A New Look at the Wealth Adequacy of Older U.S. Households

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Abstract

We examine the current wealth adequacy of older U.S. households using the 1998–2006 waves of the Health and Retirement Study (HRS). We find that the median older U.S. household is reasonably well situated, with a ratio of comprehensive net wealth to present value poverty-line wealth of about 3.9 in 2006. About 18 percent of households, however, have less wealth than would be needed to generate 150 percent of poverty-line income over their expected future lifetimes. We see similar patterns of wealth adequacy when we examine ratios of annualized comprehensive wealth to pre-retirement earnings. Comparing the leading edge of the baby boomers in 2006 to households of the same age in 1998, we find that the baby boomers show slightly less wealth, in real terms, than their elders did, but still have appear to have adequate resources at the median. Moreover, we find a rising age profile of annualized wealth, even within households over time and after controlling for other factors, suggesting that older households are not spending their wealth as quickly as their survival probabilities are falling.

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1 Introduction

The imminent retirement of the baby boom generation, coming at a time of increasing uncertainty about private pensions, Social Security, and Medicare, has led to a renewed interest in the adequacy of retirement savings. A brief taxonomy of this research might include work assessing the financial preparedness of baby boomers,[1] examinations of the saving behavior of older cohorts,[2] calculations and projections of earnings replacement rates,[3] and comparisons of observed savings to predicted behavior derived from stochastic life cycle models.[4] The evidence on savings adequacy is mixed; while some studies find evidence of significant undersaving, others conclude that retirement wealth is either adequate or at least consistent with optimizing behavior. In this paper, we use recent panel data to provide a detailed and comprehensive comparison of net wealth to benchmarks based on poverty lines and pre-retirement earnings. According to these measures, we find that the median older U.S. household appears to be reasonably well situated and that the annual value of its resources tends to rise with age. However, we do find households with inadequate resources, particularly among single baby boomers just approaching retirement.

We make several contributions to the literature on the adequacy of retirement wealth. First, using the 1998–2006 waves of the Health and Retirement Study (HRS), we provide a comprehensive and up-to-date examination of the adequacy of household wealth, with a particular focus on the leading edge of the baby boom generation. Second, we estimate age profiles of our wealth and adequacy measures over the full age distribution of older U.S. households. The age profiles help us understand the evolution of wealth and wealth adequacy over the course of retirement. Third, we use the longitudinal nature of the data to analyze within-household changes in wealth over time. We examine how annualized wealth changes in response to variables such as health status and expectations about bequests and longevity. Finally, to test the robustness of our results to different assumptions about fungibility and risk, we simulate the effects on wealth adequacy of falling home prices and/or market frictions in consuming out of housing wealth, as well as the effects of rising medical expenses, lower Social Security benefits, and differential mortality by marital status and education.

We construct our broad measure of household resources by augmenting conventional definitions of net wealth with the actuarial present values of Social Security, defined benefit plans, annuities, life insurance, Veterans' Benefits, SSI, Food Stamps, and other welfare, plus (for current workers) future wages and other compensation.[5] To convert this wealth into an annual measure of total

[1] See CBO (1993); Bernheim (1992); Lusardi and Mitchell (2007); Wolff (2007).

[2] See Gale and Pence (2006); Haveman, Holden, Wolfe, and Sherlund (2006); Haveman, Holden, Wolfe, and Romanov (2007); Hurd and Rohwedder (2006); Wolff (2002, 2007).

[3] See Bernheim (1992); Munnell and Soto (2005); Mitchell and Moore (1998); Moore and Mitchell (2000).

[4] See Engen, Gale, and Uccello (1999, 2005); Scholz, Seshadri, and Khitatrakun (2006).

