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Forecasting Retirement Needs and Retirement Wealth

Edited by Olivia S. Mitchell,
P. Brett Hammond, and Anna M. Rappaport

Pension Research Council

The Wharton School of the University of Pennsylvania

PENN

University of Pennsylvania Press

Philadelphia

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10 9 8 7 6 5 4 3 2 1

Published by
University of Pennsylvania Press
Philadelphia, Pennsylvania 19104-4011

Library of Congress Cataloging-in-Publication Data

Forecasting retirement needs and retirement wealth / edited by

Olivia S. Mitchell, P. Brett Hammond, and Anna M. Rappaport.

p. cm. "Pension Research Council Publications"

Includes bibliographical references and index.

ISBN 0-8122-3529-0 (alk. paper)

I. Retirement income — United States — Planning. I. Mitchell,
Olivia S. II. Hammond, P. Brett. III. Rappaport, Anna M.

HG179.F577 1999

332.024'01. — dc21

99-41733

CIP

Chapter 10

Retirement Expectations and Realizations: The Role of Health Shocks and Economic Factors

Debra Sabatini Dwyer and Jianting Hu

This chapter explores the relationship between people's expectations about retirement, their realizations of retirement, and the role of health shocks in this process. We look at how accurately people predict retirement and we examine the determinants of changes in retirement expectations. Expectations are made under uncertainty about future health, labor force status, household characteristics, and economic variables; therefore workers' plans must frequently be updated with new information. While many factors influence the decision to retire, we are particularly interested in the role of health shocks in people's decisions to alter their plans to retire.

Research to date has recognized the importance of understanding the relationship between health and retirement; however, until now, information about health, work, and economic wellbeing has been difficult to obtain in a single survey. The Health and Retirement Study (HRS) is the first national survey to combine comprehensive data on all of these areas. Nevertheless, much of the early HRS research used only the first wave of data, at which time many in the cohort were too young to retire. In this chapter we use new information on this group of people from both Waves 1 and 2, enabling us to observe this cohort moving into retirement. In what follows we first offer a brief discussion of the literature, and then discuss empirical models, data used in the analysis, results, and conclusions.

Motivation and Background

Never has the issue of longevity in the labor force been more important than it is today. By now it is common knowledge that our nation is aging and that the upcoming retirement of the baby-boomers is expected to put pressure on social welfare and insurance systems. The Social Security Trust Fund is

currently operating at a surplus, but the fund is expected to be exhausted within about thirty years. As a result, bringing the system into actuarial balance is a subject of substantial policy interest. Proposals range from adjustments to a complete overhaul of the current "pay-as-you-go" system. As policy analysts, it is our job to determine the likely winners and losers of alternative proposals.

Several reform proposals being seriously considered recommend further increasing the normal retirement age (NRA) as well as increasing the early retirement age (ERA) — the earliest age one can begin receiving (reduced) social security old age insurance benefits. Raising the NRA is equivalent to a cut in benefits for those retiring before they reach the new NRA. In addition, if people respond by retiring later, this would raise revenue from payroll taxes. Raising the ERA would result in reduced benefit payments and increased revenues as well.

The justification for raising these ages rests on the fact that an increase in life expectancy lengthens the period during which social security benefits must be paid. Workers now have more time over which to choose between work and retirement. If people are living longer, the argument is that they can work longer and still enjoy a lengthy retirement. Nevertheless there is concern over the health of the labor force affected by such changes. Has medical technology improved longevity for those who are not very healthy? In other words, are people living longer with impairments? If so, it may be necessary to permit continued early retirement if they are troubled with health problems. Researchers have been unable to identify the extent of this problem until now. It is our goal, therefore, to examine the role of poor health in retirement planning and labor force exits.

