Retirement and Weight[*]

Dana Goldman, Darius Lakdawalla, and Yuhui Zheng
RAND Corporation
Santa Monica, CA

December 16, 2008

Abstract

Retirement from physically demanding work has long served as a healthful respite from backbreaking labor, even if it came too late in life for many. In today's era of expanding waistlines and increasingly sedentary jobs, however, leaving a physically demanding occupation may produce less healthful outcomes. We find that, during the first six years of retirement, males retiring from strenuous jobs appear to gain weight, while those retiring from sedentary jobs lose it. In particular, retirees from strenuous jobs gain approximately 0.5 more units of BMI, and exhibit relative declines in total exercise. The empirical facts suggest both a direct reduction in job-related exercise, and behavioral substitution towards more leisure-time exercise after retirement. Changes in food intake appear to play little to no role. Finally, the evidence suggests that those retiring from strenuous jobs are at least 25% more likely to contract diabetes in their retirement years. This is consistent with the negative health impacts of weight gain and reduced exercise.

[*] The authors acknowledge funding from the National Institute on Aging.

A. Introduction

A lifetime of demanding physical labor has long been implicated in late-life disability and impairment. This finding appears in long-term historical data (Costa, 2000), as well as in studies of more recent data (Cambois et al., 2001; Case and Deaton, 2005). On either a priori or empirical grounds, it is hard to argue that grueling manual labor has long-term benefits for health.

In an era of expanding waistlines and declining physical activity, however, the effects of physically demanding work are becoming more complex. Today's "demanding" jobs are not as taxing as those performed fifty years ago, while today's workers are undoubtedly heavier and more sedentary than their historical counterparts (Lakdawalla and Philipson, 2002). As a result, departure from a physically demanding job may lead to reductions in exercise and gains in weight that may have harmful health consequences. While these may not outweigh the accumulated health effects of manual work over a lifetime, they introduce another important dimension over which occupation may affect health.

As is well known, body weight has risen dramatically over the past 30 years. More than half of Americans are overweight. Roughly one-quarter are obese (Lakdawalla and Philipson, 2006a). A large body of observational studies demonstrates that health risks are higher for the overweight, and higher still for the obese (cf, Adams et al., 2006).[1] Randomized trials echo these qualitative findings: for instance, Knowler et al (2002) show that diet and exercise regimens producing a three-year weight loss of 5-7% in overweight subjects reduce Type II diabetes risk by 58%.

Less clear, however, is whether the typical changes in physical activity that accompany retirement are large enough to affect body weight and health. In principle, departure from the labor force could produce dramatic changes in patterns of physical activity, depending on the nature of one's job. A construction worker suddenly finds he is no longer paid to swing a sledgehammer, while an accountant finally finds time away from his desk to spend on recreational exercise. Moreover, as Figure 1 indicates, secular growth in body weight among the retirement-age population has made them ever-more vulnerable to obesity-related disease. The figure depicts the growth in Body Mass Index across five adjacent birth cohorts of elderly males in the Health and Retirement Study (HRS). In the space of just ten years, age-adjusted Body Mass Index (BMI) rose between 0.75 and 1.4 units.

In this paper, we quantify the effect on body weight of retiring from strenuous and sedentary jobs, and the attendant effects on health. Consistent with the simple incentives involved, retirement appears to function as a weight control device for workers in sedentary jobs, but a cause of significant body weight increase for others. Retirees from strenuous jobs gain 0.5 to 0.6 units of BMI, and exhibit declines in exercise participation. In contrast, retirees from sedentary jobs gain just 0.1 units of BMI over an 8-year period.

[1] To be sure, there is some controversy about the magnitude of health risks for the *elderly*, as some authors have found that overweight status is protective, relative to normal weight (Grabowski and Ellis, 2001).

Over a three-year period, the strenuous job-leavers gain just over 1% of body weight, while weight is little changed for sedentary job-leavers.

Most significantly, retirement seems to cause a 1.6 percentage point (or roughly 25%) increase in the incidence of diabetes among strenuous job-leavers, but no such increase among their counterparts. There is also evidence of relative increases in hypertension, although in this case it is harder to rule out non-causal mechanisms.

Section B outlines a simple conceptual framework for the study of exercise and weight. Section C estimates the relationship between retirement and weight, and tests several possible mechanisms. Section D explores the associated effects on obesity-related illness.

B. Conceptual Framework

Retirement has at least three effects on weight: (1) Direct reduction in job-related exercise; (2) Change in the individual's leisure-time endowment, which leads to a behavioral response of more exercise; and (3) A variety of possible income effects, but only if consumption-smoothing fails to be perfect. Each of these can vary across people in different types of occupations and at different levels of weight.

Consider an individual who works for one period and is retired for another. In addition to consumption (c) and leisure (L), she values food intake (F), weight (W), and exercise (E). All else equal, people always prefer more food to less and more leisure to less. Utility is maximized at some subjectively ideal weight level. We remain agnostic about whether people enjoy exercising or prefer to avoid it.

Weight is determined by food intake and time spent exercising. The latter includes time spent exercising on the job, and at home. We take on-the-job exercise as given, so that weight can be expressed as $W(F, E_j + E_h)$, where E_j is the exogenous amount of time spent exercising at work,[2] and E_h is (chosen) time spent exercising at home. Time spent exercising reduces weight, but at a decreasing rate.

In period t, the individual has income I_t. This evolves over time according to the individual's consumption-smoothing decisions, which we do not model. Finally, the individual has time T available for leisure and exercise; retired individuals have more time available than workers.[3] Each period, the individual solves:

$$\begin{aligned} &\max_{c_t, F_t, L_t, E_{ht}} U(c_t, F_t, L_t, W(F_t, E_{ht} + E_{jt}), E_{ht} + E_{jt}) \\ &s.t.\ c_t + pF_t \le I_t \\ &\quad E_{ht} + L_t \le T_t \end{aligned} \tag{1}$$

Optimal behavior is characterized by the following first-order conditions:

$$\begin{aligned} &U_c = \lambda_t \\ &U_F + U_W W_F = \lambda_t p \\ &U_L = \gamma_t \\ &U_W W_E + U_E = \gamma_t \end{aligned} \tag{2}$$

λ is the marginal utility of income, and γ is the marginal utility of time. The three effects of retirement operate on the first-order conditions as follows: the activity effect is a decrease in E_{jt}, which induces a first-order increase in W and in W_E; the time-endowment effect is a decrease in γ_t, the marginal value of time; and the income effect

[2] In the context of retirement, it sacrifices little to take the initial choice of occupation as given.

[3] We do not explicitly model health, which may affect time endowments and could reverse this result. We choose this approach, because our empirical strategy employs a variety of techniques to control for health explicitly.

(if permanent-income falls at retirement) corresponds to an increase in λ_t, the marginal utility of income.

Direct Effects. Job-related exercise pays the individual for activity. Therefore, when job-related exercise falls, it becomes more expensive to exercise, and less of it gets done. The individual may compensate by increasing leisure-time exercise but never by enough to increase total activity, as shown in the appendix. This decrease in total activity has two effects, proven in the appendix: (1) The individual gains weight, because it is more expensive to be thin; and (2) He eats less, because the reduction in activity makes a given amount of food intake costlier in terms of weight.

Time-Endowment Effects. Retirement increases the amount of time an individual has available for leisure and leisure-time exercise. The effect on weight depends in part on whether the increase in time affects the marginal utility of food intake. However, as long as these cross-effects are not dominant, the increase in time endowment lowers weight by increasing physical activity.

Income Effects. If people smooth consumption perfectly (and if subjective discount factors are equal to financial discount factors), the marginal utility of income does not change at retirement, and there are no income effects. However, if any of these assumptions fail, people may be "poorer" in retirement. These income effects *per se* are ambiguous. Decreases in income may raise or lower food consumption, and they also reduce the time that can be spent on weight-control activities. The net effects are unclear.

Overall Effects of Retirement. Abstracting from the ambiguous income effects that may or may not operate on body weight, the simple model has clear predictions. For retirees from sedentary jobs, retirement strictly reduces weight, at least holding constant the standard biological effects of aging on weight. On the other hand, retirement may raise or lower weight for retirees from active jobs, depending on the gain in leisure time relative to the reduction in job-related exercise. However, it is clear that, among those who work the same number of hours, retirement will tend to increase weight more for those in strenuous jobs.

C. The Empirical Effect of Retirement on Weight

C.1 Data

We use data from the Health and Retirement Study (HRS), which is a nationally representative panel of individuals aged 51 and over.[4] The HRS contains longitudinal data on demographics, health status and health behaviors, financial and housing wealth, income, retirement plans and employment history. The original HRS birth cohort – those who were born between 1931 and 1941 – were first interviewed in 1992. Since then, data have been collected biennially. Seven waves of data are currently available. The War Babies birth cohort, born between 1942 and 1947, was first interviewed in 1998, and followed up biennially since then. Due to relatively low rates of labor force participation among females of this cohort, we focus on how retirement affects HRS males.

Our final sample for analysis consists of 3,936 males. 5,639 males born between 1931 and 1947 were interviewed in at least one wave. We drop the 1,200 males who were retired at baseline, because we cannot identify the date of retirement or how long

---

[4] We use a publicly available version of the HRS data (RAND HRS Data file Version G) that was cleaned and processed by the RAND Corporation with support from the Social Security Administration.

they have been retired. For similar reasons, we dropped an additional 116 who reported in at least one of the interviews that they were neither working nor retired. An additional 184 were dropped due to missing information on longest-tenured occupation. We further dropped 5 observations with missing values for body mass index, socioeconomic status and health status. Finally, we dropped 198 individuals with only one wave of valid data. These refinements yield our analytical sample of 3,936 males.

We use the HRS to construct data on: body mass index, retirement status, socioeconomic status, health status, primary occupation and job strenuousness, vigorous activity, and expenditures on dining out. Details of variable construction are presented in a data appendix, but we provide the major highlights here.

Body mass index is defined as weight in kilograms divided by height in meters-squared. The HRS data on height and weight are self-reported, but recent waves of the data collected objective measures. Using either the self-reported data directly, or self-reported data corrected for reporting error produced qualitatively similar results.[5] Data on retirement are taken from the "labor force status" variable and measure whether the individual currently reports being retired (as opposed to "working full-time", "working part-time", or "unemployed"). Measures of health status are all self-reported. The

---

[5] Self-reported weight has been shown to be systematically biased (women under-report their weight, light men over-report, and heavy men under-report) (Cawley, 1999). However, employing Cawley's well-known correction for bias – using the observed relationship in the HRS between measured weight and height, and reported weight and height – has no quantitative impact on our findings. For simplicity, we report the findings using the self-reported data alone. The results using the corrected data are given in Appendix Tables C1 through C10.

occurrence of particular diseases is measured based on whether the respondent reports that a doctor has diagnosed him with the condition. We also use self-reported health (whether the individual describes his overall health as excellent, very good, good, fair, or poor), and disability. Disability is measured as the number of limitations to Activities of Daily Living (ADL's), and Instrumental Activities of Daily Living (IADL's). The HRS collects data on limitations to five ADL's: bathing or showering, dressing, eating, getting out of bed, and walking across a room. A "limitation" is the presence of any difficulty with that activity due to a health or memory problem. There are three IADL's: making phone calls, managing money, and taking medication.[6]

All these data are summarized for the HRS sample in Table 1. Observe first that the mean HRS male is significantly overweight, defined as being at or above a BMI of 25. Therefore, weight loss is likely to be valuable, and vice-versa. About half of the males are retired by the end of the observation window.

