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ABSTRACT

While numerous studies have examined how health affects retirement behavior, few have analyzed the impact of retirement on subsequent health outcomes. This study estimates the effects of retirement on health status as measured by indicators of physical and functional limitations, illness conditions, and depression. The empirics are based on six longitudinal waves of the Health and Retirement Study, spanning 1992 through 2003. To account for biases due to unobserved selection and endogeneity, panel data methodologies are used. These are augmented by counterfactual and specification checks to gauge the robustness and plausibility of the estimates. Results indicate that complete retirement leads to a 23-29 percent increase in difficulties associated with mobility and daily activities, an eight percent increase in illness conditions, and an 11 percent decline in mental health. With an aging population choosing to retire at earlier ages, both Social Security and Medicare face considerable shortfalls. Eliminating the embedded incentives in Social Security and many private pension plans, which discourage work beyond some point, and enacting policies that prolong the retirement age may be desirable, ceteris paribus. Retiring at a later age may lessen or postpone poor health outcomes for older adults, raise well-being, and reduce the utilization of health care services, particularly acute care.

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I. Introduction

Despite rising life expectancy, the average age at retirement has been declining over the past four decades. Social security data indicate that the retirement age for men declined from 68.5 to 62.6 years, and that for women declined from 67.9 to 62.5 years (Gendell, 2001).[1] With an aging population retiring earlier, Social Security will pay out more in benefits than it collects in payroll taxes by 2018, and these deficits are expected to exhaust the trust fund by 2042. In a recent study, Gruber and Wise (2005) note that many countries have benefit structures that discourage work by lowering lifetime benefits to people who work longer. There are strong incentives to retire built into the U.S. Social Security system as well as many private pensions (Quadagno and Quinn, 1997). The unfunded liability facing Medicare is six times that of Social Security, and the hospital trust fund will be depleted far sooner than the projected date for Social Security. These trends and the financial difficulties facing Medicare and Social Security have prompted policymakers to press for several reforms including an increase in the retirement age.[2]

While the decision to retire is driven by a myriad of factors including financial readiness, health changes, survival expectations, health insurance, and preferences towards leisure, the decision is often constrained by occupational and firm choice, and by economic incentives built into the public and private pension systems.[3] In a recent survey by the Hudson Employment Index, 15 percent of workers reported that their firms encouraged older workers to retire, and 26

[1] Similarly, data from the Health and Retirement Study and the Retirement and History Study show that the large spike in retirement at age 65 has fallen whereas the spike at age 62 has increased over the last 30 years. (Gutman, and Steinmeier, 2000).

[2] As of 2002, the retirement age for full social security eligibility was raised to 67 for those born in 1960 or later. This therefore does not affect those born in 1937 or earlier. (There is a gradual increase in the retirement age from 65 to 67 for those born between 1937 and 1960. Those born in 1938 fully retire at 65 and 2 months; those born in 1955 retire at 66 and 2 months, and so on.) See http://www.socialsecurity.gov/ for full details on retirement ages.

[3] See Coile and Gruber (2000) and Mitchell and Fields (1984) for how economic incentives embedded in Social Security and pension plans influence retirement.

percent of workers in government occupations reported that retirement is actively promoted.[4] Whether early retirement is individually or socially optimal depends on how retirement affects subsequent health status. While numerous studies have examined the effects of changes in health on retirement behavior, research on how retirement impacts health status has been sparse. The objective of this study is to analyze the effects of full retirement on outcomes related to physical and mental health. We are careful in noting that the effect we are looking at is not that of retirement per se, but rather the change in environment that encompasses retirement, leading an individual to invest more or less in his or her health. If retirement improves health outcomes, then evaluation of policies that prolong retirement should account for the effect on health. In the presence of negative health effects, policies that aim to push the retirement age upwards may be desirable. A higher retirement age, by postponing or reducing poor health outcomes, will also consequently reduce the utilization of health services by older adults, which has implications for the projected increases in Medicare expenditures.

The human capital model for the demand for health (Grossman, 1972, 2000) provides the foundation for analyzing how withdrawal from the workforce affects the accumulation of health capital. The empirical specifications are based on the first six waves of the Health and Retirement Study (HRS), spanning 1992 through 2003. The HRS is a longitudinal data set collected for the purpose of analyzing life-cycle changes in health, labor force behavior, and economic resources. This study explores the effects of retirement on a variety of health outcomes related to specific diagnosed illnesses, functional and physical limitations, and symptoms indicative of mental health. Individual fixed effects control for unobserved time-invariant individual heterogeneity. The analysis further exploits the multiple observations for each individual along with sample stratification to account for endogeneity. These specifications

[4] Source: http://www.hudson-index.com/.

also shed some light on the mechanisms by which retirement may impact health. Finally, a set of counterfactuals and alternative instrumental variables estimates are provided to gauge the robustness of the results.

The remainder of the paper proceeds as follows. Section 2 reviews prior empirical studies dealing with the interaction between retirement and health. Section 3 outlines the analytical framework that guides the empirical specifications. Section 4 describes the data assembled for use in this study. Section 5 presents the results, and Section 6 concludes with a discussion.

II. Relevant Studies

The decision to retire is affected by a number of factors, including the availability of health insurance, Social Security eligibility, financial resources, and spousal interdependence. Several studies have also pointed to health status as a significant determinant. Workers in poor health, who suffer from activity limitations and chronic health conditions, are found to retire earlier than those who are healthy (Belgrave et al., 1987). Dwyer and Mitchell (1999), using data from the HRS, find that health problems influence retirement behavior more strongly than economic factors. Correcting for the potential endogeneity of self-rated health due to "justification bias," men in poor overall health expect to retire one to two years earlier. Similarly, McGarry (2004) finds that those in poor health are less likely to continue working than someone in good health. Using data from the HRS, she notes that changes in retirement expectations are driven to a much greater degree by changes in health than by changes in income or wealth. Several other studies similarly show that poor health motivates early retirement, though the relative impact of health versus economic factors is debated.[5]

[5] See, for example, Lambrinos (1981), Parsons (1982), Anderson and Burkhauser (1985), Bazzoli (1985), and Stern (1989).

In contrast, very few studies have examined the impact in the other direction – that is, how retirement affects subsequent health. Szinovacz and Davey (2004) find that depressive symptoms increase for women post-retirement, especially if retirement is perceived as abrupt or forced, and the effect is reinforced by the presence of a spouse with functional limitations. A similar effect is not found for men. A recent Whitehall II longitudinal study of civil servants by Mein et al. (2003) compared 392 retired individuals with 618 working participants at follow-up to determine if retirement at age 60 is associated with changes in mental and physical health. Their results indicate that mental health deteriorated among those continuing to work, whereas physical functioning deteriorated for both workers and retirees. A follow-up study of 178 Japanese individuals ages 60 and over finds no significant effect of retirement on either mental health or social participation (Sugisawa et al., 1997). However, interactions with age and sex indicated that early retirement among men tended to decrease social contacts and induced social isolation.

A Kaiser Permanente study of members of a health maintenance organization (ages 60-66) compared mental health and other health behaviors of those who retired with those who did not (Midanik et al., 1995). Controlling for age, gender, marital status, and education, retired members were more likely to have lower stress levels and engage in regular exercise. No differences were found between the groups on self-reported mental health status, coping, depression, smoking, and alcohol consumption.

A follow-up study on 6,257 active municipal employees in Finland found an increase in musculoskeletal and cardiovascular diseases among retired men (Tuomi et al., 1991). Ostberg and Samuelsson (1994), on the other hand, find positive effects of retirement on health, as measured by blood pressure, musculoskeletal diseases, psychiatric symptoms, and visits to the

physician. Salokangas and Joukamaa (1991) find mental health improvements but no clear effect on physical health in a study of Finnish individuals between the ages of 62 and 66 years. Bosse et al. (1987) examined psychological symptoms in a sample of 1,513 older men. Controlling for physical health status, analyses of variance indicate that retirees reported more psychological symptoms than workers. Ekerdt et al. (1983a) compared pre- and post-retirement changes in physical health among 229 male retirees with corresponding changes among 409 working peers. Regressions showed no marked difference in the decline in physical health over time across the groups. Another study by Ekerdt et al. (1983b) finds that self-reported claims of better health post-retirement are more likely among men whose retirement entailed the reduction of prior job stresses.

While these studies looking at the effect of retirement on physical and mental health highlight important aspects of the interaction, they are limited in several respects and there is no consensus. Many use self-reported evaluation of health and are based on small selected samples, the results of which may not generalize to the overall population. Most of the studies are also based on individuals in other countries, which have substantially different norms, labor markets, and economic incentives embedded in their pension systems. Thus the results may not be applicable to the U.S. Several studies employ a simple cross-sectional comparison between workers and retirees and ignore the heterogeneity between the treatment and control. Data limitations also preclude an extensive set of controls, and many do not account for changes in income or assets post-retirement. Most importantly, none of these studies account for biases due to endogeneity.

The present study exploits six longitudinal waves of a large nationally representative survey of older adults in the U.S. Diverse health measures, including self-rated health and

objective functional and illness indicators, are used as the dependent outcomes. The HRS data also allow for a rich set of controls, the exclusion of which may have biased other studies. Panel data methodologies and various specification checks are used to overcome unobserved heterogeneity and endogeneity, and disentangle the causal effect of retirement on subsequent physical and mental health status.

III. Analytical Framework

The objective of this study is to assess the extent to which complete retirement impacts health outcomes. This question can be framed within the human capital model for the demand for health (Grossman, 1972, 2000). Grossman combines the household production model of consumer behavior with the theory of human capital investment to analyze an individual's demand for health capital. In this paradigm, individuals demand health for its consumptive and investment aspects. That is, health capital directly increases utility and also reduces work loss due to illness, consequently increasing healthy time and raising earnings.[6] The individual maximizes an intertemporal utility function that contains health and other household goods (Z_t) as arguments:

(1) $U = U(\phi_t H_t, Z_t)$,

where ϕ_t is the service flow per unit stock of health (H_t) and $\phi_t H_t$ is total consumption of health services. Maximization occurs subject to a number of constraints imposed by time and income, the behavior of net investment in the stock of health, and production functions for investment in health and other household commodities.[7] This results in the following first-order condition for each period:

[6] Investment in health capital may also raise earnings by raising the marginal product of labor and consequently the wage rate.

[7] See Grossman (1972, 2000) for a full exposition of the model.

(2) $G_t [W_t + (Uh_t / \lambda) (1 + r)^t] = C_{t-1} [r - \check{C}_{t-1} + \delta_t]$.