[5] Earlier studies have included estimates of DB and Social Security wealth, but not the other components. See Gustman, Mitchell, Samwick, and Steinmeier (1999); Gustman and Steinmeier (1999); Haveman, Holden, Wolfe, and Sherlund (2006); Haveman, Holden, Wolfe, and Romanov (2007); Wolff (2002, 2007).

per-person household resources, we calculate the equivalent flow that would be available from a hypothetical actuarially fair, joint-life annuity. Although annualized wealth is not an exact measure of consumption possibilities, it allows us to analyze wealth in the spirit of the permanent income framework used in life-cycle models of saving.[6] The panel allows us to identify how annualized wealth evolves within households over time.[7]

To establish an "absolute" benchmark of adequacy, we examine "poverty-line wealth," which estimates the minimum level of wealth required to provide income equal to the poverty line over the expected remaining lifetimes of each household member. Poverty lines are designed to reflect the affordability of core expenditures such as food, and as such, they embody a concept of a subsistence level of income.[8] Because, however, the poverty line is a bit unambitious as a bar against which to measure wealth adequacy, in practice we use 1.5 times poverty and three times poverty as the relevant thresholds. As a "relative" benchmark of adequacy, we compare the annualized value of wealth to a measure of pre-retirement earnings.[9]

By these measures, we find that the median older U.S. household is reasonably well situated, with a "poverty ratio" of about 3.9 in 2006. However, we find that about 18 percent of households have less wealth than would be needed to generate 150 percent of poverty-line income over their expected future lifetimes. We find a median "replacement rate" of about 105 percent, with about 13 percent of households experiencing replacement rates of less than 50 percent. Comparing the leading edge of the baby boomers in 2006 to households of the same age in 1998, we find that the baby boomers show slightly less wealth, in real terms, than their elders did, and single boomers show a bit higher incidence of "inadequacy" than did their elders. Nonetheless, the median single boomer appears to have adequate resources. Moreover, we find a rising age profile of annualized wealth, even within households over time and after controlling for other factors, suggesting that older households are not spending their wealth as quickly as their survival probabilities are falling.

[6]The Euler conditions governing intertemporal consumption decisions in the life cycle model only require that the marginal utility of consumption be smoothed over time. Changes in family composition, precautionary saving against health shocks, bequest motives, and the substitution of leisure for consumption can generate sharp deviations from the simplest "consumption smoothing" interpretation of the theory.

[7]Haveman, Holden, Wolfe, and Romanov (2007) use the New Beneficiary Survey and the 1991 New Beneficiary Followup to study changes over time for an older cohort. As far as we know, ours is the first study to provide a careful analysis of levels and changes in wealth for the full age distribution of older U.S. households, including the leading edge of the baby-boom cohort.

[8]Wolff (2002), Haveman, Holden, Wolfe, and Sherlund (2006) and Haveman, Holden, Wolfe, and Romanov (2007) compare annuitized retirement wealth to poverty lines at a point in time, but they do not trace the expected evolution of a given household's poverty line over retirement.

[9]Note that our poverty-line wealth and annualized wealth measures are expected values, and abstract from the utility impact of uncertainty surrounding asset returns, medical expenses, and the length of life.

2 Measuring the Adequacy of Retirement Wealth

2.1 Previous Notions of Adequacy

A commonly used measure of adequacy is the replacement rate, generally defined as post-retirement income relative to pre-retirement income (see Bernheim, 1992; Munnell and Soto, 2005; Mitchell and Moore, 1998). Using this approach, wealth is said to be adequate if it is sufficient to generate a given replacement rate. An advantage of this approach is that it measures resources in retirement relative to income in working life, so it captures the notion that *changes* in resources after retirement are of particular interest. Replacement rates, however, do not provide a measure of absolute adequacy. A low-income household can have a high replacement rate but still be in poverty throughout retirement.

In addition, the threshold replacement rate against which to measure adequacy is necessarily arbitrary. In the literature, the benchmark has typically ranged from 70 percent to 100 percent, but it has not been explicitly calibrated to standard models of saving. In general, income needs are often presumed to be lower after retirement, due to the absence of payroll taxes and other work-related expenses. But the household's post-retirement consumption problem differs in a much broader sense, due to a significant drop in the price of leisure (which could either increase or decrease consumption), the discounting effect of declining survival probabilities, and the ability to finance consumption out of savings as well as income. As a result, there is no clear theoretical replacement rate against which to measure the adequacy of wealth, and replacement rates are not really comparable across households: a relatively low replacement rate is not necessarily an indication of inadequate savings, and a relatively high rate does not necessarily indicate adequacy. Nonetheless, some standard must be applied to gauge adequacy, and the replacement rate (in our case, the ratio of annualized wealth to pre-retirement earnings) provides a rough measure of expected post-retirement consumption possibilities relative to pre-retirement possibilities.