The table breaks down all the variables according to type of occupation. We differentiate between individuals retiring from physically demanding occupations and those retiring from sedentary occupations. To measure the physical demands of jobs, we begin with restricted-access HRS data on the 3-digit 1980 Census occupation category of the respondent, and use this to link the HRS to data from the US Department of Labor's Dictionary of Occupation Titles (DOT). The DOT is, literally, a dictionary of all occupations in the US. First published in 1939, the DOT has been updated over time. We use the 4th edition, first published in 1977, the release closest to the peak labor force

---

[6] At baseline, the HRS asked about different IADL's: using a map, using a calculator, and using a microwave.

attachment period of the HRS cohort. Each entry in the dictionary lists a title for the occupation, as well as a description of the occupation's skill requirements and demands. Among these listed demands are the job's physical demands, which are reported for each occupation.[7] The DOT reports on the presence of up to 3 "physical demands" in each occupation: climbing or balancing; stooping, kneeling, crouching, or crawling; and reaching, handling, fingering, or feeling. We take the number of demands (0-3) as an index of an occupation's physical demands. Clearly, this is not a complete set of all possible physical tasks on the job, but previous research has shown it to be well-correlated with individuals' self-reports of how physically taxing their jobs are (Lakdawalla and Philipson, 2006b).

Table 2 lists a set of representative occupations throughout the physical demands distribution, and how we classify strenuous versus non-strenuous jobs. Note that 1980 Census occupation codes are associated with physical demands measures that are not necessarily integers. This occurs because the DOT data are based on a very fine occupational coding scheme that does not always coincide with the Census occupation coding. The measure for each Census occupation code represents a mean across all original DOT codes that are encompassed by the Census occupation (England and Kilbourne, 1989). Based on this index of physical demands, we divide the HRS sample into two approximately equal halves; empirically, the cut-off turns out to be just above one physical demand.

---

[7] We use England and Kilbourne's cross-walk of the DOT data to the 1980 Census 3-digit occupation coding scheme (England and Kilbourne, 1989).

C.2 Trends in the Unadjusted Data

Returning to Table 1, workers in strenuous jobs tend to be poorer, less educated, heavier, and sicker. If these differences are fixed, we can use the longitudinal structure of the data to net out the fixed differences. However, it is possible that the weight, health, and activity trajectories differ across types of occupation, in which case fixed-effects are insufficient for identification.

Figure 2 sheds light on this issue by plotting the life-cycle change in male BMI that coincides with retirement. The figure depicts unadjusted changes in BMI relative to date of retirement. It follows two halves of the HRS male population, where one half engages in more strenuous work than the other.[8] Each point on the graph corresponds to a biennial wave of the HRS. The interesting feature of this figure is the divergence in BMI that seems to occur immediately after retirement, but does not precede it. After ten years (or five waves) of retirement, men who retired from sedentary jobs are about 0.3 BMI units lighter than they were at retirement. However, after the same length of time, those retiring from strenuous jobs are more than 0.5 BMI units heavier. During the 8 years prior to retirement, growth in BMI is nearly identical for both groups. This argues against the presence of time-varying unobservables that are specific to an occupational group; such factors would tend to produce divergent trends both before and after retirement.

The table below the figure presents mean differences and sample sizes corresponding to each wave of data. The asterisks reflect statistically significant differences in wave-to-wave BMI changes between the two occupational groups. There

[8] Later, we discuss the detailed definition of "strenuous" versus "sedentary" work.

are no significant differences in any year prior to retirement, but significant differences in the two waves after the observation of retirement. Subsequent waves show no significant difference, likely due to the declining sample sizes, which are also shown.

C.3 Regression Analysis

Figure 2 provides suggestive evidence that retirement causes weight gain among strenuous workers, but weight loss among sedentary workers. We can test this interpretation more formally using the following regression model:

$$BMI_{it} = \beta_0 + \beta_1 retired_{it} + \beta_2 strenuous_i + \beta_3 retired_{it} * strenuous_i + \beta_4 Z_{it} + \beta_5 X_i + u_{it} \quad (3)$$

BMI_{it} is individual $i's$ body mass index at wave t. The variable $retired_{it}$ is either a dummy for whether retired at wave t or the number of waves since retirement at wave t. The variable $strenuous_i$ is a binary measure of whether individual i retired from a strenuous or a non-strenuous job, while $retired_{it} * strenuous_i$ is the interaction between the measure of retirement (either the dummy variable or number of waves since retirement) and job strenuousness. X_i is a vector of time-invariant characteristics for individual i: race, ethnicity, and education. Z_{it} represents a vector of time-varying characteristics of individual i at time t: age, age squared, log of household income (in 1998 dollars), a dummy for non-positive household wealth, and log of household wealth (in 1998 dollars). As sensitivity analyses of whether our effects are driven by health changes, we also include in Z_{it} the following time-varying measures of health: self-rated general health, IADL limitations, ADL limitations, and physician-diagnosed illnesses (cancer, diabetes, heart diseases, hypertension, lung diseases, and stroke).

Table 3 presents the results of this model. The first two columns of the table display results from the OLS regression model in equation 3. The second column adds the time-varying controls for individual health. The next two columns repeat these analyses, but measure the per-wave effect of being retired, rather than a single combined effect of retirement. Finally, the last four columns repeat the OLS analysis, but with individual fixed-effects. Note that all specifications net out age-specific (quadratic) trends in weight. Both the OLS and fixed-effects results imply that strenuous-job retirees gain more weight than sedentary-job retirees.

The inclusion or exclusion of health conditions has virtually no quantitative impact on the interaction between retirement and occupation, particularly in the fixed-effects specifications. This suggests that the interaction appears not to be influenced by time-varying health observables. Arguably, this is also evidence that the interaction is similarly unrelated to time-varying *un*observables related to health.

The differences between the OLS and fixed-effects coefficients suggest that BMI levels are higher for strenuous workers at retirement than sedentary ones.[9] Since these baseline differences are unrelated to retirement, we would like to exclude them. Accordingly, we focus on the fixed-effects results for the balance of the paper.

The fixed-effects results imply that retirement lowers BMI by about 0.25 units for retirees from sedentary jobs, but raises it by the same amount for their counterparts retiring from strenuous jobs. This result is robust to the inclusion of controls for time-varying health characteristics, which do not affect the estimated interaction between

[9] This is consistent with the finding that strenuous jobs also impose strength demands that tend to increase muscle mass and body weight (Lakdawalla and Philipson, 2007).

retirement and occupation. This provides some evidence that unobservable health shocks do not produce the differential effect of retirement across occupational groups.

C.4 Results of instrumental variables models

There is no definitive evidence that BMI changes cause retirement, or that they are correlated with a third factor that does. Moreover, we also failed to find evidence that third factors like health shocks are related to the estimated interaction effects. Nonetheless, it is impossible to rule out the possibility of reverse causation or an unobserved common causal factor. As a result, we explore models that allow for the possible endogeneity of the retirement decision. The more general IV specification reveals the same differential effect of retirement on the weight of sedentary and strenuous workers.

We estimate a fixed-effects model that instruments for retirement using the ages of Social Security and Medicare eligibility (ages 62 and 65, respectively). We expect a discontinuous change in the incentive to retire at these ages. Note that a second-degree polynomial in age is present in the second-stage regression; therefore, the instruments pick up only the discrete break in retirement exactly at ages 62 and 65. The first-stages of the fixed-effects IV regression have the following form:

$$retired_{it} = \gamma_0 + \gamma_1 age62_{it} + \gamma_2 age65_{it} + \gamma_3 age62_{it} * strenuous_i + \gamma_4 age65_{it} * strenuous_i + \gamma_5 Z_{it} + \alpha_i + u_{it} \quad (4)$$

$$retired_{it} * strenuous_i = \delta_0 + \delta_1 age62_{it} + \delta_2 age65_{it} + \delta_3 age62_{it} * strenuous_i + \delta_4 age65_{it} * strenuous_i + \delta_5 Z_{it} + \alpha_i + u_{it} \quad (5)$$

The variables $age62_{it}$ and $age65_{it}$ represent whether the individual is at or above age 62 or 65, respectively. The other variables are as defined previously. Since retirement is interacted with occupational strenuousness, we also interact strenuousness with the identifying instruments. One can think of this approach as running two IV models, separately by occupation, but imposing the restriction that the covariates Z_{it} have the same effects on both types of occupation.

The first-stage results of the IV model are shown in Table 4.[10] Turning age 62 and 65 have the expected effects on retirement: becoming eligible for Social Security (turning 62) increases the probability of retirement by about 15% for sedentary workers and 24% for strenuous workers; Medicare eligibility increases the probability by about half that much. The instruments are quite strong. The F-statistics easily pass the “cookbook” cut-off of 10.0, and the single instrument of age 62 has a t-statistic over 10.

The second-stage results are given in Table 5. The IV strategy increases standard errors relative to the fixed-effects model, but retirement continues to increase weight relatively more for strenuous workers, by 0.5 BMI units over the sample window or 0.13 per HRS wave. These results confirm the fixed-effects finding that workers in strenuous jobs gain more weight after retirement.

C.5 Effect of Retirement Over the Life-Course

The regressions above compute the effects of retirement *ceteris paribus*, but it is helpful to place these effects into life-cycle context, alongside the standard biological effects of aging on weight. Weight grows with age across the population, up until very old ages, at which point health decline causes weight loss. Putting all these effects

---

[10] To conserve space, we suppress the sensitivity analyses with health controls. These are virtually identical to the models reported.

together, our results suggest substantial BMI gains for strenuous job-leavers, and very modest BMI gains for sedentary job-leavers. For sedentary workers, retirement serves as a weight-control device that limits weight gain due to aging. For strenuous workers, it reinforces the effects of aging.

This point is made by Figure 3, which plots the predicted change in BMI from retirement onwards, for the mean sedentary and strenuous workers. In the 10 years following retirement, strenuous job-leavers are projected to gain more than 0.7 units of BMI, while sedentary job-leavers gain less than 0.1 units. In this figure, changes in weight over time are driven by the *ceteris paribus* effects of aging, as well as the effects of age-related changes in income, wealth, self-rated health, disability, and disease. The age-specific means of each variable are passed into the estimated fixed-effects model shown in the last column of Table 3.

C.6 Mechanisms for the Retirement Effects

First, we investigate which mechanisms are likely to explain the divergence in weight across retirees from different kinds of jobs. Second, we study whether retirement-induced weight changes are driven primarily by physical activity, or food intake.

C.6.1 *Explaining Differences Across Occupation*

Theoretically, we identified three mechanisms at work in the retirement-weight relationship. The divergence in trend at retirement is probably best explained by the "direct effects," which are the direct reductions in exercise faced by retirees from strenuous jobs. However, we need to rule out two alternative possibilities: (1) Retirees from sedentary jobs gain more time at retirement, and they spend more of this time on exercise; or (2) Different income effects across occupation create differences in food intake that drive the results.

To test the first hypothesis, we analyzed whether the reduction in hours worked differs across occupation. The results, shown in Appendix Table A6, imply that there is no differential change by occupation. On average, retirement leads to a 36 hour reduction in weekly work time. However, there is no significant difference across occupations. The difference in the hours reduction for strenuous occupations is estimated to be -0.36 hours, with a 95% confidence interval of [-1.2, 0.5]. The bottom of the confidence interval would imply that sedentary workers gain an extra 1.2 hours per week at retirement, but even this represents just 3% of the total effect of retirement on time available. It thus seems unlikely that differential time reduction explains patterns in weight.