The retirement age choice is one that is made over the working life cycle. However career choices and labor force commitments are made, the consequences of these decisions affect the timing of retirement. Regardless of the degree of planning, there is some uncertainty associated with the future propensity to afford leisure and desire work. Perhaps the largest source of uncertainty is associated with health and disability, or the ability to perform work. It is for this reason that we expect poor health to have quite a substantial impact on retirement. Bound et al. (1997), when looking at the effects of health on labor force transitions of older men and women using the first two waves of the HRS, find that poor health is a very strong predictor of labor force exits. Changes in health between the two waves have the biggest effect on labor force transitions. There were no economic controls in that research. Blau, Gilleskie, and Slusher (1997) focus on alternative measures of health and also conclude that health plays an important role in labor market transitions of older men.

When people report expectations about retirement, we assume this is the optimal choice given such factors as their current health, family, work, and economic status. This is consistent with the assumption prevalent in life-

cycle retirement models, that individuals form rational long-range plans. If this is the case, and assuming preferences for work and leisure remain unchanged, then, *ceteris paribus*, any changes to expectations would be the result of changes to one or more of these factors. Consequently, those closer to retirement report more accurate expectations. Bernheim tests the rationality of retirement expectations in his research using the Retirement History Study (RHS). There he reports that individuals do not form expectations based on all information currently available, but they do respond rationally (in altering their expectations) to new information in the period directly preceding retirement. He also finds that while individuals do not use full information in forming expectations, the expectations are reliable indicators of actual retirement (Bernheim 1987, 1990). Honig uses the HRS and corroborate these conclusions (1996). Irelan (1977) uses the RHS as well and also finds that deviations from retirement expectations can be explained by unforeseen changes to retirement circumstances.

In the present study, we build on the work of Dwyer and Mitchell (1999) and follow expectations into retirement. The earlier research found that the two most important determinants of retirement expectations were health and access to health insurance. Magnitudes of the effects of economic factors were very small. It could not be determined whether health plays a much bigger role in the decision to retire than do economic factors (suggesting an inelastic price elasticity for leisure), or whether people in poor health have stronger preferences for retiring earlier (if they can afford to do so). This second interpretation of the Dwyer/Mitchell results is consistent with Bernheim's findings on the use of information in planning for retirement (1990). In the present study, we re-examine information used in planning for retirement, what drives changes to those plans, and who retires between Waves 1 and 2. The goal is to test for the rationality of expectations in the presence of heterogeneity among planners, as well as to examine the role of health shocks in changes to those expectations.

Research Questions and Hypotheses

We define retirement as complete withdrawal from the labor force. We hypothesize that during a planning period, using information available at that time, a worker selects an expected retirement age that maximizes utility over the remainder of his or her life. Expected retirement is influenced by potential labor earnings, income from pensions and social security, and preferences for leisure. Health status can also affect labor earnings and preferences for leisure. Of course, during the planning phase, full information on health and other factors is not available, so expectations regarding these future earnings and retirement income, non-labor income, and the value of non-market time, are all that can be used. As new information arrives, retirement expectations may be adjusted.

Actual retirement behavior can diverge from expectations for two reasons: new information becomes available after the plans are made (i.e. health shocks, early-out offers), or full information is not used in formulating expectations. In a model of changes to expectations, we would include changes to all of the factors that influence retirement. Some of those factors do not change much and theoretically should fall out of the model (future benefits). Labor earnings of older people and retirement income entitlements may be fairly well anticipated, though even here, learning may take place about pension plan rules and similar benefit entitlements. For this reason our model controls on earnings levels as well as on other non-labor income. We test to see if learning takes place by evaluating the effects of factors that do not change over time.

Econometric Modeling Issues

We use a two-period sequential model of the retirement decision-making process. The first question in this sequential process asks "Do you plan to retire by the second period?" and then, conditional on that response, the question is asked "Did you retire in the second period?" The two steps of the sequential process are characterized as follows:

$$\begin{aligned} EXP_1 &= F(W_1, H_1, Z_1), \\ R_2 &= G(W_2, \Delta W, H_2, \Delta H, Z_2 | EXP_1), \end{aligned}$$

where

$$\begin{aligned} EXP_1 &= \text{expectations of retirement/work,} \\ R_2 &= \text{retirement/work next period,} \\ H_t &= \text{health status in period } t, \\ W_t &= \text{vector of economic factors (income, assets, retirement income,} \\ &\quad \text{health insurance),} \\ Z_t &= \text{vector of other exogenous variables.} \end{aligned}$$

We assume that expectations are formed using the same variables as those that influence actual retirement—namely health and socioeconomic factors. The retirement model uses current information as well as changes from the first period, conditioning on expectations.