In the above equation, G_t represents the marginal product of health capital – that is the increase in healthy time due to a one-unit increase in the health stock, W_t is the wage rate, Uh_t is the marginal utility of healthy time, λ is the marginal utility of wealth, C_{t-1} is the marginal cost of gross investment in health in period t-1 and depends on time and market inputs, $\check{C}_{t-1}$ is the percent change in marginal cost between periods t-1 and t, and δ_t is the rate at which health capital depreciates. The left-hand side denotes the undiscounted value of the marginal product of the optimal stock of health capital at any given age. An investment in the stock of health raises healthy time, allowing the individual to work and earn more. It also directly raises utility, where Uh_t/λ measures the monetary value of the increase in utility due to a one-unit increase in healthy time. The right-hand side contains interest, depreciation, and capital gains components and can be interpreted as the rental price or user cost of health capital. The first-order condition thus equates the marginal benefit and the supply price of health capital for a working individual.

In general, the individual's value of time is the maximum of the wage rate or the monetary equivalent of the marginal utility of time. In a life-cycle framework, the wage rate may fall when the loss of general human capital due to depreciation exceeds gross investment over time. This results in a concave age-earnings profile (Mincer, 1974; Johnson and Neumark, 1996). At some point when the wage falls below the monetary value of time, the individual chooses to retire. For a retired individual the wage rate does not represent the value of time, and

in the above first-order condition the wage is replaced explicitly by the monetary value of the marginal utility of time (Uh_t / λ).

Whether retirement improves or worsens health depends on how retirement affects the marginal benefit and marginal cost of health capital. This in turn depends on whether the marginal value of time has increased or decreased post-retirement. Note that for a retiree, the marginal value of time is necessarily higher than the potential wage rate in that period. However, the relevant comparison is between the earned wage prior to retirement and the marginal value of time post-retirement. If the marginal value of time is constant or decreasing over the life-cycle, then the marginal benefit of investing in health capital is lower post-retirement. If the marginal value of time is increasing over the life-cycle, then this valuation may exceed the pre-retirement earned wage, leading to a higher marginal benefit of health investment.[8] The marginal or user cost of health capital is also affected by the value of time since own time is an input in the production of health investment. For instance if the marginal value of time declines post-retirement, then the time cost of visiting a physician or waiting in a queue to fill prescriptions would be lower. The change in marginal cost relative to the change in marginal benefit partly depends on the relative importance of time versus market inputs in the production of health. If investment in health is more time-intensive relative to other commodities, then a declining value of time may decrease marginal cost more than the decline in marginal benefit, leading to better health.[9] If, consequently, the marginal value of time increases after retirement, then the marginal cost of investing in health will also rise. Under the assumption of health production being sufficiently more time-intensive, investment in health

[8] The monetary value of the marginal utility of time may rise over the life-cycle if the market rate of interest exceeds the rate of time preference for the present.

[9] This result holds constant other factors that determine the marginal benefit and supply cost of health capital. In particular, the comparative static assumes constant marginal utility of income (λ) and consequently constant income.

capital will decline post-retirement.[10] Due to this theoretical ambiguity, the effect of retirement on health status remains an empirical question.

There are other mechanisms which may further explain how investments in health may be affected subsequent to retirement. Prior studies (Cohen, 1988, 2004; Melchior et al., 2003; Putnam, 2000; Glass et al., 1999) suggest that social interactions are strongly associated with physical and mental health. With social interactions in the form of external memberships and church attendance on the decline, social support or networks formed at work take on added importance and may buffer individuals from shocks that may otherwise impact health (Saffer, 2005; Cole et al., 2002; Sobel, 2002; Putnam, 2000). The transition from work to full retirement, by reducing the degree of social interactions, may have a negative effect on mental and physical health. Sugisawa et al. (1997) find that retirement reduced social contacts for males over the age of 60 and induced social isolation. If social isolation induces depression, for instance, this may also reinforce deterioration in physical health, since both have been found to go hand in hand.[11] The higher social status and respect from others that individuals might obtain from being employed may also diminish upon retirement, inducing depression. On the other hand, to the extent that work is stress-enhancing and utility-reducing, retirement may lead to better physical and mental health. Sternberg (2001) documents how physical and psychological stresses can lead to illness by adversely affecting immune and hormonal responses.

Work and related actions may also be the primary form of physical activity and exercise for many individuals. Grundy et al. (1999) report that 27 percent of males and 31 percent of

[10] The time intensity of health is not relevant under a pure-investment framework for health demand. In this case, where the demand for health has no consumptive aspects, the demand for health capital is positively related to the marginal value of time as long as health is produced with both time and market inputs. Under a pure consumption framework of health demand, health production being more time intensive relative to other commodities is sufficient for an inverse relation between the demand for health capital and the marginal value of time.

[11] Depression is associated with stroke (Jonas et al., 2000), heart failure (Abramson et al., 2001), reduced bone density among the elderly (Robbins et al., 2001), and higher mortality (Blazer et al., 2001; Schulz et al., 2000; Koenig et al., 1999). The direction of causality is not well established and may run in both directions.

females get no regular physical activity outside of work. The positive benefits of physical activity on health indicators, including coronary heart disease, weight, diabetes, hypertension, cholesterol, heart attack and stroke, cerebral blood flow, overall mortality, and depression have been well-documented.[12] Frano et al. (2005), for example, find that moderate and high physical activity not only prolongs life but also increases the number of years free of cardiovascular disease. To the extent that the shift from work to retirement leads to a decline in the frequency or intensity of physical activity, retirement may lead to worse health outcomes, ceteris paribus. On the other hand, physical activity from the working years may be habit forming and may not decline upon retirement, conditional on age effects.

The transition from employment to retirement may also be accompanied by a change in health insurance status, which in turn may affect health outcomes. In this respect, the effects are indeterminate since several possibilities arise. Individuals who are covered under their own or their spouse's employer while working may continue to be covered after retirement. Other individuals may be working for firms that do not extend coverage to retirees. If they retire at age 65, having previously been covered, their coverage would remain uninterrupted since they become eligible for Medicare. However, the amount of coverage and benefits under private insurance and Medicare will differ.[13] If these individuals retire prior to age 65, then they may be uninsured for part of the period before age 65 if they do not purchase private health insurance. Some individuals may have been uninsured at various stages prior to age 65 due to part-time work or unemployment spells, in which case Medicare represents a positive change in coverage. To the extent that retirement decisions are generally made at the same time and in conjunction

[12] See for example Lee and Skerrett (2001), Dorn et al. (1999), Grundy et al. (1999), Oja et al. (1998), Stender et al. (1993), Rogers et al. (1990), and Salonen et al. (1982).

[13] These differences are related to prescription drug coverage, inpatient and outpatient care, and differences in co-payments and deductibles, and further depend on whether the individual opted into Medicare Part B or any other privately purchased Medigap plans.

with prospective coverage, part of the effects on health outcomes may be due to the change (positive or negative) in health insurance status. The transition to retirement also represents a shift in real income, which along with health insurance coverage, affects the demand for health care, preventive services, and other activities that have an impact on health. This study aims to estimate the impact of retirement on health status, conditional on insurance and income or wealth.

Empirically identifying this causal effect of retirement on health is complicated by two issues. First, an individual's retirement behavior and health status may depend on a common set of unobserved factors (for example, life history and time preference). Second, retirement may be endogenous to health. In addition to retirement affecting health outcomes, the literature has also identified causality in the other direction.

Consider linear specifications of the structural demand function for negative health outcomes (H_{it}) and the labor supply function representing retirement (R_{it}):[14]

(3) $$H_{it} = \alpha_1 R_{it} + \alpha_2 X_{it} + \alpha_3 \mu_i + \varepsilon_{it}$$

(4) $$R_{it} = \beta_1 H_{it} + \beta_2 X_{it} + \beta_3 \mu_i + \eta_{it}$$

Equation (3) is a demand function for health (H_{it}), which is a function of retirement (R_{it}), observable characteristics that affect health outcomes such as age, gender, race, and education (X_{it}), and unobservable characteristics pertaining to the individual, such as family background, tolerance towards risk, and the rate of time preference (μ_i). Equation (4) postulates labor supply in the form of full retirement (R_{it}). The vector X_{it} represents observed individual characteristics that determine retirement behavior; these characteristics are the same as the observed determinants of health (X_{it}). Similarly, the vector μ_i denotes unobserved determinants of

[14] The health outcomes function is based on the demand for health model in Grossman (1972, 2000). The retirement function is based on the standard labor supply model (for example, see Borjas, 2004).

retirement that may also influence health. The subscripts refer to the i^{th} individual in time period t. Intercepts are suppressed for convenience.

The parameter of interest is α_1, the structural effect of retirement on negative health outcomes. Ordinary least squares estimation of equation (3) may be biased. This is reflected in equation (5), the quasi-reduced form labor supply function, obtained by substitution of equation (3) into equation (4).

(5) $$R_{it} = (\alpha_2\beta_1+\beta_2 / 1-\alpha_1\beta_1) X_{it} + (\alpha_3\beta_1+ \beta_3 / 1-\alpha_1\beta_1) \mu_i + (\beta_1 / 1-\alpha_1\beta_1) \varepsilon_{it} + (1 / 1-\alpha_1\beta_1) \eta_{it}$$

$$R_{it} = \pi_1 X_i + \pi_2 \mu_i + \pi_3 \varepsilon_{it} + \pi_4 \eta_{it}$$

If there are common unmeasured factors (μ_i) that determine both health and retirement ($\alpha_3 \neq 0$ and $\beta_3 \neq 0$), then such unmeasured factors are likely to be correlated with retirement ($\pi_2 \neq 0$). The possibility that health influences the decision to retire also leads to correlated errors ($\beta_1 \neq 0$, $\pi_3 \neq 0$).

The estimation strategy exploits the longitudinal panels of the data to control for these biases. The Health and Retirement Study is a rich longitudinal data set containing information on parental history, health insurance, and indicators for tolerance towards risk and the rate of time preference. Even with the inclusion of a rich set of controls, however, the possibility of unobserved selection remains. Since observed health outcomes and labor force behavior for older adults are affected by an accumulation of life-cycle factors, there may be unobserved individual characteristics that may have impacted current health status and the decision to retire. The longitudinal aspect of the data allows for the estimation of individual fixed effects models that control for all unobserved time-invariant heterogeneity across individuals (μ_i).