The presence of income effects is more difficult to test directly, because we do not observe consumption in the HRS waves.[11] However, including controls for wealth and income, which are likely correlated with the degree of consumption-smoothing, has no impact on the estimated interaction between retirement and occupation (Appendix Tables A2 and A3). Appendix Table A5 explicitly analyzes the change in log household income at retirement, by occupation. The table demonstrates that there is no statistically significant increase in income for sedentary retirees, relative to strenuous retirees.

[11] Consumption measures are available in the last two waves (2001 and 2003). We found, for models estimated only over these two waves, that including consumption had no impact on the interaction between retirement and occupation. Clearly, however, statistical power is a concern in this analysis.

C.6.2 *The Effect of Retirement on Physical Activity*

At an immediate level, changes in weight are always caused by changes in physical activity, changes in food intake, or some combination of the two. From its third wave (in 1996) onwards, the HRS asks respondents about their level of physical activity in the following survey question: "On average over the last 12 months have you participated in vigorous physical activity or exercise three times a week or more? By vigorous physical activity, we mean: things like sports, heavy housework, or a job that involves physical labor." The question elicits either a "yes" or "no" answer. We use the responses to this question in waves 3 through 6 of the HRS. While this is a crude and imperfect measure of exercise, it sheds some much-needed light on how retirement affects exercise.

Table 6 suggests that changes in exercise may be playing an important role in driving the impact of retirement on weight changes. The table demonstrates, using simple cross-tabulations, that the frequency of thrice-weekly vigorous physical activity decreases for workers retiring from strenuous jobs, but increases for retirees from sedentary jobs. Figure 4 breaks this apart further by time until retirement (only HRS males who retire during the survey window are included in the figure). From the wave before retirement onwards, there is a steady decline in the vigorous physical activity of workers in strenuous jobs. However, retirement actually causes a slight increase in vigorous activity for workers in sedentary jobs.

We can test these patterns formally by repeating the OLS, fixed-effects, and fixed-effects instrumental variables analyses. The only difference from the previous analysis is the use of vigorous physical activity as the dependent variable, instead of BMI. To economize on space, we report results only for models with the binary measure of retirement. The results from these analyses are entirely consistent with the patterns in weight we documented earlier.

Table 7 reports the results. The OLS and fixed-effects results are quite similar, indicating that baseline differences in exercise do not play a significant role in the retirement-activity relationship. The proportion of retirees from sedentary jobs engaging in vigorous physical activity increases by 5 to 6 percentage points. In contrast, the proportion falls by 14 to 16 percentage points for retirees from strenuous jobs. Just as in the BMI analysis, instrumenting for retirement increases the standard errors and renders the effect of retirement insignificant for sedentary workers. However, retirees from strenuous jobs decrease their activity significantly more than others, even in the instrumental variables specification. The first-stage results associated with the instrumental variables regression appear in Table 8. These are substantially similar to the earlier first-stage findings.

It would be ideal to map the estimated changes in exercise to implied effects on weight. Unfortunately, the qualitative wording of the HRS question makes it difficult to associate exercise changes with calorie expenditure. In addition, it is not straightforward to associate calorie expenditure with weight reduction, since the degree of metabolic compensation is uncertain.[12]

---

[12] According to Wilson et al (1991), "When normal subjects consume hypercaloric diets, less weight is gained than would be predicted on the basis of the excess calories ingested…humans can apparently partially adapt to chronic excessive carbohydrate and protein intake, and this protective effect attenuates the weight gain. Part of this adaptive response is related to an increase in…the resting metabolic rate."

C.6.3 *The Effect of Retirement on Food Intake and Preparation*

Changes in exercise patterns appear to align with changes in weight, at least qualitatively. It remains to show whether differential changes in food intake (due, for example, to different income effects of retirement) play a role. While the HRS measures of food intake are not as powerful as the exercise measures, they do suggest that weight changes are not well-explained by changes in food intake. This finding is consistent with the previous literature on this subject.

The economics literature suggests that retirement does not affect food consumption. Aguiar and Hurst (2005) show that neither quality nor food intake change at retirement. Unfortunately, they cannot directly examine whether the effect of retirement on food intake differs by occupation, due to limitations in their data. However, their analysis demonstrates that — for the average worker — food intake does not change. The only way food intake could explain our findings, while remaining consistent with Aguiar and Hurst, would be if retirees from sedentary jobs cut their food intake by as much as retirees from strenuous jobs raised it.

It is difficult to rule this out, because the HRS data on food intake is rather limited, but the Consumption and Activities Mail Survey (CAMS) supplements to the HRS ask subsamples of respondents to self-report spending on food and drink consumed at home, as well as away from home. 980 males in our analytic sample can be linked to CAMS. And among those 980, 487 respondents have only one wave of data, 122 of them have two waves of data, and 371 of them have three waves of data. The small samples, and particularly the small number of men with repeated observations, make fixed-effects models too imprecise for inference. Appendix Table A4 reports results of OLS regressions that test differences in food expenditures among retirees from different occupations. We find no differential effects by occupation.

It is difficult to draw firm conclusions, given the small samples, and the lack of direct data on calorie intake. Therefore, we supplement this analysis with direct investigation of whether income changes differentially at retirement. As discussed previously, Appendix Table A5 demonstrates that household income changes uniformly at retirement for retirees from strenuous and sedentary occupations. This further cuts against the hypothesis that changes in calorie intake (and food expenditure) explain much if any of the differential change in weight.

D. Health Effects of Weight Changes at Retirement

Obesity, especially excessive abdominal fat, is associated with insulin resistance and glucose intolerance through elevated release of free fatty acids (FFAs) (Kopelman, 2000). This makes it a significant risk factor for Type-II diabetes (Chan et al., 1994; Colditz et al., 1995; Ford et al., 1997). Obesity has also been linked to hypertension through both observational studies (Dyer and Elliott, 1989; Brown et al., 2000), and known clinical pathways (NIH, 1998). Finally, excess body weight has been found to be a risk factor for more serious cardiovascular disease (Rimm et al., 1995; Willett et al., 1995; Harris et al., 1997). These clinical facts motivate our investigation of how retirement and occupation affect the onset of obesity-related disease.

D.1 Trends in the Unadjusted Data

Figure 5 depicts changes over time in diabetes, by occupation. Prior to retirement, the prevalence of diabetes is growing at roughly the same rate for both types of workers, with a possibly faster rate of growth among the sedentary workers. However, after retirement, the growth in diabetes prevalence is more rapid among the strenuous retirees, who are also gaining greater body weight. In the unadjusted data, the differences after retirement are not statistically significant, due to the relatively small numbers of sample respondents with the condition.

Similar patterns are evident for hypertension (Figure 6), but it is somewhat harder to rule out time-varying unobservables across occupation as an alternative explanation. Rates of hypertension grow more slowly after retirement for sedentary job-leavers, but similar trends appear prior to retirement. For heart disease (Figure 7), there is some evidence that rates of disease grow more slowly for sedentary job-leavers after retirement, but not before. In this case, however, the differences are small relative to the statistical power of the HRS sample.

The unadjusted trends suggest what formal analyses confirm. There are statistically significant differentials in disease growth after retirement for diabetes and hypertension. In the case of hypertension, however, there is also a statistically significant difference in the pre-retirement trend. There may be causal effects of retirement on hypertension and heart disease, but we are unable to detect it given the statistical power of the HRS, and the pre-retirement trends in the data. However, the effects may be detectable in the case of diabetes, to which we now turn.

D.2 Regression Analysis

Table 9 displays the fixed-effects regression results for diabetes. According to the results in the upper panel, the prevalence of diabetes rises after retirement by 1.5% to 1.7% points more for strenuous job-leavers. These effects are robust to the inclusion of occupation-specific age trends, which account at least partially for time-varying unobservables that differ across occupation. However, the "per-wave" effects are more fragile. Indeed, the unadjusted trends in Figure 5 suggest that the difference across occupations varies quite a bit during the post-retirement window.

This pattern, coupled with *a priori* information about mortality from diabetes, raises concern about attrition bias due to differential mortality between diabetics and non-diabetics. The Hausman test for panel attrition bias compares estimates using the full sample, to estimates using only respondents who survive throughout the sample period. The latter are shown below. The "balanced" sample exhibits stronger interactions between retirement and occupation, and significant effects across the board. The Hausman test statistics (at the bottom of the table) reveal that the balanced samples yield statistically different estimates, consistent with attrition bias.

The difference between the balanced and whole samples suggests that including the attriters weakens the effect between diabetes and retirement from a strenuous job. Regardless of the sample, the total effect of leaving a strenuous job on diabetes remains significant, although it becomes smaller in the whole sample, compared to the balanced sample. It is likely that, among the frail group of attriters, factors unrelated to health drive diabetes incidence; this injects statistical noise into the estimates, but does not wipe out the total effect of retirement.

Finally, if time-varying unobservables differ across occupation, and if the occupation-specific age trends fail to absorb these, instrumental variables estimates may be called for. Unfortunately, there is not enough power in our sample to use the public-program eligibility instruments used earlier, as shown in Table 10. The smallest standard error on the interaction between retirement and occupation is 1.4%. Therefore, we are unable to detect effects of less than 1.4%*1.65=2.31%. Since the mean prevalence of diabetes in our estimation sample is 11.4%, 2.31% is a large effect, equivalent to one fifth of the mean prevalence.

D.3 Overall Effects of Retirement on Diabetes

Retiring from a strenuous job raises the prevalence of diabetes by 1.5 to 2.7 percentage points, or 13.4% to 24%. Viewed from the opposite perspective, the relative diabetes risk of sedentary workers, compared to their peers in strenuous jobs, falls by 13% to 24% after retirement. This is one-quarter to one-third as large as intensive and controlled interventions in diet and exercise (Knowler et al., 2002).

E. Conclusions

We have presented robust evidence that retirement increases body weight by significantly more for those in physically active jobs, compared to those retiring from sedentary jobs. The data suggest that the difference among retirees is the result of differential declines in job-related exercise, rather than food intake. Finally, there is also suggestive evidence that these fairly typical life-cycle changes in exercise have measurable consequences for obesity-related disease, raising the relative risk of diabetes by as much as 25% for strenuous job-leavers. The health effects are harder to detect than the effects on weight, given the complex determination of health status, and the difficulty of measuring mild deterioration in health. However, the presence of any measurable effects on disease prevalence is notable.

The effects on weight and health contrast markedly with the long-observed pattern of health deterioration for workers who remain in manual jobs. They may provide a glimpse into the future relationship between labor force participation and health. While yesterday’s manual labor exacted a punishing physical toll, today’s less demanding varieties many even do more good than harm.

Further research is needed using finer measures of health, food intake, and exercise, to either confirm or reject the hypothesis we have advanced. The data used in this paper have permitted more analysis of food intake and exercise than is typically possible with survey data, but it is clearly limited. As we have discussed, the food intake data are relatively sparse, and we were only able to examine a particular, crude measure of exercise. Better data are needed to quantify more precisely the causes and consequences of weight gain at retirement, and more generally, the relationship between labor force participation, body weight, and health.

Data Appendix

A. Body Mass Index and Physical Activity

We use self-reported weight and height to calculate body mass index (BMI) (kg/m^2). Weight is reported in each wave. Height is usually reported only at the first two waves of interview and is regarded as constant in later waves. HRS asks questions about participating in light and heavy physical activities. Light physical activity was asked only in the first two waves. Vigorous physical activity was asked in all waves but the question in the first two waves is not comparable with the question from wave 3 to wave 6. As a result, we define physical activity according to the vigorous physical activity question in wave 3 to 6. It is a binary variable measuring participation in three or more vigorous physical activities three times a week or more. It takes the value of one if the answer is yes, and zero otherwise. Only wave 3-6 HRS data is used for the analysis on physical activity.

