effects for black men were even greater. Chirikos and Nestel controlled for "true" health status by using an index of impairment that summarized the degree of reported functional limitations.

These results again leave us with the issue of which variable is a better measure of true health status. Chirikos and Nestel showed that, controlling for impairment status and certain physical activities of current jobs, wages are correlated with the probability of reporting a limitation in the amount or kind of work one can do. If self-reported limitations are actually a better measure of "true" health status, at least as it pertains to any effects on wages, then the direction of causality may run from health limitations to wages rather than the reverse.

Their results for the effect of health on labor-force participation found that the coefficients on wages in a regression of hours of work were virtually the same whether self-reported health or an index of impairment was used as an independent variable. For white males, poor health

[19]Bazzoli used two different measures of self-reported health status. The first was the response to the activity limitations question discussed earlier, while the second was the Fillenbaum-Maddox health impairment index. The latter measure was statistically significant whether measured prior or subsequent to retirement while the activity limitations measure was significant only subsequent to retirement, and had a larger effect in either case than the activity limitations measure.

as measured by the impairment index actually reduced hours of work more than the alternative specification in which health status was measured by self-reported limitations in work ability. However, the overall effect of the different health measures, including the impact on predicted wages, was that in all cases self-reported poor health had a greater total reduction on hours of work than poor health as measured by the impairment index.

Summary

Leaving aside the issue of which measure best captures "true" health status, we have left two questions with some corroborating answers to the first and conflicting answers to the second.[20] First, has the effect of health on retirement been overstated in past studies because of the way health was measured? The criticism offered by Johnson and the results reported by Chirikos and Nestel and Bazzoli suggest that it has.

Second, does the use of self-reported health variables lead to biased estimates of wage and income retirement elasticities? Results from Chirikos and Nestel and Bazzoli suggest that it does not, while results from Parsons and Anderson and Burkhauser suggest that it does, at least compared to using subsequent mortality as a measure of health. More results are needed before we can answer either question with any degree of confidence.

VI. Disaggregated Effects of Health on Retirement

All of the results we have considered so far are for males and predominantly for white males. There have been few attempts to determine if the effects of health on labor-force participation are similar for women and minorities or if these effects vary with occupation.

In one of the few studies of the retirement behavior of older women, Honig (1984) estimated a model that allowed for full and partial retirement. She found that the effect of poor health for these women was similar to the effects that have been found for men.

Parsons (1980) looked at the labor-force participation decision of white and black males. Estimating separate equations for the two groups, he found that individuals in poor health, as measured by subsequent mortality, had significantly lower participation probabilities, but that the effect of poor health was about the same for blacks and whites.

In contrast, Gustman and Steinmeier found differences in the effect of health on the probability of retirement for blacks and whites. Descriptive statistics from their data indicated that, for men aged 58 to 72, being in poor health increased the probability of full retirement by about

28 percentage points on average. However, for blacks, poor health increased the probability of retirement by between 40 and 53 percentage points, depending on the worker's type of job. Their estimates of preference functions for work and retirement showed that poor health had a much larger impact towards increasing the disutility of work for blacks than for whites. Poor health also had a larger negative impact on estimated full-time wages for blacks in more physically demanding jobs.

Quinn (1977) and Chirikos and Nestel (1981) tested whether poor health was more likely to lead to retirement in certain types of occupations. Occupations were grouped according to their degree of autonomy, physical strain, and working conditions in the first study, and according to their physical requirements in the latter. Neither study was able to establish a systematic difference by occupation in the effect of poor health on the probability of retirement.

Gustman and Steinmeier (1985) found different results after separating their sample into workers in more and less phsyically demanding jobs. Descriptive statistics from their data showed that, for white workers, the effect of poor health was to increase the probability of full retirement by 30 percentage points for those in more physically demanding jobs, but by 23 percentage points for those in less physically demanding jobs. For black workers, however, the results were reversed. Poor health increased the probability of full retirement for those in physically demanding jobs by 40 percentage points, but by 53 percentage points for those in less physically demanding jobs.

This finding may be the result of the way jobs were classified. Jobs were grouped into more or less physically demanding according to broad occupational categories. As Gustman and Steinmeier point out, within the categories of more or less physically demanding work, jobs may vary a great deal in their degree of physical difficulty. Moreover, the grouping was based on the job held by the respondent at the beginning of the survey. Some workers may have already retired from more to less physically demanding work by that time.

To summarize, retirement research for groups other than white males is sparse and inconclusive at this time. One problem that may confound the existing research is that observed racial or occupational differences may be capturing the effect of unobserved or improperly measured differences in other factors affecting retirement, such as pension coverage and benefit levels or mandatory retirement rules. To separate out such effects, researchers will need to move towards data sources with more precise industry or occupational specific pension data.

VII. Summary and Conclusions

Results from retirement research suggest the following conclusions about health, retirement, and the likely effects of the changes in retirement age made by the 1983 Social

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[20]While not attempting to establish which is the "best" measure, Burtless (1985) at least offers the encouraging finding that health as measured by activity limitations, by comparison to others the same age and by subsequent mortality are highly correlated.

Security Amendments. First, after controlling for non-health-related factors, it is clear that older workers who are in poor health retire earlier than workers with similar economic circumstances who are in good health. Second, the research reviewed here tends to indicate that the response of the average worker to the changes made in the social security full retirement age by the 1983 amendments will be small. Estimates suggest than the average increase in the retirement age will be between zero and 3 months. Finally, while the evidence is much less certain, research results suggest that older workers in poor health may respond even less than the average worker.

It is not possible to say precisely what will happen to lifetime incomes as a result of these changes. A small labor supply response suggests that not much of the lost social security benefits will be made up by additional earnings, either for workers on average or for workers in poor health. However, earnings are only part of the total income picture. Other than a brief mention, this article has not addressed how workers may adjust their savings behavior, or how private pensions may adjust, and particularly whether the potential for adjustment through these avenues is the same for workers in poor health as for the average worker.

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