It is also likely that an individual chooses to withdraw from the labor force because of poor health outcomes, conditional on assets or income. The direction of bias due to this

endogeneity or reverse causality can be determined a priori. Since β_1 is positive (negative health outcomes may motivate retirement), the parameter π_3 is also positive, imparting a positive correlation between R_{it} and ε_{it}. Thus, the effect of retirement on adverse health outcomes in the individual fixed effects models may be overstated.[15] To account for this bias, the sample is stratified across individuals who had no major illnesses or health problems in the waves prior to retirement.[16] For these individuals, retirement is much more likely to be exogenous to health. Since they are physically and mentally healthy in the waves prior to retirement, their subsequent retirement cannot have been driven by poor health status. Individual fixed effects specifications estimated for the pre-retirement healthy sample will therefore provide the cleanest post-retirement health effects, for the average healthy individual. The comparison of the full-sample and the stratified-sample marginal effects will also provide an additional check for whether the endogeneity bias is declining in the hypothesized direction.

Further specifications build on these and exploit the longitudinal aspect of the data set to disentangle some of the driving mechanisms by which retirement may impact health outcomes. The social interactions hypothesis suggests that the decline in social buffers after retirement could play a role. If this is the case, then this effect may be offset somewhat by the presence of a spouse. Thus, specifications limited to married individuals should find a smaller adverse effect of retirement (if any) on health relative to unmarried individuals.

The transition from work to retirement may affect health by affecting the level of physical activity. Specifications limited to those individuals who partake in frequent or intense physical activity post-retirement should find a smaller (larger) adverse (positive) health effect of

[15] It can be shown that the bias due to structural endogeneity is equal to $E[\Sigma (R_{it} - \check{R}) (\varepsilon_{it}) / \Sigma (R_{it} - \check{R})^2]$, which is positive if R_{it} and ε_{it} are positively correlated.

[16] This is equivalent to a differenced specification with individual fixed effects.

retirement. The health effects may also differ based on whether the individual's work was physically demanding, and samples are stratified along this dimension.

Work itself may also be a large source of disutility as is often assumed in labor supply models. In this case, the transition to retirement may impart some positive benefits or may buffer other negative effects. Specifications which restrict the sample to those individuals who report that their job involved much stress should find smaller negative effects or larger positive effects of retirement on health, especially indicators of mental health.

In order to disentangle the effects of health insurance status from retirement, and to bypass the potential endogeneity of the retirement decision on health insurance status, models are stratified across individuals who are insured at all points in time. In these models, the effects of retirement on health cannot be due to changes in health insurance status accompanying the retirement decision. If the estimates remain robust, then shifts in health insurance status due to retirement are not likely to be driving the health effects.

IV. Data

The analysis relies on the Health and Retirement Study (HRS), which is conducted by the Institute for Social Research at the University of Michigan. The HRS is an ongoing longitudinal study, which began in 1992 and is repeated biennially. Prior to 1998, the HRS cohort included individuals born between 1931 and 1941, and a separate Study of Assets and Health Dynamics Among the Oldest Old (AHEAD) included individuals born before 1924. The original sample frames of the HRS and AHEAD studies comprised of 12,832 and 8,222 individuals, respectively. Since 1998, AHEAD respondents have been contacted as part of a joint data collection effort with the HRS, and the sample frame was also expanded by including cohorts born between 1924 and 1930 and those born between 1942 and 1947. The present analysis utilizes the first six

waves, spanning 1992 through 2003, and restricts the sample to older adults between the ages of 50 and 75. This yields a maximum sample size of about 65,000 individual-year observations.

The HRS is administered for the specific purpose of studying life-cycle changes in health and economic resources, and includes detailed information on various health outcomes. A series of twelve measures of physical and mental health are created from the data. A dichotomous indicator is defined for whether the respondent self-reports that his or her health is poor. Additional indicators are defined separately for whether the respondent reports that he or she has been diagnosed with the following illnesses: diabetes, heart disease, stroke, high blood pressure, arthritis, and psychological problems. A composite index measuring the number of these illnesses is also defined and ranges from zero to six. An indicator for whether the respondent has cancer or a malignant tumor of any kind (except skin cancer) is also created for a counterfactual test.[17] Excluding ever-smokers and heavy drinkers, and controlling for access to primary care, retirement should not have any effects on cancer in models that control for selection and endogeneity. Additional composite indices are defined to measure difficulties associated with mobility and activities of daily living (ADL). The mobility index ranges from zero to five and indicates difficulties reported by the respondent in walking one block, walking several blocks, walking across a room, climbing one flight of stairs, and climbing several flights of stairs. The ADL difficulties index also ranges from zero to five and indicates difficulties in bathing, eating, getting dressed, getting in or out of bed, and walking across a room. The HRS contains a depression scale, as defined by the Center for Epidemiologic Studies (CES), which ranges from zero to eight. This CESD score measures the sum of adverse mental health symptoms for the

[17] This counterfactual test is not a perfect one. Evidence has been put forth suggesting that some types of cancer are affected by lifestyle, stressing good nutrition and physical activity in cancer prevention (Calle et al., 2003; Doll and Peto, 1981). However, if large negative effects of retirement on cancer are found for non-risk engaging individuals, then the specifications may still be reflecting endogeneity bias.

past week, including if the respondent felt depressed, felt that everything was an effort, had restless sleep, was not happy, felt lonely, felt sad, could not get going, and did not enjoy life. [18] Studies have confirmed the validity and reliability of the CESD scale as a screening instrument for the identification of major depression in older adults (Irwin et al., 1999; Beekman et al., 1997). These measures are chosen since they summarize a broad range of physical and mental health outcomes. These measures are also correlated with lifestyle factors such as diet, exercise, smoking and drinking, which means that they would be most likely to reflect any causal effect of retirement through behavioral channels.[19]

Dichotomous indicators are defined for complete retirement, if the respondent reports that he is retired and not working, and for partial retirement, if the respondent reports that he is retired but continues to work part-time. Individuals otherwise not in the labor force, including homemakers and the disabled, are excluded from the analysis. Individuals who are partially retired are excluded when estimating the effects of complete retirement on health. Similarly, individuals who are fully retired are excluded from specifications estimating the effects of partial retirement. Thus, in both analyses the reference category comprises of working individuals in the labor force, and this facilitates the comparison of marginal effects across models.

Health outcomes differ across several observable socio-economic and demographic dimensions. Indicators for gender, race, ethnicity, marital status, and no religious preference are defined and included in the models. Age fixed effects control for any linear or non-linear declines in health associated with age, allowing the retirement indicator to pick up shocks beyond general age-related health deterioration. Education has also been found to have a positive causal impact on health (Grossman, 2000; Grossman and Kaestner, 1997) As such, the

[18] More information on the CES-D scale can be found in Radloff (1977).
[19] See, for instance, Roberts and Barnard (2005), Kromhout et al. (2002), Hu et al. (2001), Penninx et al. (2001), Vuori (2001), Hermansen (2000), Stampfer et al. (2000), Gorelick et al. (1999), and Wannamethee et al. (1998).

total years of schooling completed is also included in all models. Real income is calculated for each individual from all available sources including earnings, pension, supplemental security, social security retirement, and other government transfers deflated by the consumer price index.[20]

An individual's health status may also depend on access to care, which in turn is a function of health insurance coverage. The respondent's health insurance status is determined from various questions. A coverage indicator is defined for whether the individual reports being covered by health insurance under any governmental program including Medicare or Medicaid, under his own current or previous employer, under his spouse's current or previous employer, or under any other supplemental insurance.

The HRS further contains a rich set of information on other variables that may confound the relationship between retirement and health. The mother's and father's current age or age at death are included in the models. Conditional on the respondent's age, these variables may proxy for genetic endowment as measured by parental life-span. Indicators for whether the mother and the father completed at least eight years of schooling are also included as proxies for parental human capital and early upbringing. An indicator for whether the respondent was born in the U.S. is defined. Tolerance towards risk may further act as a confounding factor in the relationship between health and labor-force behavior.[21] Individuals with a greater tolerance for risk may partake in more risky activities, which may affect health, and work in riskier, higher-paying occupations, which may affect retirement behavior. A categorical index of risk preference can be defined based on hypothetical scenarios where the respondent is asked to

[20] Models were also estimated with alternate measures, including net household assets and net household income. The results are not materially affected. Since these measures are missing for a larger proportion of the sample, reported specifications control for income from all sources instead.
[21] See Saffer and Dave (2005).

choose between a current steady income stream and another higher-paying job with varying probabilities.[22] An indicator for individuals who identify themselves to be the most risk-averse is included in the models. Individuals are also asked about their financial planning horizon. Indicators are constructed for whether the respondent reported planning ahead for the next five to ten years and planning ahead for longer than ten years. Conditional on the respondent's age and retirement status, these variables may proxy for the rate of time preference. Individuals who are more future-oriented (have a high degree of time preference for the future) may make larger investments in health (Fuchs, 1982). All models include dichotomous indicators for year of the interview, to capture unobserved time-varying factors, and indicators for eight census divisions, to capture unobserved differentials in health care and outcomes across the regions.

Additional information from the HRS is helpful in disentangling some of the channels by which retirement may impact health. An indicator is defined for whether the respondent participates in vigorous physical activity three or more times a week. This variable is used to partition the sample into those individuals who remain active post-retirement and those who do not. An indicator is also defined for whether the respondent worked in a job that required a great deal of physical effort all or most of the time. Respondents are also asked whether their job involved much stress all or most of the time. In partitioning the sample along these dimensions, the estimates can be compared to gauge the consistency of the direction of the effect in the context of various different mechanisms. Weighted means for all variables for the full sample and samples stratified across retirement status are presented in Table 1.

V. Results

[22] Questions on tolerance towards risk are asked only once to each individual, and thus these variables do not vary over time in the data set. See Barsky et al. (1997) for a detailed analysis of the risk preference module in the HRS.

Table 1 indicates that about 39 percent of the sample is fully retired, with an additional 11 percent partially retired. The means also indicate that fully retired individuals are in poorer health. For instance, retirees have 1.7 illnesses compared to one illness for those still working. Similar statistically significant differences are observed for all other indicators of physical and mental health. The figures further show that retirement is correlated with other observed and sometimes unobserved characteristics. For example, retired individuals have fewer years of schooling as well as have parents with fewer years of schooling. Fewer retirees are married, have a high income, or no insurance coverage. They are also more likely to be risk averse and differ somewhat in their financial outlook. Stratifying the sample across health measures shows similarly significant differences along these dimensions (results not shown). Thus there may be "positive selection" on observed characteristics – individuals who are retired are not a random sample. They are also more likely to differ along characteristics which generally are associated with worse health (less human capital, less parental human capital, less income, non-married, Hispanic or other race, generally more present-oriented, to name a few). The multivariate models account for these differences.