B. Retirement Status

Retirement status is derived from the constructed variable of "labor force status" in the RAND-HRS data. Those respondents coded as being employed full-time, employed part-time, or unemployed, are considered to be 'working.' Those coded as being retired, partly retired, or disabled are considered to be 'retired.' We consider those respondents coded as not in the labor force to be neither working nor retired. The labor force status variable is constructed from several sources in the HRS questionnaire, addressing work, retirement, and disability. See St. Clair (2005) for a more detailed description of its construction.

C. Primary Occupation and Job Strenuousness

We obtained access to the restricted RAND HRS data containing detailed 3-digit occupational codes for the jobs with the longest reported tenure at each interview. The occupation codes follow the 1980 Standard Occupational Classification system. We define primary occupation for an individual as the longest-held occupation at the wave of retirement. For those who are not retired until the end of the study, primary occupation is defined as the first available occupation for the longest tenure. After identifying primary occupation for each individual, we use the occupational measures file for the 1980 census detailed occupations (EK file) (England and Kilbourne, 1989) to obtain job strenuousness measure. The EK file includes a physical demand score for each occupation. The score ranges from 0-3. The higher is the score, the more strenuous the occupation. The job strenuousness variable is defined as a binary one. It takes the value of 1 if the physical demand score for the primary occupation is greater than or equal to 1, and 0 otherwise. About half of the males in our sample have strenuous jobs.

D. Consumption and Activities Mail Survey(CAMS)

The Consumption and Activities Mail Survey (CAMS) is a supplement to the core HRS survey. In the fall of 2001, questionnaires were mailed out to a subsample of 5,000 households interviewed in the 2000 HRS survey. Questions were asked on individual activities and household patterns of consumption. If the household has two panel members, one member was randomly selected to receive the survey. 3,866 respondents completed the interview in 2001. In 2003 and 2005, the same households were contacted for the survey. 3,254 completed the survey in 2003. In 2005 there is a slight change of sample. If a household has two eligible members, the respondent – contacted for the 2001 or 2003 CAMS – was mailed the “full” survey which included a complete list of questions. The spouse or partner of that respondent received a “partial” questionnaire containing only questions on activities. In 2005, 3,880 completed the “full” version and 1,935 completed the “partial” version.

CAMS asks two questions on household food expenditure, one is about spending on food and drinks (including alcoholic) that people buy in grocery or other stores. The other is about spending on dining/drinking out: items in restaurants, cafes, diners, and take-out restaurants. Respondents can report weekly, monthly or yearly spending. We convert these into annual spending and into year 2005 dollars.

CAMS also asks questions on time use in various activities during last week. We examined two activities that are related to food production. These activities include: meal preparation time, clean-up time, and time spent shopping or running errands.

E. Attrition bias

The original HRS cohort and the War Babies cohort were first interviewed in year 1992 and 1998, respectively. After initial interview they were then interviewed biennially up to year 2004. However, attrition could happen due to various reasons: the most obvious reason is mortality; there were also non-response among individuals alive; finally, some individuals were not interviewed yet their mortality status was unknown. In addition to the three types of attrition, we introduced two other types of attrition in our analytic sample: first, if at a certain wave an individual reported not being retired after the first wave of reporting being retired, the individual’s waves of observations since that wave were dropped. Second, an observation is dropped if there is any missing value for one of the dependent or independent variables.

The analytic sample includes 3,936 males with 20,913 observations. 3,169 of them belong to the original HRS cohort while 767 of them belong to the War Babies cohort. If there were no attrition then the number of observations would be 25,251. Therefore there are 4,338 cases of attrition. Table Appendix A7 shows the break down of the 4,338 cases into five types, as mentioned above. The attrition might be non-absorbing if it is not due to mortality.

If attrition patterns are endogenous then our estimation will be inconsistent. To check whether attrition bias exists, we used a Hausman type specification test proposed by Nijman and Verbeek (1996). The key idea is to test whether the estimation using the whole (both balanced and unbalanced) sample is the same as the estimation using only the balanced sample. And we use bootstrap to calculate the standard errors of the difference between two estimations. Appendix Table A-8 shows the fixed effects estimations using the whole sample and the balanced sample only, under two model specifications. For Hausman specification test, the two p-values for the corresponding chi-square statistics are very high and we cannot reject the null hypothesis that the estimation from the balanced sample and the estimation from the unbalanced sample are the same. Therefore we don't find evidence of attrition bias.

Theoretical Appendix

In this appendix, we prove that when E_j falls, total exercise (E_h+E_j) falls, food intake (F) falls, and weight (W) rises. By displacement, we can rewrite the problem in 1 as a function of only food intake and exercise at home.

$$\max_{F_t, E_{ht}} U(I_t - pF_t, F_t, T_t - E_{ht}, W(F_t, E_{ht} + E_{jt}), E_{ht} + E_{jt})$$

Observe that the first order conditions associated with the displaced problem can be written as:

$$\begin{aligned} -pU_c + U_F + U_W W_F &= 0 \\ -U_L + U_W W_E + U_E &= 0 \end{aligned} \tag{6}$$

To simplify the analysis, define this displaced objective function as $V(F, E_h; E_j, T_t, p, I_t)$. E_h and E_j enter the analysis nearly symmetrically, except that increases in E_h have the additional effect of reducing time available for labor. In particular, we have:

$$\begin{aligned} V_{FE_h} &= V_{FE_j} - \frac{\partial}{\partial T_t} V_F \\ V_{E_h E_h} &= V_{E_h E_j} - \frac{\partial}{\partial T_t} V_{E_h} \end{aligned} \tag{7}$$

We assume that reductions in time available raise the marginal utility of food and exercise, because income effects dominate, so that $\frac{\partial}{\partial T_t} V_F > 0$ and $\frac{\partial}{\partial T_t} V_{E_h}$.

To ensure the existence and uniqueness of this optimum, we assume that $V(F, E)$ is jointly concave. We assume further that $V_{FE_h} > 0$, $V_{FE_j} > 0$, and $V_{FE} > 0$, where E is total exercise. Therefore, whenever total exercise rises — and no matter how it rises —

food intake is more valuable. Finally, we assume that $V_{E_hE_j} < 0$, so that exercise at home and at work are substitutes. Taken together, these assumptions imply the following key conditions:

$$\begin{aligned} &V_{FE_j} > V_{FE_h} > 0 \\ &V_{E_hE_h} < V_{E_hE_j} < 0 \end{aligned} \tag{8}$$

Performing comparative statics on the objective function V yields:

$$\begin{bmatrix} V_{FF} & V_{FE_h} \\ V_{FE_h} & V_{E_hE_h} \end{bmatrix} \begin{bmatrix} \dfrac{\partial F}{\partial E_j} \\ \dfrac{\partial E_h}{\partial E_j} \end{bmatrix} = \begin{bmatrix} -V_{FE_j} \\ -V_{E_hE_j} \end{bmatrix} \tag{9}$$

$$\frac{\partial E_h}{\partial E_j} = -\frac{V_{FF}V_{E_hE_j} - V_{FE_h}V_{FE_j}}{V_{FF}V_{E_hE_h} - V_{FE_h}^2} \tag{10}$$

The concavity of the problem and assumptions about cross-partials imply that $\frac{\partial E_h}{\partial E_j} < 0$.

Moreover, the inequalities in equation 8 imply that: $\left|\frac{\partial E_h}{\partial E_j}\right| < 1$. This implies that increases in on-the-job exercise lead to partially compensating reductions in exercise at-home, and vice-versa. This implies that reductions in E_j lead to reductions in $E_h + E_j$.

QED

Define F^o and E^o as the original levels of food consumption and at-home exercise, and F^n and E^n as the new levels. To prove that F falls, assume that $F^n \geq F^o$. Note that $V_F(F^o, E_h^0; E_j^o) = 0$. Moreover, in the new equilibrium, total exercise is lower. Therefore, $V_F(F^o, E_h^n; E_j^n) < 0$. By concavity, it must then be true that $V_F(F^n, E_h^n; E_j^n) \leq V_F(F^o, E_h^n; E_j^n) < 0$. This is a contradiction.

Finally, we prove that $W^n > W^o$. Since weight is a function of exercise and food intake, we can rewrite our objective function as a function of only exercise and weight. Define this objective function as $Z(W, E_h; E_j)$, and note that $Z_{WE} > 0$, based on the properties of V. Suppose that $W^n \leq W^o$. Clearly, $Z_{E_h}(W^o, E_h^o; E_j^o) = 0$. Moreover, by concavity, $Z_E(W^n, E_h^o; E_j^o) \geq Z_E(W^o, E_h^o; E_j^o) = 0$. Since $E^n < E^o$, concavity implies $Z_E(W^n, E_h^n; E_j^n) > Z_E(W^n, E_h^o; E_j^o) \geq 0$. This is a contradiction.

References

Adams, K. F., A. Schatzkin, T. B. Harris, et al. (2006). "Overweight, Obesity, and Mortality in a Large Prospective Cohort of Persons 50 to 71 Years Old." New England Journal of Medicine **355**(8): 763-78.

Brown, C. D., M. Higgins, K. A. Donato, et al. (2000). "Body mass index and the prevalence of hypertension and dyslipidemia." Obes Res **8**(9): 605-19.

Cambois, E., J.-M. Robinek and M. D. Hayward (2001). "Social Inequalities in Disability-Free Life Expectancy in the French Male Population, 1980-1991." Demography **38**(4): 513-24.

Case, A. and A. Deaton (2005). Broken Down by Work and Sex: How Our Health Declines. In: Analyses in the Economics of Aging; 185-205; Chicago: University of Chicago Press. D. A. Wise, Ed.

Cawley, J. (1999). Obesity and Addiction. Economics. Chicago, IL, University of Chicago.

Chan, J. M., E. B. Rimm, G. A. Colditz, et al. (1994). "Obesity, fat distribution, and weight gain as risk factors for clinical diabetes in men." Diabetes Care **17**(9): 961-9.

Colditz, G. A., W. C. Willett, A. Rotnitzky, et al. (1995). "Weight gain as a risk factor for clinical diabetes mellitus in women." Ann Intern Med **122**(7): 481-6.

Costa, D. L. (2000). Long-Term Declines in Disability Among Older Men: Medical Care, Public Health, and Occupational Change. National Bureau of Economic Research, Inc, NBER Working Papers.

Dyer, A. R. and P. Elliott (1989). "The INTERSALT study: relations of body mass index to blood pressure. INTERSALT Co-operative Research Group." J Hum Hypertens **3**(5): 299-308.

England, P. and B. Kilbourne. (1989). "Occupational Measures from the Dictionary of Occupational Titles for 1980 Census Detailed Occupations."

Ford, E. S., D. F. Williamson and S. Liu (1997). "Weight change and diabetes incidence: findings from a national cohort of US adults." Am J Epidemiol **146**(3): 214-22.

Grabowski, D. C. and J. E. Ellis (2001). "High body mass index does not predict mortality in older people: analysis of the Longitudinal Study of Aging." J Am Geriatr Soc **49**(7): 968-79.

Harris, T. B., L. J. Launer, J. Madans, et al. (1997). "Cohort study of effect of being overweight and change in weight on risk of coronary heart disease in old age." BMJ **314**(7097): 1791-4.

Knowler, W. C., E. Barrett-Connor, S. E. Fowler, et al. (2002). "Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin." N Engl J Med **346**(6): 393-403.

Kopelman, P. G. (2000). "Obesity as a medical problem." Nature **404**(6778): 635-43.