We test a number of hypotheses using this sequential model. First, we hypothesize that health shocks will significantly affect retirement in the second period, even after conditioning on expectations. Continuing health problems should not play a role on second-period retirement after conditioning on expectations. Likewise, labor income and future benefits are not expected to change, so we expect no effect on retirement in the second period after conditioning on expectations. This tests the rationality of ex-

pectations by checking to see if factors that have not changed were included in those expectations.

The sequential model assumes that the sequential steps are independent. In particular, we assume that expectations in the first period are independent of the outcome in the second period. To deal with the possibility of correlation across the equations we use a simultaneous multinomial logit model of work transitions. The corresponding schematic model is as follows:

$$WR2 = Q(W, \Delta W, H, \Delta H, Z),$$

where

- $WR2 =$ Labor force transition
- = 1 if expected to retire by the next period and did,
 - = 2 if expected to retire by next period and did not,
 - = 3 if did not expect to retire by next period and did,
 - = 4 if did not expect to retire by next period and did not.

This models the probability of ending up in one of the four labor force transition cells.

Similar hypotheses are examined using both models. We expect health shocks, or a worsening of health in the second period, to increase the likelihood of retirement, regardless of which model we use and independent of the first period expectations. We expect changes in socioeconomic status to influence actual retirement as well, although, for the most part, we do not expect tremendous changes in most economic factors for older workers. Earnings tend to be stable and future retirement benefits are based on a lifetime of work. Early-out offers are expected to play a role. Factors that do not change should not substantially influence retirement in the second period, since we are conditioning on expectations from that period in the sequential model. If full information is used in forming expectations, then the groups should be homogeneous in the combined health and socioeconomic factors.

Data Description

The analysis uses the first two waves of the HRS; respondents in the first wave (1992) are between the ages of 51 and 61, and by Wave 2 (1994) they attained the ages of 53–63. We restrict the sample to age-eligible respondents who participated in both waves of the study, and who were either working, partially retired, or fully retired in the first wave.¹ Excluded are people who were disabled, unemployed, homemakers, and others who did not clearly fall into one of the work/retirement categories because of missing values. Our sample size is 5,902 individuals.

In the sequential model we have two dependent variables. The first is *EXPI*, which is a dichotomous variable that equals one if the respondent plans to retire by Wave 2. The second is a dichotomous indicator of retirement in Wave 2. In the multinomial Logit we define a categorical dependent variable that takes four values for the four possible outcomes as described above.

We use three measures of health status in all models. As a measure of functional capacity we use a self-report of the presence of work limitations. A self-report of overall general health measures disease and illness. These variables have proven to be complements rather than substitutes in retirement models (see Dwyer and Mitchell 1998). For each measure we include a change variable as well as a levels variable. We create indicators for whether the condition is reported in both Waves, or is a new problem in Wave 2. In addition we include a self-report of health in Wave 2 compared to Wave 1, which directly measures shocks to health status.²

Economic variables include net worth, household income, and future retirement income. Net worth is defined as assets minus debts. Assets include real estate, vehicles, businesses, IRAs, savings, inheritances, and trusts. Household income includes any labor earnings, pensions and retirement income, government transfers, rent, interest, and dividend income of any member of the household over the past year. Future retirement income includes both social security and pensions for retirement at ages 62 and 65.