Table 2 presents estimation of the baseline specifications (equation 3) for self-rated poor health and mobility difficulties.[23] The limited specification includes a sparse set of controls, which are least likely to be endogenous on health status, along with age, year, and census division fixed effects. Conditional on these covariates, complete retirement has a significant negative impact on health. It raises the probability of poor health by 0.11 percentage points and increases the number of mobility difficulties by 0.66. The effects of other factors are consistent with prior studies. Blacks and individuals who are of other race are of significantly poor health

[23] Standard errors in all models are corrected for autocorrelation at the individual level using STATA's cluster option.

relative to whites; Hispanics have worse health outcomes relative to non-Hispanics. Prior studies document that education makes individuals more efficient in producing health, and hence educated individuals have better health outcomes (Grossman and Kaestner, 1997). Married individuals are also healthier, as are non-religious individuals. The marginal effect of income indicates that health is a normal good. One of the channels by which retirement may affect health is through income. Models which exclude income (not reported) yield marginal effects of retirement on poor health outcomes that are only slightly larger in magnitude. This indicates that the decline in income upon retirement is not the main driver of the decline in health.

The extended models control for health insurance status, parental characteristics, and proxies for risk and time preference. The magnitude of the marginal effect of retirement on health outcomes is virtually unchanged. Individuals with better health endowment, as proxied by the life-span of the parents, are healthier. Growing up with more educated parents also improves adult health outcomes. Risk-averse individuals are healthier since they may be less likely to engage in risky activities, such as smoking or drinking, or work in riskier occupations, which may adversely affect health (Saffer and Dave, 2005; Barsky et al., 1997). Conditional on age, individuals who are more future-oriented, as proxied by their planning horizon, are also healthier relative to those who are more present-oriented. These individuals may also be less likely to engage in risky health behaviors and may make greater investments in their own health capital. Health insurance has a negative impact on health. This may be due to adverse selection. Prior studies have generally found that health insurance has little or no causal effect on the health status of the average individual (Newhouse, 1993).

The robustness of the health effects of retirement between the limited and the extended models suggests that selection on observable characteristics is not confounding the relationship

between retirement and health. However, the magnitudes of the marginal effects are very large. Evaluated at the sample mean of each health outcome, the semi-elasticity indicates that retirement seems to worsen health by 94 percent for mobility difficulties and 194 percent for self-rated poor health. This implies that there may still remain considerable selection on unobservable characteristics which may be driving the link between health and retirement. Since the decision to retire and adult health outcomes are generally the result of an accumulation of life-cycle decisions to invest in health and human capital, most of the effects of retirement on health may reflect heterogeneity across individuals. The longitudinal panels of the HRS allow for the estimation of individual fixed-effects models that account for this unobserved heterogeneity. The marginal effects of retirement on health remain significant, but decline substantially in magnitude by about 60 percent. This is consistent positive selection, that there is something systematically different among individuals in poor health that is positively correlated with their withdrawal from the labor force. For instance, these individuals may have made inadequate investments in their own human capital or have dysfunctional family upbringing that may lead to withdrawal from the labor force and worse adult health.

Table 3 presents the marginal effects for the limited, extended, and individual fixed effects models for other measures of poor physical and mental health outcomes. While controlling for individual fixed effects diminishes the magnitudes, retirement is found to have a significant adverse effect on all proxies of physical and mental health. Results from the last column of Table 3 show, for instance, that complete retirement worsens mobility by 32.5 percent, leads to a 58.5 percent increase in difficulties associated with activities of daily living (ADL), leads to a 7.6 percent increase in illnesses, and worsens mental health by between 11-12 percent. The individual fixed effects specifications account for selection effects. Identifying off

the within-individual variation, conditional on age and income, the results are analogous to a pre- and post-retirement difference in health status for each individual. However, the possibility remains that retirement itself may be motivated by deteriorating health (Dwyer and Mitchell, 1999).[24] This endogeneity would inflate the negative effects of retirement on health. The last row of Table 3 serves as a counterfactual and suggests that this is indeed what may be occurring. Restricting the sample to never-smokers and moderate drinkers, retirement is found to raise the probability of cancer (excluding skin cancer) by about 20 percent. It is unlikely that post-retirement lifestyle changes could *cause* such a large increase in cancer, although it needs to be noted that lifestyle factors have the potential to affect certain types of cancer to some degree. If anything, retirement should have minimal or no impact on the probability of contracting cancer for individuals who do not engage in risky activities.

To bypass endogeneity, Table 4 presents estimation of the individual fixed effects models for samples restricted to individuals who were physically and mentally healthy in the waves prior to retirement. Specifically, the sample is limited to individuals with no mobility difficulties, no illness conditions (diabetes, heart disease, stroke, high blood pressure, arthritis, cancer, or lung disease), and no reported psychological problems pre-retirement. For these individuals, subsequent retirement will be exogenous to health. That is, retirement for these workers should not be motivated by poor health status and represents labor force decisions orthogonal to current or past health. These specifications yield the cleanest estimates of retirement by minimizing biases due to unobserved selection and endogeneity. Comparison of the full-sample with the pre-retirement healthy sample also provides a specification check. The magnitude of the

[24] It is possible that individuals in worse health may continue to work if they do not want to lose coverage or feel that they do not have the adequate funds to retire due to lower-paying occupations or interrupted labor-market history. However, conditional on assets or income and health insurance status, studies have generally shown that poor health leads to early withdrawal from the labor force.

marginal effect of retirement on poor health outcomes should decline in the stratified sample if it is actually minimizing the positive bias due to endogeneity (see footnote 15).

The first column of Table 4 shows that the negative effects of complete retirement on health are indeed generally much smaller in magnitude, though they remain statistically significant. Retirement causes a 23-29 percent increase in difficulties associated with mobility and daily activities, and an eight percent increase in illnesses.[25] It also leads to about a ten percent decline in mental health, as proxied by the CES Depression Scale, though there is no significant effect on physician diagnosed psychiatric problems. In addition, these specifications show that while retirement negatively impacts physical and mental health measures, which are most likely to be correlated with lifestyle changes, it has no effect on cancer for individuals who do not engage in risky activities, where we do not expect to find any large effect.

Prior studies have highlighted important, though not always consistent, differences across gender. To maximize sample size, differential effects by gender were estimated through an interaction term for the specifications in Table 4 (results not reported). For males, retirement generally leads to a larger decline in physical health outcomes as proxied by self-reported health, difficulties in mobility and daily activities, illness conditions, diabetes, heart disease, and stroke. However, with respect to the CES Depression Scale, retirement is found to have a larger negative effect for females. This differential effect may be related to the reasons proposed for the overall larger prevalence of depression and anxiety disorders among women at all stages of life. These

[25] The semi-elasticities represent the effect for the average individual in the HRS sample. The marginal effect necessarily represents a larger decline in health if evaluated at the mean health outcome pre-retirement. It should be noted that these effects are strictly applicable only to the pre-retirement healthy group of individuals due to non-random sorting of pre-retirement healthy and unhealthy individuals. As expected, the pre-retirement healthy group differs along observable characteristics. The average individual in this sample is more likely to be a married, non-black, male who is more future-oriented and has about a half-year more schooling, 16 percent more income, and more educated parents, relative to the excluded individuals. To the extent that retirement may magnify some of the channels for those who are unhealthy prior to retirement, the decline in health post-retirement may be larger. In this respect, these effects may be interpreted as lower-bound estimates.

include the hypotheses that women are more likely to experience chronic strain partly related to their sociocultural roles, have a lower sense of mastery, engage in greater rumination, and may have different coping mechanisms (Nolan-Hoeksema et al., 1999).

Withdrawal from the labor force before the age of 65 may be accompanied by a change in health insurance status, which may also be endogenous to health outcomes. The adverse health effects post-retirement may reflect a decline in access to health care if retired individuals lose their employer-sponsored coverage, are ineligible for Medicare if younger than 65 years of age, and opt not to purchase private insurance. Shifts in health insurance status may also reflect different amounts of coverage, which may impact health. To ascertain that the retirement effects are not driven by changes in health insurance status, the sample is constrained to individuals who are consistently covered in all waves. The marginal effects, presented in the last column of Table 4, are virtually unchanged and remain statistically significant. This is consistent with studies which have shown that increased use of health care services due to coverage has very little effect on health outcomes (Newhouse, 1993; Newhouse and Friedlander, 1980). Conditional on individual fixed effects, shifts in and out of health insurance related to retirement do not play a major role in the post-retirement decline in health.

Since these specifications show a robust negative health effect, Table 5 estimates the same individual fixed-effects models for the pre-retirement healthy sample, stratified across additional dimensions.[26] These stratifications shed light on some of the possible mechanisms for the post-retirement decline in health. In addition, the models also provide a robustness check to gauge the plausibility of the estimates.

[26] Results are presented for the composite measures of physical and mental health. Estimates for the separate illness conditions (such as diabetes, high blood pressure, and heart disease) follow the same pattern.

One hypothesis concerns the post-retirement decline in social interactions and support that were formed through and at work. Since studies have linked social interactions to positive health, the transition from work to full retirement may lead to deteriorating mental and physical health through this channel. In this case, the negative effects of retirement should be larger for individuals without a spouse or a partner. Social support from a spouse may help to buffer shocks and offset some of the diminished external social interactions. The first two rows of Table 5 confirm this direction of effect. Complete retirement generally leads to worse health for single relative to married individuals. The difference is especially large for mental health, which is consistent with prior studies that show social interactions to have a significant effect on depression (Bolton and Oatley, 1987).

For many individuals, work-related activities may constitute the primary form of exercise and physical activity. If retirement leads to a decline in the frequency or intensity of physical activity, then health may deteriorate. The prevalence of engagement in physical activity post-retirement is similar for those individuals with physically demanding work relative to others. The decline in physical activity post-retirement is therefore steeper for individuals who had physically demanding jobs prior to retirement. Ceteris paribus, retirement would be expected to have a larger adverse health effect for these workers. The next two rows stratify the sample across individuals who report that their job required a great deal of physical effort almost all of the time. Retirement is found to deteriorate physical health more for these individuals relative to those in non-laborious work.[27] Similarly, retirement should cause the largest declines in health among those who do not participate in vigorous physical activity post-retirement, to substitute for the drop in work-related physical activity. The next two samples, stratified across individuals

[27] Since the specification is limited to individuals who were physically and mentally healthy pre-retirement, controlling for age and individual fixed effects, it is unlikely that the post-retirement worsening in health is significantly related to their work.

who participate and do not participate in physical exercise after retirement, show that the marginal effects are indeed substantially larger for those who do not remain physically active. Summary measures show that for individuals who do not engage in physical activity, there is a significant increase in weight and the probability of being overweight. This is consistent with the transition from work to full retirement leading to negative lifestyle factors that worsen health.