Lakdawalla, D. and T. Philipson (2002). The Growth of Obesity and Technological Change: A Theoretical and Empirical Examination, National Bureau of Economic Research, Inc, NBER Working Papers: 8946.

Lakdawalla, D. N. and T. J. Philipson (2006a). Economics of Obesity. The Elgar Companion to Health Economics. A. M. Jones, Ed. Northampton, MA, Edward Elgar**:** 72-82.

Lakdawalla, D. N. and T. J. Philipson (2006b). "Labor Supply and Weight." Journal of Human Resources **forthcoming**.

Lakdawalla, D. N. and T. J. Philipson (2007). "Labor Supply and Weight." Journal of Human Resources **42**(1): 85–116.

NIH (1998). "Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health." National Institute of Health.

Nijman, T. E. and M. Verbeek (1996). Incomplete Panels and Selection Bias. The Econometrics of Panel Data: Handbook of Theory and Applications (Second Revised Edition). L. Matyas, and P. Sevestre, Eds. Dordrecht

Kluwer Academic Publishers**:** 449-490.

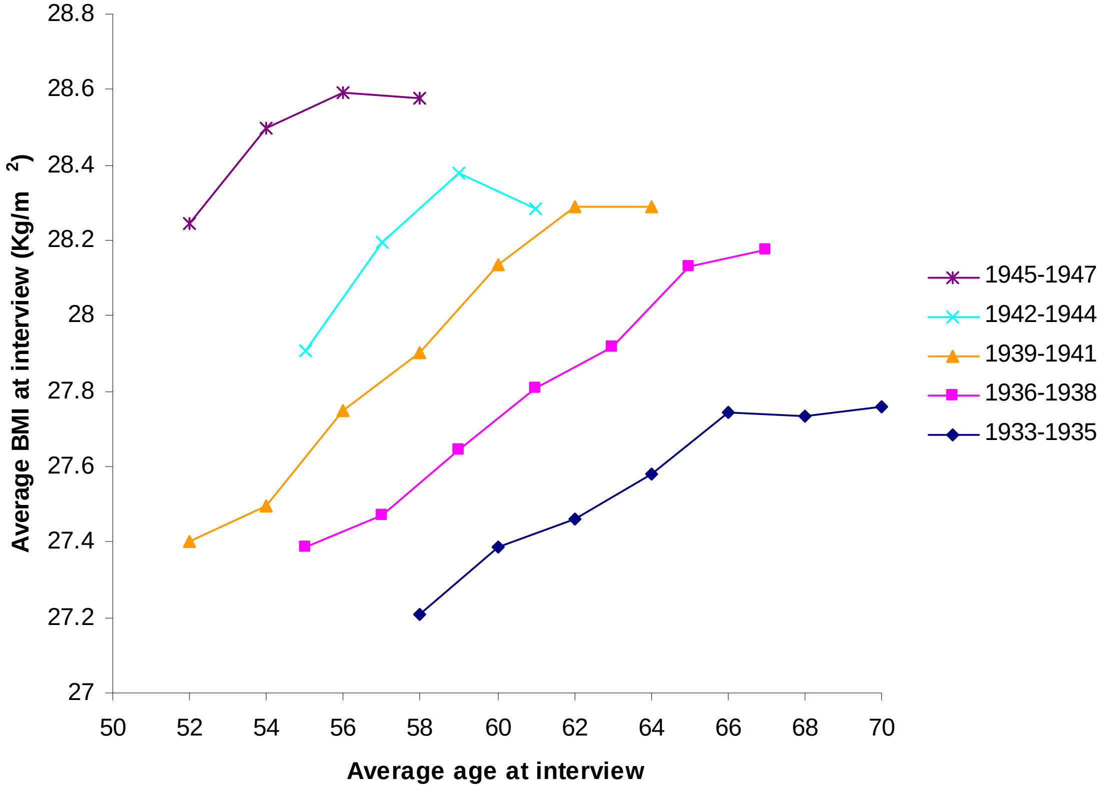
Rimm, E. B., M. J. Stampfer, E. Giovannucci, et al. (1995). "Body size and fat distribution as predictors of coronary heart disease among middle-aged and older US men." Am J Epidemiol **141**(12): 1117-27.

St.Clair, P., et al (2005). RAND HRS Data Documentation, Version E. Santa Monica, CA, RAND Center for the Study of Aging.

Willett, W. C., J. E. Manson, M. J. Stampfer, et al. (1995). "Weight, weight change, and coronary heart disease in women. Risk within the 'normal' weight range." Jama **273**(6): 461-5.

Wilson, J. D., E. Braunwald, K. J. Isselbacher, et al., Eds. (1991). Harrison's Principles of Internal Medicine. New York, McGraw-Hill.

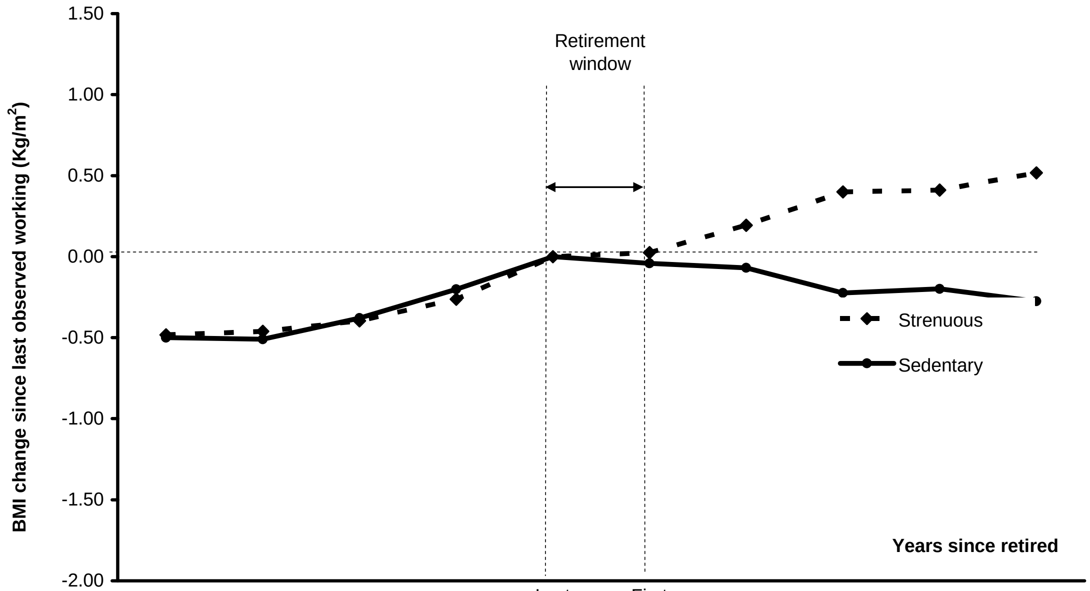
Figure 1: Growth in BMI for five elderly birth cohorts.



Source: Health and Retirement Study 1992 to 2004

Notes: This figure depicts BMI trajectories of five birth cohorts born between 1933 and 1947. Those males with non-missing BMI in all eligible waves are included. As a result, sample sizes are identical across years for a given cohort, and are as follows: n = 462 (1945-1947), n = 481(1942-1944), n = 780(1939-1941) n = 737(1936-1938), and n = 653(1933-1935).

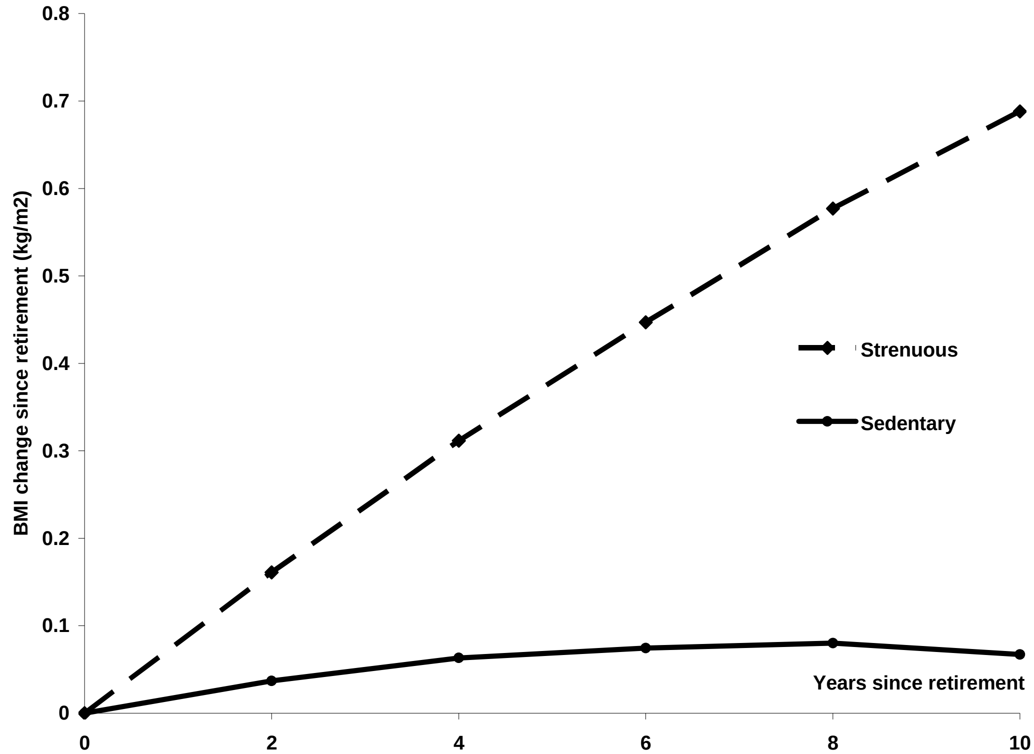
Figure 2: Unadjusted change in BMI since last observed working for males by occupation



	-8	-6	-4	-2	Last observed working	First observed retired	4	6	8	10
Strenuous	-0.48	-0.46	-0.40	-0.26	0.00	0.02**	0.19**	0.40	0.41	0.52
N	306	511	724	984	1,262	943	643	423	268	
Sedentary	-0.50	-0.51	-0.38	-0.20	0.00	-0.04**	-0.07**	-0.22	-0.20	-0.28
N	243	384	566	749	957	712	477	304	191	

Source: Health and Retirement Study, 1992 to 2004.
Notes: The figure is based on the men in our sample who retire at some point during the HRS observation window. Since we can define a retirement date for each such person, we can also calculate time until or since retirement. This figure calculates cumulative changes in mean BMI since last observed working, as a function of time from retirement, for males in different occupations. The table at the bottom of the figure shows the point estimates for cumulative changes in BMI from the retirement date, as well as the relevant sample sizes. "**" indicates that the change of BMI for males in strenuous occupation at a certain time since retirement is significantly different from that in sedentary occupation, at the 5% significance level.