A different approach is to compare wealth patterns in the data with optimal accumulation patterns from a stochastic life cycle model (see Engen, Gale, and Uccello, 1999, 2005; Scholz, Seshadri, and Khitatrakun, 2006). The advantage of this method is that it derives from theoretical principles: working households save in order to smooth the marginal utility of consumption over their expected lifetimes. The stochastic model recognizes that each household experiences a unique set of shocks to earnings and expected mortality over the life cycle, and thus low levels of observed wealth may be consistent with optimal behavior once we account for individual realizations of life cycle shocks. These papers find that most households prepare adequately for retirement, by this measure, with actual saving patterns in the neighborhood of what the life cycle model would predict. For example, Scholz, Seshadri, and Khitatrakun (2006) find that more than 80 percent of the households in the HRS saved more than their optimal life-cycle wealth targets, and that the deficits for most of those saving below the target were small.

Interpreting the results of these models, however, can be tricky. Stochastic life-cycle models generate optimal consumption paths that are conditional on a particular set of assumptions regarding mortality, preferences, and the sources and sizes of random shocks. To take well-known examples, decision rules for consumption are quite sensitive to different values of the coefficient of relative risk aversion, and the presence of bequest motives can substantially alter post-retirement consumption paths. Moreover, the concept of optimality does not fully address the issue of adequacy: it might be optimal for model households who receive bad shocks to arrive at retirement with no resources outside of Social Security, but this wealth could nonetheless be inadequate relative to an absolute criterion such as a poverty line.

2.2 Our Measures of Adequacy

2.2.1 Comprehensive Wealth Relative to Poverty-Line Wealth

Our first measure of adequacy compares comprehensive wealth to the actuarial present value of future poverty lines. Poverty-line wealth can be interpreted as the minimum level of wealth that would be sufficient to finance consumption equal to the expected poverty line over the expected remaining lifetimes of the household members.[10] The poverty lines are taken from the U.S. Census Bureau (Census, 2008) and vary with the number of adult members and their ages. For simplicity, we model four possible poverty lines, corresponding to singles aged 65 or older, singles under 65, couples in which at least one member is 65 or older, and couples in which both are under 65. Poverty-line wealth therefore varies across households because of differences in household-specific poverty lines and differences in the survival probabilities of the household members.

A disadvantage of using the poverty line as a measure of adequacy is that the official poverty thresholds in the U.S. are imperfect and arbitrary. The thresholds are based on a definition of absolute poverty established in 1964, which were computed as a multiple of (e.g. 3 times) the Department of Agriculture's "economy food plan"—the least expensive of several plans that satisfied basic nutritional requirements. Although the thresholds were revised in subsequent years, the core concept of poverty as rooted in the affordability of adequately nutritious food expenditures remains the same.[11] This is, by construction, a limited and arbitrary measure of adequate resources, because it excludes a great deal of information about the changing costs of living, such as housing and medical expenses.[12] Nonetheless, in addition to being a standard measure that is widely used in public policy, the poverty line also provides a generally accepted method for assessing the cost of a subsistence level of consumption, a notion conceptually distinct from a replacement rate

[10]Note that given uncertainty over medical expenses and length of life, poverty-line wealth does not *guarantee* income equal to the poverty line throughout retirement, but only provides it in expected value.

[11]For more information on the history and definition of poverty thresholds, see Census (2008).

[12]The multiple of three is meant to capture subsistence-level consumption of all other (non-food) items and was based on an estimate that about a third of low-income households' consumption was on food in the 1960s.

or the optimality of savings. Moreover, the official poverty thresholds are adjusted to account for household economies of scale and age, which enables us to incorporate basic life-cycle and demographic effects in our analysis. However, because the poverty line itself is a noisy and somewhat unambitious measure of adequate resources, we also report statistics on households for different multiples of poverty wealth.