In standard models of labor supply, it is assumed that leisure is utility-enhancing, and consequently work is utility-diminishing. In this case, retirement would be expected to yield positive benefits due to the increase in leisure time, ceteris paribus. To the extent that this effect offsets some of the negative health effects, retirement would be expected to have a smaller adverse effect on health, especially mental health, for those individuals who found work especially distasteful or stressful. The next two samples are stratified across individuals who report that their work involved a great deal of stress almost all of the time. For these individuals, retirement is stress-reducing, imparts some benefits, and does not lead to any deterioration in mental health. Consequently, their decline in physical health is also expectedly smaller.

Where the negative health effects of full retirement are mediated by other positive factors, the magnitudes are found to be smaller. An additional robustness check is permitted by individuals who are partially retired – that is, those who continue to do some part-time work after retiring from their jobs. Complete retirement has adverse health effects, consistent with an increase in the relative net price of health investment, a decline in social interactions and a decline in work-related physical activity.[28] If this is a true causal relationship, then partial retirement would be expected to have little or no adverse health effects since the incentive to avoid work loss from illness still exists, which raises the marginal benefit of investing in health. Part-time work may also impart positive effects through social support and physical activity.

[28] There may also be other negative lifestyle changes, such as changes in diet, which are unobserved in the data.

The final two rows of Table 5 confirm this pattern. Partial retirement generally has a much smaller negative effect on health outcomes, relative to full retirement. It is found to significantly increase the number of illness conditions by 0.07 (5.5 percent relative to the mean), compared with 0.097 (7.6 percent) for complete retirement. For other measures of physical and mental health, partial retirement has no significant adverse effects.

As a final specification check, a pseudo-retirement indicator is constructed to gauge whether the preferred specifications are bypassing the endogeneity bias. The pseudo-indicator is defined such that an individual who retired in wave 5 is falsely assigned retirement in a prior wave (wave 3 in this case), and so on. Table 6 presents the marginal effects of pseudo-retirement on poor health outcomes for the extended and preferred specifications.[29] Pseudo-retirement should have no causal effect on poor health outcomes, since it is not inherently reflecting any real change in status. In the extended specifications, however, the pseudo-indicator has a strong, significant negative effect on all measures of health. This shows that even after controlling for a rich set of observable individual characteristics, the effects are biased upwards (in magnitude) due to endogeneity. The pseudo-retirement is picking up systematic variations across individuals and other concurrent shifts related to aging, health, and labor force behavior. If the preferred specifications are successful in removing the endogeneity, then the marginal effect of pseudo-retirement should decline to zero and become insignificant. The last column shows the results for the individual fixed effects models restricted to the pre-retirement healthy sample. This specification reassuringly shows that pseudo-retirement has no effects on health.

[29] For this analysis, the sample is limited to non-retired individuals. If retired individuals are included in the sample, the pseudo-indicator may still pick up subsequent negative health effects of actual retirement.

Models based on instrumental variables are also estimated, though these results should be interpreted with caution due to the inherent difficulties of identifying valid instruments. The sample was limited to those who reported that they expected to retire at the same time as their spouse, and further limited to those who reported that they were not concerned about not having enough retirement income. For these individuals, the spouse's retirement status (complete, partial, or non-retired) is a significant predictor for own-retirement status. The instruments are also presumably orthogonal to own health, conditional on own retirement and wealth, and they "pass" the overidentification test. The results from these models indicate marginal effects somewhere between the full sample individual fixed effects and the pre-retirement healthy sample individual fixed effects models. The standard errors are larger, making the estimate imprecise for the depression scale. Even though tests indicate that the instruments are "valid," these tests are not always reliable and the marginal effects still appear rather large (see Saffer and Dave, 2005). Models are also estimated separately for those individuals who retired at age 62 and those who retired at age 65. Retirement at these ages is likely to be more exogenous, since the spikes in retirement at 62 and 65 are related to social security, other pension eligibility, and Medicare. Due to sample size limitations, these results are imprecisely estimated though the marginal effects in most cases are similar to those estimated based on the individual fixed effects models for the pre-retirement healthy sample. These results are presented in the Appendix.

VI. Conclusions

This study analyzes the causal effects of retirement on measures of physical and mental health. While the simple models document a strong negative effect of complete retirement on health, the concern was to examine whether this association was driven by unobserved selection and endogeneity. To assess the extent to which this effect is causal in nature, operating through

consequent changes in lifestyle and investments in health capital, the longitudinal waves of the HRS were exploited to account for the biases. Results from the preferred specifications indicate that complete retirement leads to a 23-29 percent increase in difficulties associated with mobility and daily activities, an eight percent increase in illness conditions, and an eleven percent decline in mental health.

Additional checks indicated that the effects tend to operate through lifestyle changes including declines in physical activity and social interactions. Future research should focus further on these lifestyle shifts and other channels by which retirement impacts health. The adverse health effects are mitigated if the individual is married and has social support, continues to engage in physical activity post-retirement, or continues to work part-time upon retirement.

With the financial difficulties facing Social Security and Medicare compounded by an aging population retiring earlier, policymakers have pressed for higher retirement ages.[30] For employer and private pension plans, 60 remains a popular age for benefits eligibility. Furthermore, the Social Security system as well as many private pension plans contains incentives that discourage work. Research has shown that after some point, the delayed retirement credit for someone who continues to work is less than actuarially fair.[31] For Social Security, this occurs at age 65 or at full eligibility, when the delayed retirement credit falls from about seven percent to only four percent.

The negative effects of retirement on subsequent health status should be incorporated into any policy evaluation that aims at shifting the retirement age. Ceteris paribus, eliminating embedded incentives that penalize continuing work and enacting policies that raise the retirement

[30] Alan Greenspan headed up the 1983 bipartisan commission that raised the Social Security payroll tax and enacted an increase in the retirement eligibility age. He continued thereafter to press for further increases in the retirement age, given the improving feasibility of work at older ages. See http://money.cnn.com/2005/02/16/retirement/fed_socialsecurity/.

[31] See Quadagno and Quinn (1997), Mitchell (1992), and Kotlikoff and Wise (1987).

age may be desirable. Retiring at a later age would lessen or postpone poor health outcomes, raising well-being and reducing the utilization of health care services, particularly acute care. Thus, policies that shift the retirement age upwards, while improving the financial liability of Social Security, may also curb the long-term growth in Medicare expenditures, even if the Medicare eligibility age remains unchanged at 65 years.

References

Abramson J, Berger A, Krumholz HM, Vaccarino V. (2001). Depression and risk of heart failure among older persons with isolated systolic hypertension. *Archives of Internal Medicine*. 161(14):1725–30.

Anderson KH, Burkhauser RV. (1985). The retirement-health nexus: a new measure of an old Puzzle. *Journal of Human Resources*. 20(3):315-30.

Bazzoli GJ. (1985). The early retirement decision: new empirical evidence on the influence of health. *Journal of Human Resources*. 20(2):214-34.

Baltagi BH. (2001). *Econometric analysis of panel data*. John Wiley & Sons, Ltd.: New York.

Barsky RB, Juster FT, Kimball MS, Shapiro MD. (1997). Preference parameters and behavioral heterogeneity: an experimental approach in the Health and Retirement Study. *Quarterly Journal of Economics*. 112(2):537-79.

Belgrave LL, Haug MR, Gomez-Bellenge FX. (1987). Gender and race differences in effects of health and pension on retirement before 65. *Comprehensive Gerontology* [B]. 1(3):109-17.

Beekman ATF, Deeg DJ, Van Limbeek J, Braam AW, Vries MZ, Van Tilburg W. (1997). Brief Communication. Psychological Medicine. 27(1): 231-235. [doi: 10.1017/S0033291796003510, Published Online September 8, 2000]

Blazer DG, Hybels CF, Pieper CF. (2001). The association of depression and mortality in elderly persons: a case for multiple, independent pathways. *Journals of Gerontology Series A, Biological Sciences and Medical Sciences*. 56(8):M505-9.

Bolton W, Oatley K. (1987). A longitudinal study of social support and depression in unemployed men. *Psychological Medicine*. 17(2):453-60.

Borjas G. (2004). *Labor economics*. McGraw-Hill: New York.

Bosse R, Aldwin CM, Levenson MR, Ekerdt DJ. (1987). Mental health differences among retirees and workers: findings from the Normative Aging Study. *Psychology and Aging*. 2(4):383-9.

Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. (2003). Overweight, Obesity, and Mortality from Cancer in a Prospectively Studied Cohort of US Adults. *New England Journal of Medicine*. 348(17):1625-38.

Cohen S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology*. 7(3):269-97.

Cohen S. (2004). Social relationships and health. *American Psychologist*. November: 676-84.

Coile C., Gruber J. (2001). Social security incentives for retirement. NBER Working Paper No. 7651.

Cole MS, Schaninger WS, Harris SG. (2002). The workplace social exchange network: a multilevel, conceptual examination. *Group and Organizational Management*. 27(1):142-67.

Davidson R, MacKinnon J. (1993). *Estimation and Inference in Econometrics*, New York: Oxford.

Doll R, Peto R. (1981). *The causes of cancer*. Oxford University Press: New York, NY.

Dorn JP, Cerny FJ, Epstein LH, Naughton J, Vena JE, Winkelstein W Jr, Schisterman E, Trevisan M. (1999). Work and leisure time physical activity and mortality in men and women from a general population sample. *Annals of Epidemiology*. 9(6):366-73.

Dwyer DS, Mitchell OS. (1999). Health problems as determinants of retirement: are self-rated measures endogenous? *Journal of Health Economics*. 18(2):173-93.

Ekerdt DJ, Baden L, Bosse R, Dibbs E. (1983a). The effect of retirement on physical health. American *Journal of Public Health*. 73(7):779-83.

Ekerdt DJ, Bosse R, LoCastro JS. (1983b). Claims that retirement improves health. *Journal of Gerontology*. 38(2):231-6.