Empirical Findings

Table 1 reports means and frequencies by expectations of retirement in Wave 1 and actual retirement in Wave 2. We separate those who expected to retire from those who did not, and report within-group differences. Almost three-quarters (74 percent) of the sample were working full time in both waves, and roughly 9 percent were retired in both waves; one-tenth moved from work to retirement. Of the 383 workers who planned to retire by Wave 2 (9 percent of Wave 1 workers), 173 fully retired (45 percent) and 41 partially retired (11 percent). Of the 4,565 who did not plan to retire, 8 percent did fully retire and 5 percent partially retired. Of most interest in this analysis are the 10 percent in the sample who changed retirement plans.

The biggest differences among Wave 2 retirees between those who planned retirement and those that did not are in changes in health status (those who did not plan to retire had a much higher prevalence rate of new work limitations), Wave 1 health insurance status, Wave 1 household income (those who planned retirement are better off), age, and sex. This suggests that information available at Wave 1 was used in planning for retirement, and what drove the change was a worsening of health. In fact, among those who planned to work, differences in economic variables are smaller.

In all cases, health status, defined here as having a problem that limits

TABLE 1: Means of Selected Variables by Expected Retirement Status

Variables	ALL N=4,947		Planned to Retire (EXP=1) N=383		Planned to Work (EXP=0) N=4,564	
	Retired	Working	Retired	Working	Retired	Working
Work limitations both waves ¹	0.11	0.04	0.10	0.06	0.11	0.04
Work limiting Wave 2 only ²	0.30	0.06	0.19	0.07	0.36	0.06
Partner poor health W1	0.27	0.33	0.28	0.39	0.27	0.32
Health Ins. tied to work	0.67	0.67	0.76	0.68	0.62	0.67
Retiree health ins.	0.68	0.56	0.85	0.66	0.59	0.55
HH income \geq \$30,000	0.71	0.72	0.84	0.76	0.64	0.72
Social security benefit ³	0.29	0.26	0.27	0.26	0.30	0.26
Pension	0.48	0.54	0.48	0.51	0.49	0.54
Early-out offer	0.05	0.01	0.10	0.01	0.05	0.01
High-school only	0.39	0.35	0.36	0.36	0.40	0.35
Some graduate work	0.13	0.13	0.17	0.12	0.11	0.13
Age	58.9	57.0	60.5	59.9	58.1	56.8
Female	0.52	0.47	0.41	0.45	0.58	0.47
White	0.75	0.76	0.77	0.71	0.74	0.76

Source: Authors' calculations; weighted tabulations of HRS gamma release, Waves 1 and 2.

Notes:

¹ The respondent reported the problem in both waves.

² The respondent reported the problem in wave 2 only.

³ This variable = 1 if the expected annual benefit for retirement at age 65 is at least \$20,000.

paid work a person can do, was worse among those who planned to retire between Waves 1 and 2.³ Health was worse among all who actually retired by Wave 2. As expected, the aging process results in overall declines in health status, but the greatest deterioration was among retirees who did not plan to retire.

Table 2 reports the results from the sequential logit model. We condition on expectations status in Wave 1 and allow the slope coefficients to differ by that status. Not surprisingly, the presence of a work limitation significantly increased the probability of retirement in the second wave, particularly for those who did not plan to retire. In all models, a worsening of health, measured as a new work limitation between Waves 1 and 2, had a larger impact on retirement than did a persistent health problem.⁴ Again, this is most apparent for those who did not plan to retire and then do. Those with a new work limitation in that group were 29 percent more likely to retire than those who did not, while those with a persistent one were only 18 percent more likely to do so. For those who expected to retire the corresponding figures were 43 percent and 30 percent respectively. The parameter estimates for health are larger in magnitude for those whose retirement represented a change in plans from Wave 1. This is not surprising, since poor health was a driving factor in forming the Wave 1 expectations that