2.2.2 Annualized Wealth Relative to Pre-Retirement Earnings

We derive our measure of annualized wealth by imagining that a household uses all of its resources to purchase an actuarially fair, joint life annuity with a last survivor payout rule. Each dollar of this hypothetical annuity will pay $\$\alpha$ in each subsequent year if both members are alive and \$1 if just one member is alive. Slightly modifying the formula for a joint-life annuity (see Brown and Poterba (2000)), the actuarially fair price of this annuity is given by

$$p_t = \sum_{i=1}^{T} \left\{ \frac{\alpha S^f_{t+i} S^m_{t+i} + S^f_{t+i}(1 - S^m_{t+i}) + S^m_{t+i}(1 - S^f_{t+i})}{(1+r)^i} \right\},$$

where T is the maximum lifespan, and S^m_t and S^f_t are the cumulative survival probabilities for each member of the household, which depend on the ages of each member in period t. Assuming that a household converts all of its comprehensive wealth, CW_t, into such an annuity, the annualized value of wealth, ACW_t, will be given by $ACW_t = CW_t/p_t$. When both members of a household are alive, the annuity pays αACW_t, where $\alpha < 2$ represents economies of scale within the household.[13] When just one member is alive, the annuity pays ACW_t. Annualized wealth rises with the real interest rate r and falls with increased longevity.

There are four things to note about this measure. First, by itself, it assumes zero bequest motives and a willingness to fully consume all forms of wealth, including nonfinancial forms such as housing, businesses, and vehicles.[14] Because it unclear whether households actually use all of these forms of wealth to support retirement consumption, we present a robustness exercise in which we show how wealth adequacy changes if we count only half of nonfinancial wealth.

Second, it is calculated as if it were an actuarially fair annuity with no fees, loads, or expense charges, despite the well-known imperfections in the market for private annuities (e.g. see Mitchell, Poterba, Warshawsky, and Brown, 1999). That is, it overstates consumption possibilities to the

[13]Following Haveman, Holden, Wolfe, and Sherlund (2006) and Haveman, Holden, Wolfe, and Romanov (2007), we use α=1.67 to capture economies of scale within married households.

[14]There is sometimes a debate among researchers about whether retirees are willing to consume their housing wealth (e.g. see Bernheim, 1992; Mitchell and Moore, 1998). Financial products that facilitate such consumption, such as reverse mortgages, are growing but are not yet widespread. Retirees can also consume housing by downsizing (i.e. selling their homes and moving to less-expensive quarters or living with relatives). Coronado, Maki, and Weitzer (2007) find that a substantial fraction of older households appear to liquidate some home equity when moving, suggesting that some older households do consume housing wealth in retirement.

extent that it is based on a product that is not really available in the market. Households could theoretically calculate this measure themselves and consume accordingly even in the presence of annuity-market imperfections; however the "self-annuitizing" strategy would not provide insurance against unexpectedly long life.

Third, the measure is a first moment and makes no adjustment for typical sources of risk facing older households, including asset returns, longevity, health costs, and future changes to social insurance programs. Later in the paper, we explore the sensitivity of our results to medical costs, changes to Social Security, and alternative discount rates.[15]

Finally, the present value calculations used to construct comprehensive wealth assume that households are able to process somewhat complex information about the discounted present values of their Social Security benefits, private pension payments, annuities, and other transfer wealth. Gustman and Steinmeier (2004, 2005), however, find that respondents in the HRS tend to be poorly informed about the future values of their Social Security and pension benefits.[16] While misinformation about future income can certainly affect saving behavior (e.g. pessimistic households may accumulate more wealth than optimistic ones), it does not alter the realized stream of future Social Security and pension benefits. To the extent that households are misinformed about their future income, our measure for pre-retirees is perhaps better thought of as an actual, rather than perceived, indicator of total resources.

3 Data and Methodology

3.1 Data Source and Construction of Comprehensive Wealth

We use the 1998–2006 waves of the HRS.[17] The HRS is a national panel data set consisting of an initial (1992) sample of 7,600 households aged 51-61, with follow-ups every second year following. In 1998, the HRS was merged with a similar survey covering older households, and younger cohorts were also introduced. The youngest cohort (the "Early Baby Boomers," born 1948-1953) was introduced in the 2004 wave. Our sample draws on all of these cohorts, but we restrict our analysis to households with a respondent or spouse aged 55 years or older. Our final sample size is 13,703 households in 1998 and 11,913 households in 2006.[18]

[15] Browning and Lusardi (1996) demonstrate that the introduction of a precautionary savings motive has similar effects to a lower discount rate—it acts to reduce the annuity value of a given level of wealth.