Franco OH, de Laet C, Peeters A, Jonker J, Mackenbach J, Nusselder W. (2005). Effects of physical activity on life expectancy with cardiovascular disease. *Archives of Internal Medicine*. 165(20):2355-60.

Fuchs VR. (1982). Time preference and health: an exploratory study. *Economic Aspects of Health*, edited by Victor R. Fuchs. University of Chicago Press: Chicago. 93-120.

Gendell M. (2001). Retirement age declines again in 1990s. *Monthly Labor Review*. October:12-21.

Glass TA, Mendes de Leon C, Marottoli RA, Berkman LF. (1999). Population based study of social and productive activities as predictors of survival among elderly American. *British Medical Journal*. 319: 478-483.

Gorelick PB, Sacco RL, Smith DB, Alberts M, Mustone-Alexander L, Rader D, Ross JL, Raps E, Ozer MN, Brass LM, Malone ME, Goldberg S, Booss J, Hanley DF, Toole JF, Greengold NL, Rhew DC. (1999). Prevention of a first stroke: a review of guidelines and a multidisciplinary consensus statement from the National Stroke Association. *Journal of the American Medical Association*. 281(12):1112-20.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*. 80(2): 223-255.

Grossman M. (2000). The human capital model. *Handbook of Health Economics*. Culyer AJ, Newhouse JP (eds). North-Holland: Amsterdam. Vol. 1A:348-408.

Grossman M, Kaestner R. (1997). Effects of education on health. *The Social Benefits of Education*. Behrman JR, Stacey N (eds). University of Michigan Press: Ann Arbor. 69-123.

Gruber J, Wise D. (2005). Social Security Programs and Retirement around the World: Fiscal Implications, Introduction and Summary. NBER Working Paper No.11290.

Grundy SM, Blackburn G, Higgins M, Lauer R, Perri MG, Ryan D. (1999). Physical activity in the prevention and treatment of obesity and its comorbidities. *Medicine and Science in Sports and Exercise*. 31(11) Supplement 1:S502-8.

Hermansen K. (2000). Diet, blood pressure and hypertension. *British Journal of Nutrition*. 83(S1):113-9.

Hu FB, Manson JE, Stampfer MJ, Colditz G, Liu S, Solomon CG, Willett WC. (2001). Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. *New England Journal of Medicine*. 345(11):790-7.

Irwin M, Artin KH, Oxman MN. (1999). Screening for depression in the older adult: criterion validity of the 10-item Center for Epidemiological Studies Depression Scale (CES-D). *Archives of Internal Medicine*. 159(15):1701-4.

Johnson R, Neumark D. (1996). Wage declines among older men. *The Review of Economics and Statistics*. 78(4): 740-48.

Jonas BS, Mussolino ME. (2000). Symptoms of depression as a prospective risk factor for stroke. *Psychosomatic Medicine*. 62(4):463-71.

Koenig HG, George LK, Larson DB, McCullough ME, Branch PS, Kuchibhatla M. (1999). Depressive symptoms and nine-year survival of 1,001 male veterans hospitalized with medical illness. *American Journal of Geriatric Psychiatry*. 7(2):124–31.

Kotlikoff LJ, Wise DA. (1987). The incentive effects of private pension plans. *Issues in Pension Economics*. Bodie Z, Shoven JB, Wise DA (eds). Chicago:UCP. 283-336.

Kromhout D, Menotti A, Kesteloot H, Sans S. (2002). Prevention of coronary heart disease by diet and lifestyle. *Circulation.* 105(7):893-8.

Lambrinos J. (1981). Health: a source of bias in labor supply models. *Review of Economics and Statistics*. 63(2):206-212.

Lee IM, Skerrett PJ. (2001). Physical activity and all-cause mortality: what is the dose-response relation? *Medicine and Science in Sports and Exercise*. 33(6) Supplement:S459-71.

McGarry K. (2004). Health and retirement: do changes in health affect retirement expectations? *Journal of Human Resources*. 39(3):624-48.

Mein G, Martikainen P, Hemingway H, Stansfeld S, Marmot M. (2003). Is retirement good or bad for mental and physical health functioning? Whitehall II longitudinal study of civil servants. *Journal of Epidemiology and Community Health*. 57:46-49.

Melchior M, Berkman LF, Niedhammer I, Chea M, Goldberg M. (2003). Social relations and self-reported health: a prospective analysis of the French Gazel cohort. *Social Science and Medicine*. 56:1817-30.

Midanik LT, Soghikian K, Ransom LJ, Tekawa IS. (1995). The effect of retirement on mental health and health behaviors: the Kaiser Permanente Retirement Study. *Journals of Gerontology Series B, Psychological Sciences and Social Sciences*. 50(1):S59-S61.

Mincer J. (1974). Schooling, experience, and earnings. Columbia University Press: New York.

Mitchell O. (1992). Trends in pension benefit Formulas and retirement provisions. In John A. Turner and D. J. Beller, eds., *Trends in Pensions: 1992*. U.S.G.P.O.: Washington, D.C. pp. 177-216.

Mitchell O., Fields G. (1984). The economics of retirement behavior. Journal of Labor Economics. 2(1).

Newhouse J. (1993). *Free for all? Lessons from the RAND health insurance experiment*. Harvard University Press: Cambridge, MA.

Nolan-Hoeksema S, Larson J, and Grayson C. (1999). Explaining the gender difference in depressive symptoms. *Journal of Personality and Social Psychology*. 77(5):1061-1072.

Newhouse J, Friedlander L. (1980). The relationship between medical resources and measures of health: some additional evidence. *Journal of Human Resources*. 15:200-218.

Oja P, Vuori I, Paronen O. (1998). Daily walking and cycling to work: their utility as health-enhancing physical activity. *Patient Education and Counseling*. 33 Supplement 1:87-94.

Ostberg H, Samuelsson S. (1994). Occupational retirement in women due to age. *Scandinavian Journal of Social Medicine*. 2:90-96.

Parsons D. (1982). The male labour force decision: health, reported health, and economic incentives. *Economica*. 49:81-91.

Penninx BW, Messier SP, Rejeski WJ, Williamson JD, DiBari M, Cavazzini C, Applegate WB, Pahor M. (2001). Physical exercise and the prevention of disability in activities of daily living in older persons with osteoarthritis. *Archives of Internal Medicine*. 161(19):2309-16.

Putnam R. (2000). *Bowling alone: the collapse and revival of American community*. Simon & Schuster: New York.

Quadagno J, Quinn J. (1997). Does Social Security Discourage Work? *Social Security in the 21st Century*. Kingson E, Schulz J (eds). Oxford University Press. 127-146.

Radloff, LS. (1977). The CES-D Scale: A Self Report Depression Scale for Research in the General Population. *Applied Psychological Measurement*. 1:385-401.

Robbins J, Hirsch C, Whitmer R, Cauley J, Harris T. (2001). The association of bone mineral density and depression in an older population. *Journal of the American Geriatrics Society*. 49(6):732–6.

Roberts CK, Barnard RJ. (2005). Effects of exercise and diet on chronic disease. *Journal of Applied Physiology*. 98:3-30.

Rogers RL, Meyer JS, Mortel KF. (1990). After reaching retirement age physical activity sustains cerebral perfusion and cognition. *Journal of the American Geriatrics Society*. 38(2):123-8.

Saffer H. (2005). The demand for social interaction. NBER Working Paper No.11881.

Saffer H, Dave D. (2005). The effect of alcohol consumption on the earnings of older workers. In *Advances in Health Economics and Health Services Research*, Volume 16, eds: Bjorn Lindgren and Michael Grossman. JAI Press: Greenwich, CT.

Salokangas RK, Joukamaa M. (1991). Physical and mental health changes in retirement age. *Psychotherapy and Psychosomatics*. 55(2-4):100-7.

Salonen JT, Puska P, Tuomilehto J. (1982). Physical activity and risk of myocardial infarction, cerebral stroke and death: a longitudinal study in Eastern Finland. *American Journal of Epidemiology*. 115(4):526-537.

Schulz R, Beach SR, Ives DG, Martire LM, Arivo AA, Kop WJ. (2000). Association between depression and mortality in older adults: the Cardiovascular Health Study. *Archives of Internal Medicine*. 160:1761–8.

Sobel J. (2002). Can we trust social capital? *Journal of Economic Literature*. 40(1):139-54.

Stampfer MJ, Hu FB, Manson JE, Rimm EB, Willett WC. (2000). Primary prevention of coronary heart disease in women through diet and lifestyle. *New England Journal of Medicine*. 343(1):16-22.

Stender M, Hense HW, Doring A, Keil U. (1993). Physical activity at work and cardiovascular disease risk: results from the MONICA Augsburg study. *International Journal of Epidemiology*. 22:644-650.

Stern S. (1989). Measuring the effect of disability on labor force participation. *Journal of Human Resources*. 24(3):361-95.

Sternberg E. (2001). *The balance within: the science connecting health and emotions*. W. H. Freeman: New York.

Szinovacz ME, Davey A. (2004). Retirement transitions and spouse disability: effects on depressive symptoms. *Journals of Gerontology Series B, Psychological Sciences and Social Sciences*. 59(6):S333-42.

Sugisawa A, Sugisawa H, Nakatani Y, Shibata H. (1997). Effect of retirement on mental health and social well-being among elderly Japanese. *Nippon Koshu Eisei Zasshi*. 44(2):123-30.

Tuomi K, Jarvinen E, Eskelinen L, Ilmarinen J, Klockars M. (1991). Effect of retirement on health and work ability among municipal employees. *Scandinavian Journal of Work, Environment and Health*. 17(supplement 1): 75-81.

Vuori IM. (2001). Health benefits of physical activity with special reference to interaction with diet. *Public Health Nutrition*. 4(2B):517-28.

Wannamethee SG, Shaper AG, Walker M, Ebrahim S. (1998). Lifestyle and 15-year survival free of heart attack, stroke, and diabetes in middle-aged British men. *Archives of Internal Medicine*. 158(22):2433-40.