TABLE 2: Logit Results of Wave 2 Retirement Status by Expectation Status

Variables	ALL N=4,947		Planned to Retire (EXP=1) N=383		Planned to Work (EXP=0) N=4,564	
	Parameter Estimate	Marginal Effect	Parameter Estimate	Marginal Effect	Parameter Estimate	Marginal Effect
Work limitations both waves	1.61** (0.18)	0.19	1.13** (0.45)	0.30	1.71** (0.20)	0.18
Work limiting Wave 2 only	2.19** (0.13)	0.30	1.45** (0.38)	0.43	2.43** (0.14)	0.29
Partner w/poor health W1	-0.13** (0.06)	-0.01	-0.17 (0.14)	-0.02	-0.15** (0.07)	-0.01
Health ins. tied to work	-0.16* (0.12)	-0.01	-0.14 (0.30)	-0.02	-0.22** (0.14)	-0.01
Retiree health ins.	0.67** (0.12)	0.04	1.42** (0.33)	0.08	0.37** (0.14)	0.04
HH income \geq \$30,000	0.21** (0.12)	0.01	0.37 (0.32)	0.03	0.05 (0.14)	0.01
Social security benefit	0.24** (0.11)	0.02	0.22 (0.26)	0.03	0.33** (0.13)	0.02
Pension	-0.27** (0.10)	-0.02	-0.36** (0.24)	-0.03	-0.21** (0.12)	-0.02
Early-out offer	1.84** (0.47)	0.06	2.44** (0.77)	0.13	1.76** (0.60)	0.06
High-school only	0.20** (0.11)	0.01	-0.12 (0.25)	0.03	0.25** (0.13)	0.01
Some graduate work	0.37** (0.16)	0.03	0.45* (0.35)	0.05	0.33** (0.20)	0.03
Age	0.21** (0.02)	0.01	0.12** (0.04)	0.03	0.14** (0.02)	0.01
Female	0.31** (0.10)	0.02	-0.20 (0.23)	0.03	0.55** (0.12)	0.01
White	-0.11 (0.12)	-0.01	0.25 (0.27)	-0.01	-0.04 (0.14)	-0.01
Goodness of fit stat	0.1096		0.1738		0.0859	

Notes: See Table 1. Standard errors in parentheses.

* Significant at the 0.1 level.

** Significant at the 0.05 level.

were already conditioned on. So for the group who planned to retire, a worsening of health only reinforced preferences toward earlier retirement but the health effect would have been bigger in the first step (the model of expectations; see Dwyer and Mitchell 1997).

Since poor health drove people out of the labor force, it is not surprising that the presence of a spouse in poor health worked the other way. If one partner was less likely to work, retirement became less affordable for the other.

TABLE 3: Multinomial Logit of Expected and Realized Retirement

Variables	Planned to Retire by W2		Didn't Plan to Retire by W2			
	Not Retired		Retired		Not Retired	
	Parameter Estimate	Marginal Effect	Parameter Estimate	Marginal Effect	Parameter Estimate	Marginal Effect
Work limitations both waves	-0.86** (0.10)	-0.09	-0.80** (0.15)	-0.01	-0.30** (0.16)	-0.01
Work limiting Wave 2 only	-1.21** (0.07)	-0.12	-0.78** (0.11)	-0.01	-0.11 (0.15)	-0.01
Partner poor health W1	-0.15** (0.07)	-0.02	-0.08 (0.10)	-0.001	0.09 (0.08)	0.01
Health ins. tied to work	0.10** (0.07)	0.01	0.01 (0.10)	—	0.02 (0.09)	0.001
Retiree health ins.	-0.20** (0.07)	-0.03	-0.77** (0.12)	-0.01	-0.21** (0.09)	-0.01
HH income ≥ \$30,000	-0.01 (0.07)	-0.002	-0.40** (0.11)	-0.01	-0.17** (0.09)	-0.01
Social security benefit	-0.17** (0.07)	-0.02	-0.02 (0.09)	—	0.01 (0.08)	—
Pension	0.12** (0.06)	0.02	0.17** (0.08)	0.002	0.07 (0.07)	0.004
Early-out offer	-0.86** (0.30)	0.15	-0.93** (0.36)	0.02	-0.34** (0.13)	-0.02
High-school only	-0.13** (0.06)	-0.02	-0.07 (0.09)	-0.001	-0.08 (0.08)	-0.004
Some graduate work	-0.17** (0.10)	-0.02	-0.17** (0.12)	-0.002	0.02 (0.12)	0.001
Age	0.13** (0.02)	0.02	0.46** (0.03)	0.01	0.36** (0.03)	0.02
Male	0.25** (0.06)	0.03	-0.03 (0.09)	—	0.03 (0.08)	0.002
White	0.05 (0.07)	0.01	0.12 (0.10)	0.001	0.25** (0.08)	0.01