[16] There is some evidence that respondents tend to be pessimistic about their future pension benefits (Gustman and Steinmeier, 2004). If this is the case, then one should expect, all else constant, that annualized wealth should fall with age as households learn more about the amount of their benefits. Despite this effect, we find that annualized wealth tends to rise with age.

[17] Specifically, we use the RAND HRS Data File and the 1998–2006 RAND-Enhanced Fat Files, which are HRS data files that have been compiled and processed by RAND, and are often easier to use than the raw HRS data files. See the appendix for more details on our dataset and imputation methodology.

[18] As a check on the validity of our sample, we re-create our measure of comprehensive wealth using the 2004 Survey of Consumer Finances (SCF), which includes the vast majority of the information necessary to create comparable

To compute our measure of comprehensive wealth, we aggregate asset types that differ along many dimensions. Some are held as stocks of wealth, such as corporate equities, bonds, bank accounts, retirement accounts, houses and cars. Others consist of flow payments over time, such as wages and other compensation (for current workers) and traditional pensions and Social Security (for retirees). Further differences include whether the type of wealth pays off only in expectation (e.g. life insurance), includes protection against inflation (e.g. Social Security), or terminates payments with the death of the primary recipient (e.g. some pensions and annuities). In the discussion that follows, we explain the various adjustments and calculations we use to combine these different categories into a single measure of comprehensive wealth and show how we arrive at our present value measure of poverty.[19]

We begin with a fairly straightforward measure of traditional net worth. Net (nonretirement) financial wealth is the sum of stocks, bonds, checking accounts, CDs, Treasury securities, and other assets,[20] less non-vehicle, non-housing debts (such as credit card balances, medical debts, life insurance policy loans, or loans from relatives). Non-financial wealth is the sum of housing, vehicles, business, and investment real estate, less any outstanding debt secured by these assets. To these measures we add retirement accounts such as IRA balances and balances from defined-contribution pension plans from current and previous jobs.

Next we add the actuarial present values of defined benefit pensions, Social Security, insurance, annuities, welfare, and compensation.[21] For each source of wealth, we project forward income streams based on current or expected receipts of payments. We then discount these streams of payments, taking into account survival probabilities, cost-of-living adjustments (if any), and survivors' benefits. Our baseline calculations assume a real interest rate of 2.5 percent and a nominal rate of 4.5 percent.[22]

wealth measures. We then compare kernel density estimates of age and comprehensive wealth in SCF to estimates in the 2004 wave of the HRS, where comprehensive wealth is defined analogously for the two surveys. The HRS and the SCF densities are nearly identical for both age and comprehensive wealth, which leads us to conclude that the wealth measures are reasonably similar, and thus our results are not an artifact of mismeasurement in the HRS.

[19]The appendix provides a detailed description of our methodology as it applies to each source of wealth. Note that our measure of comprehensive wealth essentially treats all assets as perfectly fungible, an assumption which may overstate the value of total wealth for some households (e.g. more liquid assets may make it easier for households to pay for large out-of-pocket medical expenses such as nursing homes). In general, our goal is to measure total wealth, and not necessarily the utility value of that wealth. To get a sense of the welfare implications of different types of wealth, it is important to examine the components of wealth separately.

[20]"Other assets" is defined in the HRS to include (among other things) jewelry, money owed to the respondent by others, collections, trusts or estates for which the respondent is a beneficiary, and other annuities not elsewhere mentioned (presumably including variable annuities).

[21]Expected welfare payments includes veteran's benefits, food stamps, Supplemental Security Income (SSI), and other welfare. The appendix provides the explicit formulas used to calculate the present values.