Table 1
Weighted Sample Means [1]

Variable	Definition	All	Retired	Non-Retired
Complete Retirement	Dichotomous indicator for whether respondent is fully retired	0.385 (0.487)	1.000 (0.000)	0.000 (0.000)
Partial Retirement	Dichotomous indicator for whether respondent is partially retired	0.112*** (0.316)	–	–
Good Health	Dichotomous indicator for whether respondent reported health as being excellent or very good	0.494*** (0.500)	0.375 (0.484)	0.576 (0.494)
Poor Health	Dichotomous indicator for whether respondent reported health as poor	0.058*** (0.234)	0.112 (0.316)	0.020 (0.141)
Mobility Difficulties	Index for mobility problems ranging from 0 to 5, indicating the respondent reporting any difficulty in walking 1 block, walking several blocks, walking across a room, climbing 1 flight of stairs, and climbing several flights of stairs	0.683*** (1.179)	1.106 (1.465)	0.416 (0.864)
Activities of Daily Living (ADL) Difficulties	Index for problems in Activities of Daily Living (ADL) ranging from 0 to 5, indicating the respondent reporting any difficulty in bathing, eating, getting dressed, getting in/out of bed, and walking across a room	0.156*** (0.594)	0.300 (0.832)	0.056 (0.316)
Illness Conditions	Index of respondent's diagnosed conditions, ranging from 0 to 6, indicating high blood pressure, diabetes, heart problems, stroke, psychiatric problems, and arthritis	1.283*** (1.151)	1.671 (1.247)	0.996 (0.993)
Diabetes	Dichotomous indicator for whether respondent has ever been told by doctor that he or she has diabetes	0.120*** (0.325)	0.167 (0.373)	0.087 (0.282)
Heart Disease	Dichotomous indicator for whether respondent has ever been told by doctor that he or she had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems	0.167*** (0.373)	0.252 (0.434)	0.101 (0.301)
Stroke	Dichotomous indicator for whether respondent has ever been told by doctor that he or she had a stroke	0.042*** (0.201)	0.075 (0.263)	0.018 (0.133)
High Blood Pressure	Dichotomous indicator for whether respondent has ever been told by doctor that he or she has high blood pressure	0.413*** (0.492)	0.499 (0.500)	0.349 (0.477)
Arthritis	Dichotomous indicator for whether respondent has ever been told by doctor that he or she has arthritis or rheumatism	0.441*** (0.497)	0.547 (0.498)	0.363 (0.481)
Psychological Problems	Dichotomous indicator for whether respondent has ever been told by doctor that he or she had emotional, nervous, or psychiatric problems	0.102*** (0.303)	0.135 (0.342)	0.079 (0.270)
Center for Epidemiologic Studies Depression (CESD) Scale	Index of mental health for respondent, ranging from 0 to 8, indicating the negative mental health symptoms for last week (depressed, everything an effort, restless sleep, not happy, lonely, sad, could not get going, and did not enjoy life)	1.204*** (1.848)	1.457 (2.017)	1.049 (1.716)
Cancer	Dichotomous indicator for whether respondent has ever been told by doctor that he or she has had cancer or a malignant tumor of any kind, except skin cancer	0.090*** (0.286)	0.125 (0.331)	0.061 (0.240)
Age	Age of respondent	61.668*** (7.043)	66.288 (6.367)	57.728 (4.933)
Male	Dichotomous indicator for whether respondent is male	0.511 (0.500)	0.476 (0.499)	0.533 (0.499)
Black	Dichotomous indicator for whether respondent is black but not Hispanic	0.093 (0.291)	0.102 (0.302)	0.090 (0.286)
Other Race	Dichotomous indicator for whether respondent's race is other than white, black, or Hispanic	0.034*** (0.180)	0.031 (0.172)	0.038 (0.191)
Hispanic	Dichotomous indicator for whether respondent is Hispanic	0.056*** (0.230)	0.049 (0.215)	0.065 (0.246)
Education	Years of education completed	12.665*** (2.997)	12.119 (3.083)	13.043 (2.861)

Married	Dichotomous indicator for whether respondent is married	0.699*** (0.459)	0.664 (0.472)	0.721 (0.449)
No Religious Preference	Dichotomous indicator for whether respondent has no religious preference	0.063*** (0.243)	0.058 (0.235)	0.067 (0.250)
Income	Total individual income from all sources, measured in thousands of 1982-1984 dollars	16.340*** (23.750)	9.556 (12.086)	21.632 (28.816)
Health Insurance	Dichotomous indicator for whether respondent has any type of health insurance coverage	0.935*** (0.247)	0.966 (0.181)	0.910 (0.286)
Mother's Age	Age of mother, or age at death	75.000*** (13.932)	75.406 (14.859)	74.505 (13.042)
Father's Age	Age of father, or age at death	70.958*** (14.122)	70.907 (14.410)	70.869 (13.856)
Mother's Education	Dichotomous indicator for whether respondent's mother has attended 8 or more years of school	0.717*** (0.451)	0.657 (0.475)	0.759 (0.428)
Father's Education	Dichotomous indicator for whether respondent's father has attended 8 or more years of school	0.635*** (0.481)	0.576 (0.494)	0.678 (0.467)
Native Born	Dichotomous indicator for whether respondent was born in the United States	0.919*** (0.272)	0.932 (0.252)	0.907 (0.290)
Risk Averse	Dichotomous indicator for whether respondent is very risk averse	0.641*** (0.480)	0.668 (0.471)	0.624 (0.484)
Planning Horizon 5-10 Years	Dichotomous indicator for whether respondent's relevant financial planning horizon is 5-10 years	0.320*** (0.467)	0.275 (0.446)	0.347 (0.476)
Planning Horizon More than 10 Years	Dichotomous indicator for whether respondent's relevant financial planning horizon is greater than 10 years	0.109*** (0.312)	0.121 (0.326)	0.100 (0.300)
New England	Dichotomous indicator for whether respondent resides in the New England region	0.052 (0.222)	0.049 (0.216)	0.053 (0.223)
Mid Atlantic	Dichotomous indicator for whether respondent resides in the New England region	0.143*** (0.350)	0.151 (0.358)	0.139 (0.346)
East North Central	Dichotomous indicator for whether respondent resides in the East North Central region	0.165*** (0.371)	0.172 (0.377)	0.159 (0.366)
West North Central	Dichotomous indicator for whether respondent resides in the West North Central region	0.091*** (0.288)	0.086 (0.280)	0.093 (0.291)
South Atlantic	Dichotomous indicator for whether respondent resides in the South Atlantic region	0.210*** (0.407)	0.198 (0.399)	0.220 (0.414)
East South Central	Dichotomous indicator for whether respondent resides in the East South Central region	0.056*** (0.229)	0.059 (0.235)	0.055 (0.228)
West South Central	Dichotomous indicator for whether respondent resides in the West South Central region	0.090** (0.287)	0.090 (0.287)	0.091 (0.287)
Mountain	Dichotomous indicator for whether respondent resides in the Mountain region	0.052** (0.223)	0.054 (0.226)	0.050 (0.218)
Pacific	Dichotomous indicator for whether respondent resides in the Pacific region	0.141** (0.348)	0.141 (0.349)	0.140 (0.347)
Vigorous Physical Activity	Dichotomous variable that equals 1 if respondent is physically active 3 or more days a week	0.432*** (0.495)	0.397 (0.489)	0.443 (0.497)
Physical Work	Dichotomous indicator for whether the respondent's job required a lot of physical effort most or all of the time	0.360 (0.480)	0.367 (0.482)	0.365 (0.482)
Stressful Work	Dichotomous indicator for whether the respondent's job involved much stress most or all of the time	0.543*** (0.498)	0.561 (0.496)	0.570 (0.495)
Year	Year of interview	1997.748*** (3.244)	1998.219 (3.035)	1997.397 (3.352)
Observations		64,462	25,681	32,554

1 Data are for individuals ages 50 to 75 from waves 1 to 6 of the Health and Retirement Study (HRS). Standard deviations are in parentheses. Number of observations listed represents the maximum number. For some variables, the actual sample size is slightly less due to missing information. Retired and Non-Retired samples exclude individuals who are partially retired. Asterisks denote that the difference between the Retired and Non-Retired samples is statistically significant as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.

Table 2
Full Sample [1]

Dependent Variable	Poor Health			Mobility Difficulties		
Specification	Limited	Extended	Individual Fixed Effects	Limited	Extended	Individual Fixed Effects
Complete Retirement	0.11280*** (0.00377) [1.916]	0.11426*** (0.00423) [1.942]	0.05051*** (0.00469) [0.858]	0.66216*** (0.01915) [0.953]	0.63866*** (0.02066) [0.919]	0.22583*** (0.01974) [0.325]
Male	0.01474*** (0.00200)	0.01446*** (0.00219)	_	-0.18697*** (0.00988)	-0.19512*** (0.01065)	_
Black	0.01473*** (0.00279)	0.00684** (0.00308)	_	0.09329*** (0.01369)	0.04569*** (0.01495)	_
Other Race	0.03459*** (0.00536)	0.02367*** (0.00595)	_	0.04312** (0.02603)	0.05867** (0.02886)	_
Hispanic	-0.01378*** (0.00408)	-0.01710*** (0.00481)	_	-0.12964*** (0.01997)	-0.10684*** (0.02335)	_
Education	-0.01139*** (0.00034)	-0.00978*** (0.00040)	_	-0.05370*** (0.00166)	-0.04850*** (0.00194)	_
Married	-0.03020*** (0.00222)	-0.03069*** (0.00241)	-0.00164 (0.00483)	-0.17760*** (0.01093)	-0.18106*** (0.01169)	0.01834 (0.02064)
No Religious Preference	0.01729*** (0.00427)	0.01802*** (0.00472)	_	0.01633 (0.02097)	0.03884* (0.02291)	_
Income	-0.00014*** (0.00005)	-0.00012** (0.00005)	-0.000003 (0.00005)	-0.00137*** (0.00022)	-0.00131*** (0.00023)	0.00001 (0.00020)
Health Insurance	_	0.01428*** (0.00396)	_	_	0.12731*** (0.01921)	_
Mother's Age	_	-0.00035*** (0.00008)	_	_	-0.00317*** (0.00036)	_
Father's Age	_	-0.00011 (0.00007)	_	_	-0.00238*** (0.00035)	_
Mother's Education	_	-0.00801*** (0.00290)	_	_	-0.00141 (0.01405)	_
Father's Education	_	-0.01256*** (0.00268)	_	_	-0.10734*** (0.01302)	_
Native Born	_	0.00074 (0.00407)	_	_	0.12951*** (0.01975)	_
Risk Averse	_	-0.00649*** (0.00216)	_	_	-0.01550 (0.01048)	_
Planning Horizon 5-10 Years	_	-0.01896*** (0.00232)	_	_	-0.10570*** (0.01125)	_
Planning Horizon More than 10 Years	_	-0.02308*** (0.00345)	_	_	-0.17553*** (0.01673)	_
Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Census Division Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Individual Fixed Effects	No	No	Yes	No	No	Yes
Observations	63,796	49,550	64,283	60,973	49,401	61,456

1 Standard errors are robust clustered at the individual level and reported in parentheses. Semi-elasticity of health outcome with respect to retirement, evaluated at the sample mean, is reported in brackets. Sample is limited to individuals ages 50 to 75. Significance is defined as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.