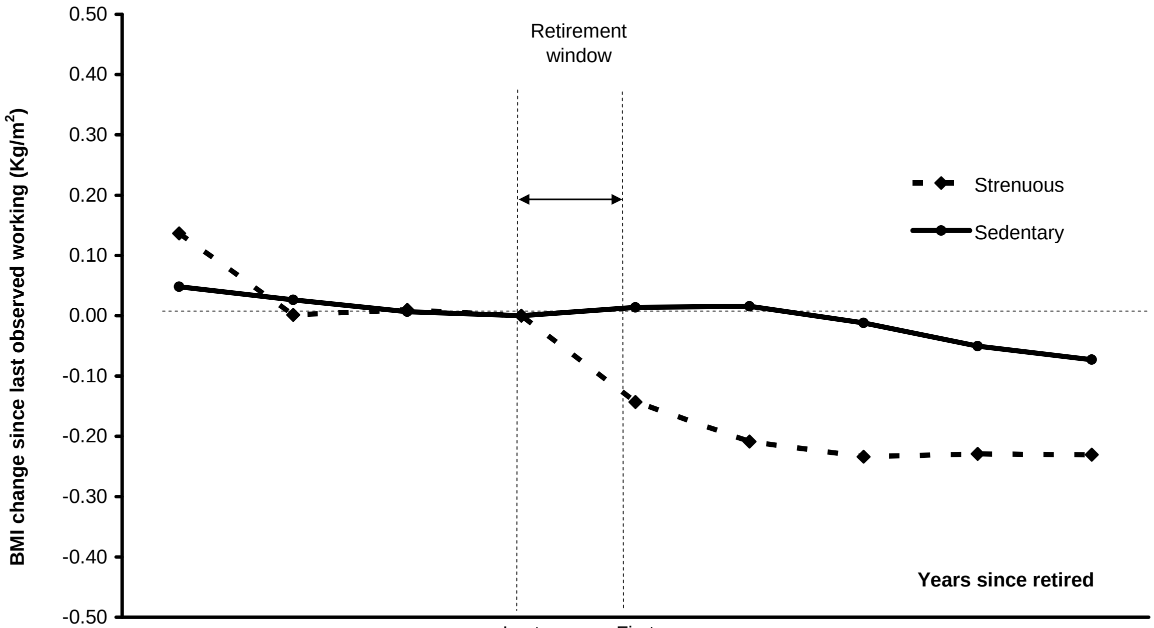
Figure 3: Simulated changes in BMI since retirement for males, by occupation



Source: Health and Retirement Study, 1992 to 2004.

Notes: this graph is the simulated BMI changes since retirement by occupation, based on the fixed-effects estimation results, as shown in the last column of Table 3. We take the average age last observed working in HRS as the age at retirement year 0, which is 59. We then increase age (and years since retirement) by two years a step, until 10 years later. We set the values of other covariates in the BMI fixed effects regression - *ln(income), non-positive wealth, ln(wealth), self-rated health is fair or poor, number of IADL limitations, number of ADL limitations, diagnosed with cancer, diagnosed with lung disease, diagnosed with heart disease, diagnosed with a stroke, diagnosed with hypertension* - at their mean values of each projected age (59,61,63,65,67,69). We set the occupation to be sedentary and simulate BMI changes since retirement for those with sedentary occupation. We then set the occupation to be strenuous and simulate BMI changes since retirement for those with strenuous occupation. As a result, the difference in the two BMI trajectories is completely due to the differential retirement effect by occupation, as measured by the interaction term of “waves since retire * strenuous job” in the last column of Table 3.

Figure 4 Unadjusted change in percentage taking vigorous exercise since last observed working for males by occupation



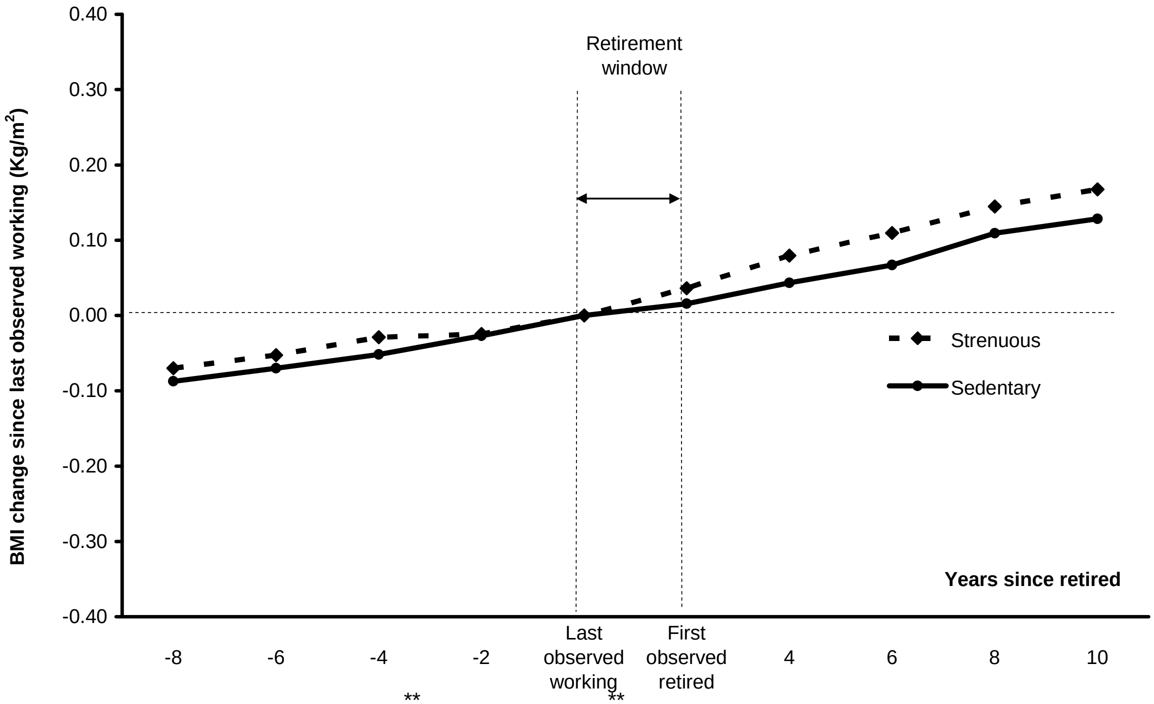
	-6	-4	-2	Last observed working	First observed retired	4	6	8	10
Strenuous	0.14	0.00	0.01	0.00 **	-0.14 **	-0.21	-0.23	-0.23	-0.23
N	133	326	540	613	579	483	294	115	
Sedentary	0.05	0.03	0.01	0.00 **	0.01 **	0.02	-0.01	-0.05	-0.07
N	91	280	430	473	413	351	208	96	

Source: Health and Retirement Study, 1992 to 2004.

Notes: The figure is based on the men in our sample who retire at some point during the HRS observation window. Since we can define a retirement date for each such man, we can also determine time until or since retirement. This figure calculates cumulative changes in percentage of individuals taking vigorous exercise since last observed working, as a function of time, for males in different occupations. The table at the bottom of the figure shows the cumulative changes, and the number of persons that are interviewed both at a certain wave since retire and at the next adjacent wave, for males in different occupation. "**" indicates that the change of percentage points from last wave in strenuous occupation is significantly different from that in sedentary occupation, at the 5% significance level.

** **

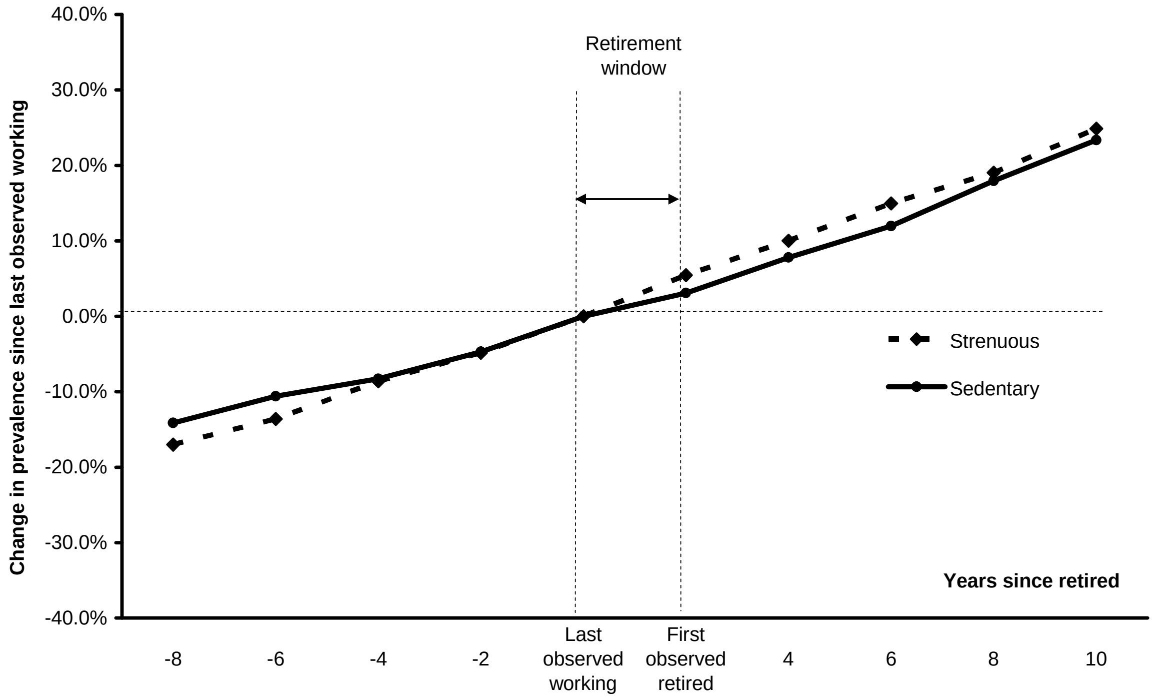
Figure 5 Unadjusted change in percentage ever diagnosed with diabetes since last observed working for males by occupation



	-8	-6	-4	-2	Last observed working	First observed retired	4	6	8	10
Strenuous	-0.07	-0.05	-0.03**	-0.02	0.00**	0.04	0.08	0.11	0.14	0.17
N	306	511	724	984	1,262	943	643	423	268	
Sedentary	-0.09	-0.07	-0.05**	-0.03	0.00**	0.02	0.04	0.07	0.11	0.13
N	243	384	566	749	957	712	477	304	191	

Source: Health and Retirement Study, 1992 to 2004.
Notes: The figure is based on the men in our sample who retire at some point during the HRS observation window. Since we can define a retirement date for each such man, we can also determine time until or since retirement. This figure calculates cumulative changes in the prevalence of diabetes since last observed working, as a functional of time, for males in different occupations. The table at the bottom of the figure shows the cumulative changes, and the number of persons that are interviewed both at a certain time since retire and at the next adjacent wave. "**" indicates that the incidence of diabetes for males in strenuous occupation at a certain time since retirement is significantly different from that in sedentary occupation, at the 5% significance level.

Figure 6: Unadjusted change in percentage ever diagnosed with hypertension since last observed working for males by occupation.