[22]We abstract from taxes, because the complications involved in projecting DC withdrawals, asset returns, and bequests (not to mention historical changes in the tax code, federal versus state taxes, and projections of future tax changes) would take us fairly far afield from the key points of our paper. The benchmarks that we use in the adequacy calculations—i.e. poverty lines and pre-retirement earnings—are also pre-tax concepts, so we do not expect tax considerations to fundamentally alter our key conclusions.

For households containing a worker, an important component of comprehensive wealth is expected future earnings and employer matches to DC plans.[23] We account for projected labor income by assuming that earnings and the employer match grow at a one-percent real rate[24] until the minimum of age 70 and the respondent's self-reported expected first receipt of Social Security benefits. We then discount the stream of total compensation using the real interest rate minus one percent (to account for the assumed real growth) and the relevant conditional survival probabilities. To the extent workers experience different wage growth or work more or fewer years than they report, their actual resources in retirement will differ from our projections.

As a benchmark against which to compare the annualized value of wealth, we use a measure of pre-retirement earnings. Households are asked about earnings from current jobs in every wave, and prior jobs in the wave in which they enter the sample. Thus, by collecting information from each wave, we can assemble information on the pre-retirement earnings of most sample members. For our measure of pre-retirement earnings, we calculate the average (in 2006 dollars) of current earnings (if working) and "last job" earnings (if not working) from each wave.[25]

4 Findings on Wealth and Adequacy

Table 1 provides a breakdown of the components of comprehensive wealth for 1998 and 2006, among households in which the older household member is at least 55 years old.[26] The largest components of comprehensive wealth are nonfinancial wealth (mostly housing) and Social Security wealth, which together make up about half of total wealth in both years. Total comprehensive wealth grew by nearly a third between 1998 and 2006, with much of the growth coming from the run-up in housing wealth over this time period. The housing boom delivered larger wealth gains to higher-wealth households—the share of housing wealth held by the top decile of comprehensive wealth increased from 44 to 55 percent.[27]

Table 2 provides a summary of our wealth and adequacy measures. Median comprehensive wealth grew in real terms from $500,000 in 1998 to $591,000 in 2006. Again we see that the growth in wealth was not evenly distributed: the 90th percentile grew by 14 percent while the 10th percentile grew by about 1 percent. Median annualized wealth grew just a bit from $33,000 to $36,000 per person per year. Here the inequality of growth is even more striking: the 90th percentile grew by 25 percent, while the 10th percentile was essentially unchanged.

[23] Future *employee* contributions to DC plans will be made out of labor income, so we do not include them here.

[24] This is the same assumption as that used in the Social Security Administration's intermediate projection (SSA, 2006a).

[25] Because employees sometimes move to part-time status before retiring, we scale up part-time earnings to their full-time equivalent.

[26] All dollar figures are adjusted to 2006 dollars using the CPI-U.

[27] Because housing wealth plays such a large role in comprehensive wealth and yet may be imperfectly consumable, and because housing prices reached a peak in 2006, below we perform a simulation exercise in which we recalculate our wealth and adequacy measures after reducing nonfinancial wealth by 50 percent.

Looking at our adequacy measures, we find that the median ratio of comprehensive wealth to poverty-line wealth rose from 3.51 in 1998 to 3.91 in 2006. The 90th percentile holds more than 10 times poverty wealth, while the 10th percentile is right around the poverty level in both years. The distributions are quite consistent in the two years, with a bit more than half of households holding more than three times poverty wealth, and about a quarter between 1.5 and three times poverty. The share with less than 1.5 times poverty was 18 percent in both 1998 and 2006.

For our "replacement rate" measure, we find that the median ratio of annualized wealth to pre-retirement earnings was 1.08 in 1998 and 1.05 in 2006. The 10th percentile was barely changed, at about 0.45, while the 90th percentile grew from 2.89 to 3.22. The distribution of this measure also remained steady from 1998 to 2006, with just over half of households experiencing replacement rates of at least 100 percent, about a third between 50 percent and 100 percent, and about one in eight below 50 percent of pre-retirement earnings.

Table 3 shows how our wealth measures vary with age and marital status. Single households hold substantially less wealth at all age levels. Even on a per-person, per-year basis, our annualized wealth measure shows higher wealth among married households.[28] By age, we see that while comprehensive wealth levels fall significantly, annualized wealth actually increases. This is a pattern we will explore in more detail with our age profiles and in fixed- and random-effect regression specifications below.