Table 3
Full Sample Contd. [1]

Dependent Variable	Specification		
	Limited	Extended	Individual Fixed Effects
Poor Health	0.11280***	0.11426***	0.05051***
	(0.00377)	(0.00423)	(0.00469)
	[1.916]	[1.942]	[0.858]
Mobility Difficulties	0.66216***	0.63866***	0.22583***
	(0.01915)	(0.02066)	(0.01974)
	[0.953]	[0.919]	[0.325]
Activities of Daily Living (ADL) Difficulties	0.26123***	0.25204***	0.09253***
	(0.00955)	(0.01064)	(0.01125)
	[1.651]	[1.593]	[0.585]
Illness Conditions	0.49392***	0.49068***	0.09772***
	(0.01836)	(0.02056)	(0.01237)
	[0.386]	[0.384]	[0.076]
Diabetes	0.06677***	0.06683***	0.01320***
	(0.00537)	(0.00599)	(0.00425)
	[0.553]	[0.553]	[0.109]
Heart Disease	0.09776***	0.09933***	0.02410***
	(0.00597)	(0.00669)	(0.00478)
	[0.595]	[0.605]	[0.147]
Stroke	0.04429***	0.04206***	0.01677***
	(0.00334)	(0.00374)	(0.00317)
	[1.058]	[1.005]	[0.401]
High Blood Pressure	0.09013***	0.09180***	0.01280**
	(0.00771)	(0.00867)	(0.00543)
	[0.219]	[0.223]	[0.031]
Arthritis	0.11916***	0.11246***	0.01911***
	(0.00762)	(0.00865)	(0.00624)
	[0.271]	[0.256]	[0.043]
Psychological Problems	0.07691***	0.07884***	0.01243***
	(0.00500)	(0.00562)	(0.00385)
	[0.751]	[0.770]	[0.121]
Depression (CESD) Scale	0.40648***	0.39939***	0.13033***
	(0.02565)	(0.02829)	(0.03310)
	[0.333]	[0.327]	[0.107]
Cancer [2]	0.01101*	0.01625**	0.01510**
	(0.00712)	(0.00797)	(0.00652)
	[0.138]	[0.204]	[0.190]

1 Each cell represents the marginal effect of Complete Retirement on the given health outcome from a separate regression. Standard errors are robust clustered at the individual level and reported in parentheses. Semi-elasticity of health outcome with respect to retirement, evaluated at the sample mean, is reported in brackets. Sample is limited to individuals ages 50 to 75, and sample sizes range from 47,840 to 64,300. Each specification includes the same covariates listed in Table 2. Significance is defined as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.
2 Sample is limited to never-smokers and moderate drinkers. Sample size ranges from 17,888 to 23,317.

Table 4
Pre-Retirement Healthy Sample [1]

Dependent Variable	Specification	
	Individual Fixed Effects	Individual Fixed Effects Insured Sample
Poor Health	0.03482*** (0.00766) [0.592]	0.03214*** (0.00749) [0.545]
Mobility Difficulties	0.19932*** (0.03289) [0.287]	0.21210*** (0.03469) [0.302]
Activities of Daily Living (ADL) Difficulties	0.03628*** (0.01259) [0.229]	0.03143** (0.01348) [0.193]
Illness Conditions	0.09657*** (0.02882) [0.076]	0.10441*** (0.03154) [0.081]
Diabetes	0.01785** (0.00760) [0.148]	0.02035** (0.00772) [0.167]
Heart Disease	0.01350 (0.00865) [-]	0.01523 (0.00990) [-]
Stroke	0.00600* (0.00357) [0.143]	0.00594* (0.00365) [0.137]
High Blood Pressure	0.02161* (0.01334) [0.052]	0.02335* (0.01410) [0.056]
Arthritis	0.03313** (0.01572) [0.075]	0.03595** (0.01767) [0.081]
Psychological Problems	0.00372 (0.00642) [-]	0.00245 (0.00711) [-]
Depression (CESD) Scale	0.13254* (0.07455) [0.109]	0.12402 (0.08015) [0.103]
Cancer [2]	0.00954 (0.01180) [-]	0.01343 (0.01187) [-]

1 Each cell represents the marginal effect of Complete Retirement on the given health outcome from a separate regression. All specifications include Married, Income, and fixed effects for age, year, census division and the individual. Standard errors are robust clustered at the individual level and reported in parentheses. Semi-elasticity of health outcome with respect to retirement, evaluated at the sample mean, is reported in brackets. Sample is limited to individuals ages 50 to 75, who had no mobility difficulties, no illness conditions, and no psychological problems in the wave prior to retirement. Sample sizes range from 4,176 to 4,448. Sample sizes for models restricted to individuals with health insurance range from 3,822 to 4,078. Significance is defined as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.
2 Sample is limited to never-smokers and moderate drinkers. Sample size is 1,718 and 1,607, respectively.

Table 5
Stratified Samples [1]

Specification	Dependent Variable			
	Mobility Difficulties	ADL Difficulties	Illness Conditions	Depression Scale
Unmarried	0.26810***	0.04009**	0.08696	0.35806**
	(0.09790)	(0.01933)	(0.05798)	(0.18075)
Married	0.16992***	0.02688*	0.11007***	0.10713
	(0.03467)	(0.01526)	(0.03301)	(0.08277)
Job required Physical Effort	0.26124***	0.05775**	0.18542***	0.18092
	(0.06062)	(0.02287)	(0.05238)	(0.14363)
Job did not require Physical Effort	0.16838***	0.02598	0.06614*	0.13709
	(0.04035)	(0.01854)	(0.03648)	(0.09766)
Non-Participation in Vigorous Physical Activity Post-Retirement	0.27512***	0.05869**	0.09672**	0.19963*
	(0.05674)	(0.02451)	(0.04574)	(0.11506)
Participation in Vigorous Physical Activity Post-Retirement	0.10894***	0.01504*	0.09428***	0.00344
	(0.03516)	(0.00787)	(0.03552)	(0.09522)
Job was Non-Stressful	0.21818***	0.04696***	0.13014***	0.25446**
	(0.05058)	(0.01626)	(0.03795)	(0.10531)
Job was Stressful	0.19025***	0.02919	0.09339**	0.10410
	(0.04606)	(0.02261)	(0.04421)	(0.12106)
Complete Retirement (Reproduced from Table 4)	0.19932***	0.03628***	0.09657***	0.13254*
	(0.03289)	(0.01259)	(0.02882)	(0.07455)
Partial Retirement [2]	0.00245	0.00370	0.07043*	0.10438
	(0.03607)	(0.00819)	(0.03713)	(0.10901)

1 Each cell represents the marginal effect of Retired on the given health outcome from a separate regression. All specifications include Married (except in samples stratified by Married), Income, and fixed effects for age, year, census division and the individual. Standard errors are robust clustered at the individual level and reported in parentheses. Sample is limited to individuals ages 50 to 75, who had no mobility difficulties, no illness conditions, and no psychological problems in the wave prior to retirement. Significance is defined as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.

2 Sample excludes individuals who are completely retired. Sample size ranges from 2,510 to 2,623.

Table 6
Pseudo-Retirement [1]

Dependent Variable	Specification	
	Extended	Individual Fixed Effects Pre-Retirement Healthy Sample
Mobility Difficulties	0.09361*** (0.02155)	-0.00411 (0.04367)
Activities of Daily Living (ADL) Difficulties	0.03165*** (0.00866)	-0.00027 (0.01028)
Illness Conditions	0.12413*** (0.02499)	-0.03984 (0.03411)
Depression (CESD) Scale	0.15048*** (0.03809)	-0.02717 (0.15773)

1 Each cell represents the marginal effect of Pseudo-Retired indicator on the given health outcome from a separate regression. The extended specification includes Male, Black, Other Race, Hispanic, Education, Married, No Religious Preference, Income, Health Insurance, Mother's Age, Father's Age, Mother's Education, Father's Education, indicators for Risk Preference and Planning Horizon, and fixed effects for Age, Year, and Census Division. The sample size ranges from 20,823 to 21,637. The individual fixed effects specification also includes Married, Income, and fixed effects for Age, Year, and Census Division, and is limited to individuals who had no mobility difficulties, no illness conditions, and no psychological problems in the wave prior to retirement. The sample is further limited to non-retired individuals in both specifications. The sample size ranges from 1,227 to 1,299. Standard errors are robust clustered at the individual level and reported in parentheses. Significance is defined as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.

Appendix

Dependent Variable	Specification		
	Instrumental Variables [1]	Individual Fixed Effects Retired at Age 62 [2]	Individual Fixed Effects Retired at Age 65 [3]
Mobility Difficulties	0.22692* (0.12158) F = 172.36*** Overid Chi-Sq. = 2.62	0.13975*** (0.05359)	0.10487 (0.07648)
Activities of Daily Living (ADL) Difficulties	0.12382*** (0.04547) F = 203.12*** Overid Chi-Sq. = 0.88	0.06556** (0.03339)	0.04035 (0.05108)
Illness Conditions	0.26927* (0.14982) F = 172.36*** Overid Chi-Sq. = 0.37	0.09354*** (0.02893)	-0.06217 (0.04094)
Depression (CESD) Scale	0.28053 (0.19014) F = 191.74*** Overid Chi-Sq. = 0.30	0.06434 (0.09016)	0.10826 (0.11880)

1 Each cell represents the marginal effect of Retired on the given health outcome from a separate IV regression. The excluded instruments are indicators for whether the spouse is completely or partially retired. The sample is limited to married individuals who reported that they plan on retiring at the same time as their spouse and they are not concerned about inadequate retirement income. Standard errors are reported in parentheses. Sample sizes range from 3,688 to 3,821. The joint F-statistic on the excluded instruments is reported. The Chi-squared statistic on the test of overidentifying restrictions is reported (Davidson and MacKinnon, 1993).

2 Each cell represents the marginal effect of Retired on the given health outcome from a separate regression. The sample is limited to individuals who retired at age 62. Standard errors are reported in parentheses. Sample sizes range from 6,901 to 7,429.

3 Each cell represents the marginal effect of Retired on the given health outcome from a separate regression. The sample is limited to individuals who retired at age 65. Standard errors are reported in parentheses. Sample sizes range from 4,086 to 4,556.