Notes: See Table 1. Standard errors in parentheses.

— Value too close to 0 to report (<0.001).

* Significant at the 0.1 level.

** Significant at the 0.05 level.

Economic factors play a significant role in retirement by Wave 2, but more so for those who did not plan to retire. Variables include an indicator for Wave 1 household income of at least \$30,000, social security, pensions, and the presence of health insurance.⁵ People with higher household income and future social security benefits retired earlier. People paying into pension plans retired later. Early-out offers drove people out earlier. Access to retiree health insurance through the employer significantly increased the likelihood of retirement in all cases. This is Wave 1 information, since we use

Wave 1 health insurance status.⁶ This implies that information about economic status is not fully accounted for when forming expectations, since pensions and retiree health insurance status are not likely to change much between the waves.

What these results suggest is that people form retirement expectations based on current health status and, to some extent, economic status. Health shocks play a big role in retirement for those who did not plan to retire. This makes sense, since Wave 1 health was conditioned by controlling for expectations. Among those who planned to retire, people more likely to do so were older, more educated, and in better economic shape than those who did not. For those who planned to continue working, those who did were younger, male, and healthier. Health played a bigger role than economic status in Wave 2 retirement for those who did not plan to retire.

Table 3 reports the results from the simultaneous model of expectations and realizations of retirement. The omitted category is those who planned to retire and did; that group was in the worst health. A respondent with a new work limitation was 12 percent less likely to be in the category of working after planning to retire, and 1 percent less likely to have not planned to retire at all. Those who planned to retire and did so were also more likely to have retiree health insurance, early-out offers, and not be within average education levels in the country.⁷ The oldest respondents tended to fall into the category of retired in Wave 2 without having planned to do so.

Conclusion

One of the invaluable aspects of the Health and Retirement Study is its usefulness in understanding the relationship between people's expectations about retirement before the event actually arrives, and their actual subsequent retirement behavior. Defining retirement as complete withdrawal from the labor force, we hypothesized that health shocks would make plans deviate from realizations, while anticipated retirement-income benefits would provide little new information and so would have no impact on changes in plans. The empirical results show that those who planned to retire and did so were in worse health but in better economic shape. Overall, a tenth of the sample altered its retirement plans, and this change was associated with changes in own health status, particularly a move into poor health.

Appendix

In Wave 1 there were 6,960 age-eligible respondents in the Health and Retirement Study who met our criteria for work status (either working or retired). We exclude the unemployed, those on leave from jobs, disabled receiving transfers, and homemakers with little work experience. Similarly

in Wave 2 we remove those who were unemployed, receiving disability transfers, or with missing values so that work status was unattainable. The resulting sample consists of 5,902 age-eligible respondents.

In addition to the variables created for each individual, we also created the same set of variables for those who had partners living in the same household, such as partner's health status and presence of work limitation.

Work Status/Retirement

Work status. We categorize respondents into three categories by wave: working, retired, or partially retired, using the self-reports of work status. This is not always clear, so we also use whether or not they were working for pay, how many hours they worked, and their self-report of retirement status. *Working:* means the respondent was working full time. *Retired:* means the respondent fully departed from the labor force. *Partially retired:* means the respondent was working part-time and considered him/herself partially retired.

Expected retirement age. For Wave 1 we use the age the person expected to fully retire from the labor force. If this was missing but available in Wave 2, we use the Wave 2 self-report (304 cases). In Wave 2 the question asked for the age he or she planned to retire—where retirement was defined by the respondent (so it could mean a switch to self-employment or partial employment). For this reason we do not extend the analysis to changes in retirement expectations between the two waves.