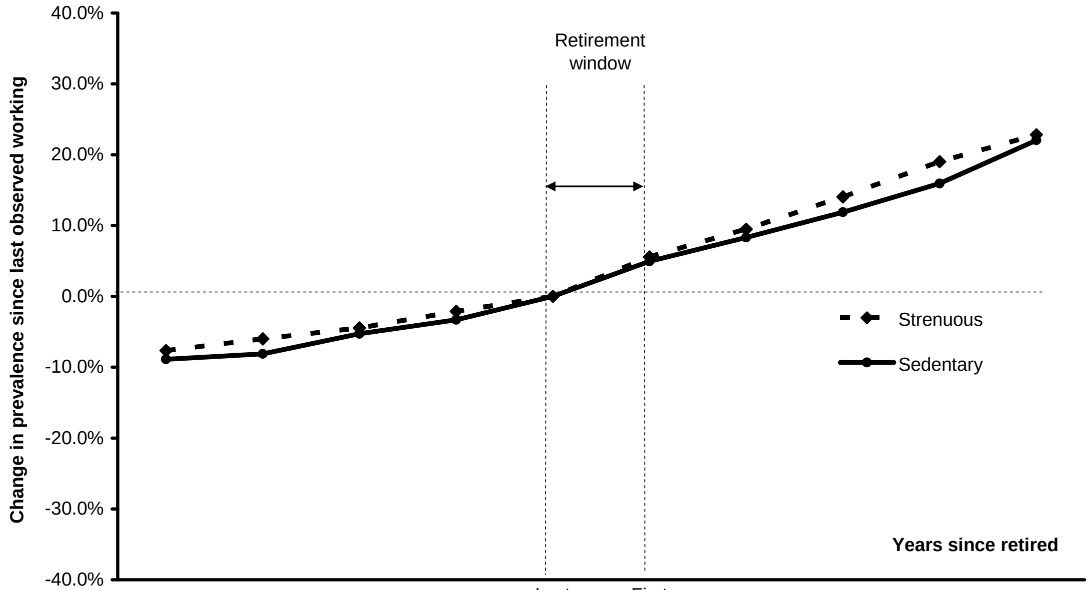


	-8	-6	-4	-2	Last observed working	First observed retired	4	6	8	10
Strenuous	-17.0%	-13.6%**	-8.6%	-4.9%	0.0%**	5.5%	10.0%	15.0%	19.1%	24.9%
N	306	511	724	984	1,262	943	643	423	268	
Sedentary	-14.1%	-10.6%**	-8.3%	-4.7%	0.0%**	3.1%	7.8%	12.0%	18.0%	23.3%
N	243	384	566	749	957	712	477	304	191	

Source: Health and Retirement Study, 1992 to 2004.

Notes: The figure is based on the men in our sample who retire at some point during the HRS observation window. Since we can define a retirement date for each such man, we can also determine time until or since retirement. This figure calculates cumulative changes in the prevalence of hypertension since last observed working, as a functional of time, for males in different occupations. The table at the bottom of the figure shows the cumulative changes, and the number of persons that are interviewed both at a certain time since retire and at the next adjacent wave. "**" indicates that the incidence of hypertension for males in strenuous occupation at a certain time since retirement is significantly different from that in sedentary occupation, at the 5% significance level.

Figure 7: Unadjusted change in percentage ever diagnosed with heart disease since last observed working for males by occupation.



	-8	-6	-4	-2	Last observed working	First observed retired	4	6	8	10
Strenuous	-7.7%	-6.0%	-4.5%	-2.1%	0.0%	5.6%	9.5%	14.1%	19.0%	22.8%
N	306	511	724	984	1,262	943	643	423	268	
Sedentary	-8.9%	-8.1%	-5.3%	-3.3%	0.0%	4.9%	8.3%	11.9%	15.9%	22.0%
N	243	384	566	749	957	712	477	304	191	

Source: Health and Retirement Study, 1992 to 2004.

Notes: The figure is based on the men in our sample who retire at some point during the HRS observation window. Since we can define a retirement date for each such man, we can also determine time until or since retirement. This figure calculates cumulative changes in the prevalence of heart disease since last observed working, as a functional of time, for males in different occupations. The table at the bottom of the figure shows the cumulative changes, and the number of persons that are interviewed both at a certain time since retire and at the next adjacent wave. “**” indicates that the incidence of heart disease for males in strenuous occupation at a certain time since retirement is significantly different from that in sedentary occupation, at the 5% significance level.

Table 1: HRS Summary Statistics.

	Type of occupation					
	All (n= 3,936)		Non-strenuous (n= 1,806)		Strenuous (n= 2,130)	
Characteristic	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Body mass (kg/m^2):						
Baseline	27.54	4.49	27.39	4.30	27.69	4.66
End of study*	28.00	4.75	27.72	4.47	28.28	4.98
Retirement:						
Retired by end of study	0.521	0.500	0.484	0.500	0.557	0.497
Age when retirement first reported	61.1	3.9	61.1	4.0	61.0	3.8
Socioeconomic status (at baseline):						
Age	54.3	2.9	54.2	2.9	54.4	2.9
White	0.887	0.317	0.926	0.263	0.850	0.358
Hispanic	0.063	0.243	0.029	0.168	0.096	0.294
Education						
Less than high-school degree	0.151	0.358	0.047	0.212	0.252	0.434
High school degree	0.347	0.476	0.211	0.408	0.479	0.500
Some college (no degree)	0.210	0.408	0.233	0.423	0.188	0.391
College degree	0.292	0.455	0.509	0.500	0.081	0.273
Household income ($1998)	79,477	85,473	103,040	105,492	56,561	50,260
Household wealth ($1998)	308,616	605,175	430,258	768,810	190,317	345,526
Health status (baseline):						
Self-rated health is fair or poor	0.113	0.317	0.071	0.257	0.154	0.361
Number of IADL limitations	0.069	0.312	0.032	0.204	0.106	0.386
Number of ADL limitations	0.023	0.184	0.015	0.151	0.030	0.211
Cancer	0.022	0.146	0.028	0.166	0.015	0.122
Lung disease	0.031	0.172	0.026	0.159	0.035	0.184
Heart disease	0.088	0.283	0.083	0.275	0.092	0.290
Stroke	0.013	0.111	0.016	0.125	0.009	0.096
Diabetes	0.066	0.248	0.065	0.247	0.066	0.249
Hypertension	0.297	0.457	0.286	0.452	0.307	0.461

Notes: Baseline BMI for each respondent is measured in 1992 for the original HRS cohort (n = 3,169), and in 1998 for the War Babies cohort (n = 767). "End of study" BMI is measured in the respondent's final HRS wave. The average elapsed time between baseline and the end of study is 10 years for the original HRS cohort, and 5.5 years for the War Babies cohort. Instrumental activities of daily living (IADL) include three activities: using the phone, managing money, and taking medications. Activities of daily living (ADL) include five activities: bathing, eating, dressing, getting in and out of bed, and walking across a room. The existence of disease is determined by asking the respondent, “Has a doctor ever told you that you had [disease]?”

Table 2: Examples of Strenuous and Non-Strenuous Occupations.

Occupation (3-digit 1980 Census Occupation Code)	Physical Demands
Non-strenuous	
Social work teachers (146)	0
Teachers, elementary school (156)	0.07
Legislators (003)	0.43
Managers and administrators (019)	0.63
Supervisors and preprietors, sales occupation (243)	0.67
Biological and life scientists (078)	0.97
Strenuous	
Mail carriers, postal services (355)	1.03
File clerks (335)	1.35
Automobile mechanics (505)	1.92
Janitors and cleaners (453)	2.45
Farm workers (479)	2.57
Electricians (575)	2.72
Carpenters (567)	2.87

Notes: The table shows a sampling of strenuous and sedentary occupations in our data. Each occupation is a 1980 Census 3-digit occupation. The relevant 3-digit code is shown in parentheses next to the occupation title. The scores are derived from the England-Kilbourne file described in the text. They represent the number of physical demands present in the following list: climbing or balancing; stooping, kneeling, crouching, or crawling; reaching, handling, fingering, or feeling.

Table 3: OLS and fixed effects regression results for effect of retirement on weight, by occupation

	Specification							
	OLS				Individual fixed effects			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Retired	-0.050	-0.269			-0.263***	-0.251***		
	(0.193)	(0.186)			(0.052)	(0.052)		
Retired*strenuous occupation	0.728***	0.678***			0.269***	0.268***		
	(0.234)	(0.224)			(0.061)	(0.061)		
Waves since retire			0.002	-0.077			-0.129***	-0.120
			(0.076)	(0.074)			(0.022)	(0.02
Waves since retire*strenuous job			0.261***	0.255***			0.125***	0.124
			(0.084)	(0.080)			(0.022)	(0.02
Age	0.257	0.159	0.411**	0.236	0.299***	0.280***	0.228***	0.221
	(0.174)	(0.172)	(0.201)	(0.200)	(0.050)	(0.050)	(0.056)	(0.05
Age squared	-0.002*	-0.002	-0.004**	-0.003	-0.002***	-0.002***	-0.001***	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)	(0.00
ln(income)	0.130***	0.137***	0.128***	0.139***	0.032**	0.033***	0.032**	0.033
	(0.047)	(0.046)	(0.047)	(0.046)	(0.013)	(0.013)	(0.013)	(0.01
Non-positive wealth	-0.405	-0.155	-0.391	-0.159	0.142	0.135	0.128	0.12
	(0.505)	(0.480)	(0.507)	(0.482)	(0.142)	(0.142)	(0.142)	(0.14
ln(wealth)	-0.051	-0.011	-0.051	-0.012	0.003	0.003	0.002	0.00
	(0.040)	(0.038)	(0.040)	(0.038)	(0.012)	(0.012)	(0.012)	(0.01
Control for health-related variables[(b)]	No	Yes	No	Yes	No	Yes	No	Yes
No. individuals	3,936	3,936	3,936	3,936	3,936	3,936	3936	3,93
No. of observations	20,913	20,913	20,913	20,913	20,913	20,913	20,913	20,91
Retired + Retired * strenuous occupation	0.678	0.408	0.263	0.180				
(p-value)	(p<0.01)	(p=0.028)	(p<0.01)	(p=0.017)				
Waves since retire + Waves since retire*strenuous job					0.006	0.017	-0.004	0.00
(p-value)					(p=0.908)	(p=0.741)	(p=0.844)	(p=0.8

* p<0.10, ** p<0.05, *** p<0.01

Notes: [(a)] OLS denotes ordinary least squares. all OLS regressions also include dummy variables for: strenuous occupation, white, Hispanic, less than high school degree, high school degree, and some college without degree, census region is Northeast, Middle west, and West.

[(b)] Health-related variables include number of IADL limitations, number of ADL limitations, self-rated health is fair/poor, ever being diagnosed with the following six chronic conditions: cancer, diabetes, heart disease, hypertension, lung disease, and stroke.

Table 4: First-stage IV estimates[(a)] for models of retirement and BMI

	Specification (1)		(2)	
	retired	**retired* strenuous**	**waves of retirement**	**waves of retirement* strenuous**
Age	0.005	0.009	-1.319***	-0.730***
	(0.012)	(0.009)	(0.034)	(0.034)
Age squared	0.000***	0.000	0.013***	0.007***
	(0.000)	(0.000)	(0.000)	(0.000)
Age >= 62	0.151***	-0.108***	-0.071***	-0.463***
	(0.013)	(0.004)	(0.027)	(0.014)
Age >= 65	0.091***	-0.083***	0.002	-0.704***
	(0.015)	(0.006)	(0.037)	(0.023)
(Age >= 62) * Strenuous occupation	0.092***	0.462***	0.105***	0.905***
	(0.015)	(0.010)	(0.034)	(0.024)
(Age >= 65) * Strenuous occupation	0.002	0.264***	0.254***	1.546***
	(0.018)	(0.012)	(0.043)	(0.032)
ln(income)	-0.044***	-0.023***	-0.071***	-0.030***
	(0.003)	(0.003)	(0.007)	(0.005)
Non-positive wealth	0.036	-0.012	-0.166**	-0.143***
	(0.028)	(0.023)	(0.065)	(0.056)
ln(wealth)	-0.000	-0.003	-0.022***	-0.017***
	(0.002)	(0.002)	(0.006)	(0.005)
Control for health-related variables[(b)]	NO	NO	NO	NO
No. of observations	3,936	3,936	3,936	3,936
No. individuals	20,913	20,913	20,913	20,913
Joint F-statistic of age>=62, age >= 65, and interactions with strenuous occupation	146	1501	22.7	1595
P value of over-identification test	0.350		0.682	

* p<0.10, ** p<0.05, *** p<0.01

Notes:

(a) Models include individual fixed-effects. Age>=62, Age>=65, and interactions are instruments for retirement and its interaction.

(b) Health-related variables include number of IADL limitations, number of ADL limitations, self-rated health is fair/poor, ever being diagnosed with the following six chronic conditions: cancer, diabetes, heart disease, hypertension, lung disease, and stroke.

Table 5: Second-stage IV estimates[(a)] of retirement on weight, by occupation.

	Specification			
	(1)	(2)	(3)	(4)
Retired	-0.160		-0.145	
	(0.243)		(0.242)	
Retired*strenuous occupation	0.512***		0.505***	
	(0.115)		(0.116)	
Waves since retire		0.131		0.182
		(0.455)		(0.454)
Waves since retire*strenuous occupation		0.143*		0.133*
		(0.074)		(0.075)
Age	0.324***	0.609	0.304***	0.649
	(0.061)	(0.591)	(0.061)	(0.582)
Age squared	-0.002***	-0.005	-0.002***	-0.005
	(0.001)	(0.006)	(0.001)	(0.005)
ln(income)	0.042**	0.051	0.043**	0.054
	(0.019)	(0.035)	(0.019)	(0.034)
Non-positive wealth	0.144	0.180	0.133	0.179
	(0.180)	(0.193)	(0.179)	(0.192)
ln(wealth)	0.004	0.008	0.004	0.009
	(0.016)	(0.018)	(0.015)	(0.018)
Control for health-related variables[(b)]	NO	NO	YES	YES
No. individuals	3,936	3,936	3,936	3,936
No. observations	20,913	20,913	20,913	20,913
Retired + Retired * strenuous occupation	0.352		0.360	
(p-value)	(p=0.080)		(p=0.075)	
Waves since retire + Waves since retire*strenuous job		0.274		0.315
(p-value)		(p=0.482)		(p=0.416)

* p<0.10, ** p<0.05, *** p<0.01

Notes:

[(a)] Models include individual fixed-effects. Age>=62, Age>=65, and interactions are instruments for retirement and its interaction.

[(b)] Health-related variables include number of IADL limitations, number of ADL limitations, self-rated health is fair/poor, ever being diagnosed with the following six chronic conditions: cancer, diabetes, heart disease, hypertension, lung disease, and stroke.

Notes: Models include individual fixed-effects. Age>=62, Age>=65, and interactions are instruments for retirement and its interaction.

Table 6: Proportion of HRS males engaging in vigorous physical activity 3 or more times weekly

Retirement status	Non-strenuous			Strenuous		
	Mean	Std. Dev	N	Mean	Std. Dev	N
Not retired	0.54	0.50	3,687	0.64	0.50	3,826
Retired	0.57	0.50	1,931	0.51	0.48	2,668

Source: Health and Retirement Study 1996 to 2002

Notes: Vigorous physical activity includes activity on-the-job and off-the-job.

Table 7: Effect of retirement on vigorous physical activity of HRS males

	Specification		
	OLS	Individual fixed effects	Individual fixed effects with IV
Retired	0.049**	0.063***	0.146
	(0.020)	(0.022)	(0.114)
Retired*strenuous occupation	-0.139***	-0.164***	-0.150**
	(0.025)	(0.028)	(0.068)
Age	-0.035	-0.024	-0.014
	(0.028)	(0.026)	(0.032)
Age squared	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)
ln(income)	0.010**	0.010**	0.013**
	(0.005)	(0.005)	(0.006)
Non-positive wealth	0.171***	0.033	0.033
	(0.053)	(0.053)	(0.056)
ln(wealth)	0.017***	0.003	0.004
	(0.004)	(0.005)	(0.005)
Self-rated health is fair or poor	-0.104***	-0.028*	-0.031
	(0.018)	(0.016)	(0.020)
Number of IADL limitations	-0.032	-0.012	-0.015
	(0.021)	(0.023)	(0.027)
Number of ADL limitations	-0.077***	-0.045***	-0.048***
	(0.011)	(0.014)	(0.016)
Diagnosed with cancer	-0.056**	-0.057*	-0.059
	(0.025)	(0.033)	(0.038)
Diagnosed with lung disease	-0.061**	-0.049	-0.057
	(0.031)	(0.050)	(0.061)
Diagnosed with heart disease	-0.001	0.026	0.021
	(0.018)	(0.029)	(0.037)
Diagnosed with stroke	-0.074**	-0.148***	-0.154***
	(0.033)	(0.052)	(0.055)
Diagnosed with diabetes	-0.050**	0.048	0.048
	(0.021)	(0.031)	(0.038)
Diagnosed with hypertension	-0.049***	0.058**	0.059**
	(0.014)	(0.023)	(0.025)
No. individuals	3,712	3,712	3,417
No. of observations	12,112	12,112	11,797
Retired + Retired * strenuous occupation	-0.090	-0.101	-0.004
(p-value)	(p<0.001)	(p<0.001)	(p=0.962)

* p<0.10, ** p<0.05, *** p<0.01

Source: Health and Retirement Study 1996-2002
Notes: OLS regressions also include dummy variables for: strenuous occupation, white, Hispanic, less than high school degree, high school degree, and some college without degree. The model of "individual fixed effects with IV" adds the following instruments for retirement: Age>=62 and Age>=65

Table 8: First-stage IV effects on retirement of turning age 62 and 65

	retired	retired* strenuous
Age	0.028**	0.030*
	(0.022)	(0.016)
Age squared	0.000**	-0.000**
	(0.000)	(0.000)
Age >= 62	0.108***	-0.069***
	(0.017)	(0.005)
Age >= 65	0.090***	-0.061***
	(0.019)	(0.006)
(Age >= 62) * Strenuous occupation	0.113***	0.370***
	(0.022)	(0.015)
(Age >= 65) * Strenuous occupation	-0.027**	0.203***
	(0.023)	(0.016)
ln(income)	-0.031***	-0.012***
	(0.004)	(0.003)
Non-positive wealth	0.024**	-0.023**
	(0.036)	(0.028)
ln(wealth)	-0.002**	-0.004**
	(0.003)	(0.002)
Self-rated health is fair or poor	0.030**	0.024**
	(0.013)	(0.011)
Number of IADL limitations	0.042**	0.025*
	(0.019)	(0.015)
Number of ADL limitations	0.040***	0.028***
	(0.012)	(0.010)
Diagnosed with cancer	0.039**	0.033**
	(0.029)	(0.023)
Diagnosed with lung disease	0.072*	0.031**
	(0.042)	(0.034)
Diagnosed with heart disease	0.063***	0.039**
	(0.024)	(0.018)
Diagnosed with a stroke	0.064**	0.071*
	(0.046)	(0.037)
Diagnosed with diabetes	0.010**	0.036*
	(0.023)	(0.019)
Diagnosed with hypertension	-0.015**	0.006**
	(0.017)	(0.013)
Joint F-statistic of age>=62, age >= 65, and interactions with strenuous occupation	55.1	275.8
P value of over-identification test	p=0.153	

* p<0.10, ** p<0.05, *** p<0.01

Source: Health and Retirement Study 1996-2002

Notes: OLS regressions also include dummy variables for: strenuous occupation, white, Hispanic, less than high school degree, high school degree, and some college without degree. The model of “individual fixed effects with IV” adds the following instruments for retirement: Age>=62 and Age>=65

Table 9: Fixed effects regression results for the effect of retirement on ever diagnosed with diabetes

Covariates	Specification (1)	(2)	(3)	(4)
Panel A: whole sample				
Retired	-0.005	-0.004		
	(0.005)	(0.006)		
Retired*strenuous occupation	0.017***	0.015*		
	(0.007)	(0.008)		
Waves since retire			0.001	0.001
			(0.002)	(0.003)
Waves since retire*strenuous occupation			0.003	0.003
			(0.002)	(0.004)
Age	0.003	-0.006	0.007	-0.004
	(0.005)	(0.008)	(0.006)	(0.008)
Age squared	0.000*	0.000**	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Age*strenuous occupation		0.019*		0.022*
		(0.011)		(0.012)
Age squared*strenuous occupation		-0.000*		-0.000*
		(0.000)		(0.000)
Number of individuals	20,913	20,913	20,913	20,913
Retired + Retired * strenuous occupation	0.012	0.011		
P value of the Wald test of Retired + Retired * strenuous occupation = 0	0.021	0.064		
Waves since retire + Waves since retire*strenuous job			0.004	0.004
P value of the Wald test of Waves since retire + Waves since retire*strenuous job = 0			0.044	0.121
Panel B: balanced sample only				
Retired	-0.018***	-0.020***		
	(0.007)	(0.007)		
Retired*strenuous occupation	0.023***	0.027***		
	(0.008)	(0.010)		
Waves since retire			-0.005**	-0.007**
			(0.003)	(0.003)
Waves since retire*strenuous occupation			0.005*	0.008*
			(0.003)	(0.004)
Age	0.001	-0.007	-0.002	-0.014
	(0.006)	(0.009)	(0.007)	(0.010)
Age squared	0.000*	0.000**	0.000**	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Age*strenuous occupation		0.018		0.025*
		(0.012)		(0.014)
Age squared*strenuous occupation		-0.000		-0.000*
		(0.000)		(0.000)
Number of individuals	14,141	14,141	14,141	14,141
Retired + Retired * strenuous occupation	0.005	0.007		
P value of the Wald test of				

Retired + Retired * strenuous occupation = 0	0.43	0.82		
Waves since retire + Waves since retire*strenuous job			0.000	0.001
P value of the Wald test of				
Waves since retire + Waves since retire*strenuous job = 0			0.32	0.760
Hausman specification test of attrition bias				
F-statistic	20.4	28.6	26.7	33.7
P-value	0.005	0.000	0.002	0.000

Note: All models control for household income and household wealth

Table 10: Fixed effects with IV regression results for the effect of retirement on ever diagnosed with diabetes

	Specification			
Covariates	(1)	(2)	(3)	(4)
Panel A: whole sample				
Retired	-0.005	-0.008		
	(0.028)	(0.048)		
Retired*strenuous occupation	0.019	0.028		
	(0.014)	(0.054)		
Waves since retire			0.058	-0.057
			(0.055)	(0.109)
Waves since retire*strenuous occupation			-0.002	0.180
			(0.009)	(0.126)
Age	0.003	-0.006	0.082	-0.079
	(0.007)	(0.011)	(0.072)	(0.140)
Age squared	0.000	0.000	-0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Age*strenuous occupation		0.019		0.279
		(0.015)		(0.170)
Age squared*strenuous occupation		-0.000		-0.003
		(0.000)		(0.002)
Number of individuals	20,913	20,913	20,913	20,913
Panel B: balanced sample only				
Retired	0.010	-0.023		
	(0.034)	(0.055)		
Retired*strenuous occupation	0.020	0.077		
	(0.016)	(0.065)		
Waves since retire			0.072	-0.013
			(0.068)	(0.092)
Waves since retire*strenuous occupation			-0.002	0.198
			(0.010)	(0.134)
Age	0.004	-0.008	0.105	-0.024
	(0.008)	(0.013)	(0.093)	(0.127)
Age squared	0.000	0.000	-0.001	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Age*strenuous occupation		0.023		0.318
		(0.017)		(0.199)
Age squared*strenuous occupation		-0.000		-0.003
		(0.000)		(0.002)
Number of individuals	14,141	14,141	14,141	14,141
Hausman specification test of attrition bias				
F-statistic	8.6	7.4	10.8	3.8
P-value	0.285	0.386	0.288	0.925

* p<0.10, ** p<0.05, *** p<0.01

Note: All models control for household income and household wealth