Health Measures

General Health Conditions. Change in health status between the two waves was defined as changes in *general health*: excellent, very good, good, fair, and poor; and *general health compared to last one or two years*: much better, somewhat better, same, somewhat worse, much worse.

Presence of Work Limitation. Change in the presence of work limitation between the two waves was defined as changes in impairments or health problems limiting the kind or amount of paid work.

Functional Limitations. Change in the number of functional limitations between the two waves was defined as a change in the *number of functional limitations*: to run or jog, to walk several blocks, to walk one block, to climb several stairs, to climb one stair, to lift 10 pounds, to stoop, kneel, or crouch, to reach or extend arms above shoulder level, and to pull or push large objects. Non-severe and severe functional limitations were defined as having some difficulties and severe difficulty performing each function.

Activities of Daily Living (ADL). Change in the number of ADLs between the two waves was defined as a change in the *number of activities of daily living*: to walk across a room, to sit for two hours, to get up from a chair, to get in or out of bed, to take a bath or shower, to eat, and and to dress. Non-severe and severe ADLs are defined as having some difficulties and severe difficulty to perform each function.

Instrumental Activities of Daily Living (IADL). Change in the number of IADLs between the two waves was defined as *number of instrumental activities daily living*: to pick up a dime from a table, to keep track of money or bill, and to make phone calls. Non-severe and severe IADLs was defined as having some difficulties and severe difficulty to perform each function.

Diagnostic Indicators. Having high blood pressure or hypertension and high cholesterol.

User of Medical Facilities. Change in using medical facilities between the two waves was defined as a change in staying in a hospital or a nursing home overnight, number of doctor visits, days of staying in bed due to illness or injury, and needing any professional nursing care at home in the past year.

*Medical Conditions.*⁸ These included *mental health*: ever having emotional, nervous, or psychiatric problems, felt depressed in the past week, felt everything was an effort, restless sleep, felt unhappy, felt lonely, felt people were unfriendly, not enjoying life, felt sad, felt disliked, could not get going, poor appetite, felt listless, felt tired, felt not rested when woke up, felt depressed for weeks; *musculoskeletal conditions*: having arthritis or rheumatism, problems with back, feet and legs, and a fracture or broken bone; *head injuries and trauma*: having been unconscious due to a head injury; *respiratory and cardiovascular system conditions*: ever having chronic lung disease except asthma, ever having heart attack, coronary heart disease, angina, congestive heart failure, or others, currently having any angina or chest pains, any heart failure, seeing doctors for heart problems during the last 12 months, ever having a special test or treatment of heart, ever having heart surgery, ever having a stroke, and having asthma; *other conditions*: ever having diabetes or high blood sugar, ever having cancer or a malignant tumor of any kind except skin cancer, having kidney or bladder problems, stomach or intestinal ulcers.

Economic Variables

Household income. Measured as annual 1991 gross income. It includes all sources of household income. Past year labor earnings and pensions are asked of the respondent, partner/spouse, and other adult family members.

Private assets include household income from rent, interest, and dividends. Government transfers are also included.

Net worth. Real estate, vehicles, businesses, IRAs, savings, inheritances, trusts, minus debts reported in \$1991 ($\times 10^{-4}$). Missing values, if any, were imputed by Juster and Suzman (1995).

Retiree health insurance. Self-report of having retiree health insurance in either of the waves.

Employer-provided health insurance. Self-report of having employer-provided health insurance in either wave.

Private pensions. The employer-provided pension plan descriptions are used to calculate annual pension benefits for retirement at age 65 for those who provided consent forms and information.

Estimated SS retirement benefits. An algorithm was devised for projecting social security old age benefits for retirement at age 65.

Early out offer. Respondent was offered an early retirement window.

The authors thank Benjamin Bridges, Olivia Mitchell, Jan Olson, Herbert Reff, and Chuck Slusher for helpful comments and/or data support. In addition they acknowledge Bernie Wixon and Denny Vaughan for their support.

Notes

1. Retirees are excluded from the multivariate analysis but useful for some of the descriptive analysis.

2. The HRS provides many health indicators to choose from, including reports of specific symptoms and conditions. Many of the questions were changed between the two waves, making them less useful in a transition model (ADLs, IADLs, and functional status variables). Dwyer and Mitchell (1998) show that the combined self-reports are exogenous good measures of overall health.

3. Models including several measures of health find the functional status variables to be most significant. Many of the specific symptoms are correlated with this measure causing multicollinearity. We exclude irrelevant variables to maximize degrees of freedom, given small sample sizes.

4. We would expect a health problem that existed in the first wave not to have a substantial impact on retirement in the second wave, since that was accounted for in the formation of the expectation, which is conditioned in. Because we do not control on the severity of the problem, it is possible for a condition to have existed but worsened in the second wave. For this reason we do not predict the effect of a persistent problem to be 0, as it is not, but smaller, as it is.

5. Wave 1 net worth is never significant so it is omitted.

6. Wave 2 economic status is endogenous.
7. They seem to be bimodal — low educated and in poor health, or highly educated and able to afford retirement.
8. We define a change in the two waves as whether or not the condition was present in both waves, Wave 1 only, Wave 2 only, or not at all.

References

- Anderson, Kathy and Richard V. Burkhauser. 1985. "The Retirement-Health Nexus: A New Measure of an Old Puzzle." *Journal of Human Resources* 20: 315–30.
- Bazzoli, Glora J., 1985. "The Early Retirement Decision: New Empirical Evidence on the Influence of Health." *Journal of Human Resources* 20: 215–34.
- Bernheim, B. Douglas. 1987. "The Timing of Retirement: A Comparison of Expectations and Realizations." in: David A. Wise, ed., *The Economics of Aging*, Chicago: University of Chicago Press, 335–56.
- . 1990. "How Do the Elderly Form Expectations? An Analysis of Responses to New Information." in David A. Wise, ed., *Issues in the Economics of Aging*. Chicago: University of Chicago Press, 259–85.
- Blau, David M., D. B. Gilleskie, and C. Slusher. 1997. "The Effect of Health on Employment Transitions of Older Men." Unpublished manuscript.
- Bound, John. 1991. "Self-Reported Versus Objective Measures of Health in Retirement Models." *Journal of Human Resources* 26: 106–38.
- Bound, John, M. Schoenbaum, T. Stinebrickner, and T. Waidmann. 1997. "Measuring the Effects of Health on Retirement Behavior." Unpublished manuscript, University of Michigan.
- Dwyer, Debra Sabatini and Olivia S. Mitchell. 1999. "Health Shocks as Determinants of Retirement: Are Self-Rated Measures Endogenous?" *Journal of Health Economics* 18, 2: 173–93.
- Gatti, Roberta. 1997. "Savings and Health Shocks." Unpublished manuscript. Howard University (November).
- Honig, Marjorie. 1996. "Retirement Expectations: Differences by Race, Ethnicity, and Gender." *Gerontologist* 36 (3): 373–82.
- Irelan, Lola M. 1977. "Almost 65: Baseline Data from the Retirement History Study." Research Report No. 49, Office of Research and Statistics, U.S. Social Security Administration. Washington, D.C.: Government Accounting Office.
- Juster, F. Thomas and R. M. Suzman. 1995. "An Overview of the Health and Retirement Study." *Journal of Human Resources* 30 (Supplement): S7–56.
- Rust, John and C. Phelan. 1997. "How Social Security and Medicare Affect Retirement Behavior in a World of Incomplete Markets." *Econometrica* 64, 4: 781–831.
- Smith, James P. 1997. "The Changing Economic Circumstances of the Elderly: Income, Wealth, and Social Security." *Syracuse University Policy Brief*, No. 8.