Comparing the youngest age group across the two years is particularly interesting because it provides a comparison between the edge-of-retirement baby boomers (in 2006) and their immediate elders when they were at the edge of retirement in 1998. We see that relative to their elders, single baby boomers are approaching retirement with slightly less wealth ($390,000 vs. $423,000 in median comprehensive wealth, and $24,000 vs. $26,000 in median annualized wealth), while married baby boomers are at essentially the same level as their elders.

Table 4 shows how our adequacy measures vary with age and marital status. The share of married households in the 1998 sample falls from 57 percent among the youngest age category to 33 percent in the oldest. The 2006 sample shows a similar decline, from 61 percent to 35 percent (the distribution of married households is reported in the table footnotes). According to the measures, single households have significantly less adequacy of wealth than married households, though even single households appear reasonably well-off at the median. We generally see increasing adequacy by age. Comparing the single baby boomer group to their elders, we see that the baby boomers tend to have a bit lower adequacy. Nevertheless, the overall adequacy of the single baby boomer group appears to be reasonably healthy, with wealth of about 2.3 times the poverty level in 2006, and annualized wealth at about 82 percent of pre-retirement earnings. At the 10th percentile, however, single baby boomers appear to have a relatively low level of resources, with wealth at just about 70 percent of the poverty level and annualized wealth at less than a third of pre-retirement

[28]Recall that the annuity factor adjusts for economies of scale within married households.

earnings.

The distribution of adequacy measures reported in Table 5 indicates that in all age groups, the vast majority of households with wealth less than 1.5 times poverty are single households.[29] Nearly a third of single baby boomers are in this group, compared to only 7 percent of married baby boomers.[30] These shares are a bit higher than the comparable shares of their elders when they were the same age. The "replacement rate" measure shows a similar pattern, with about 24 percent of single baby boomers in the "inadequate" group (i.e. annualized wealth less than 50 percent of pre-retirement earnings), compared to 8 percent of married boomers. These shares are also higher than the comparable shares of the older generation just before retirement. Again we see improving adequacy with age.

These results lead to the question of whether we should be worried about the financial preparation of baby boomers. One answer seems to be that if we do worry, we should worry largely about the single baby boomers, who are much more likely to have "inadequate" resources than their married equivalents. Additionally, single baby boomers show a higher incidence of inadequacy than their elders when they were the same age. On the other hand, Table 4 showed that even among single boomers, the median household appears to have reasonably adequate wealth. Thus, even focusing on the adequacy of single baby boomers, the concern might be limited to the lower half of the distribution. Within this part of the distribution, however, households may be forced to choose between, on the one hand, accepting very low resources in retirement, and on the other, remaining in the workforce longer than they had anticipated. Since we value future compensation according to self-reported ages of expected Social Security receipt, delayed retirement can substantially increase the measured adequacy of resources among lower-wealth households.

5 Age Profiles of Wealth and Adequacy

Each of the tables discussed above hinted at increasing age profiles of annualized wealth and adequacy. We make use of the full distribution of ages in our sample data to estimate non-parametric age profiles of each of our wealth and adequacy measures in 1998 and 2006.[31] Figure 1 shows the age profiles of median comprehensive wealth and median annualized wealth in 1998 and 2006. Comprehensive wealth declines steadily with age—mechanically, as present values fall with declining survival probability, and behaviorally, as households consume their stocks of wealth over time. The

[29]Breaking down these singles into gender and marital status categories, we find that the majority of the singles with less than 1.5 times poverty wealth are widowed women. In 2006, females accounted for about 80 percent of singles with less than 1.5 times poverty wealth. (The breakdown shows similar patterns in 1998.) Of these, slightly more than 38 percent were divorced or separated, 9 percent were never married, and 53 percent were widows. In contrast, single men in this wealth category were much more likely to be divorced.

[30]Note that about 61 percent of the baby boomer sample households were married in 2006.

[31]The figures plot smoothed profiles of median wealth and adequacy by age. Since households can (and usually do) change marital status over long periods of retirement time, we do not present separate profiles for single and married households.

profiles for the two years are very similar, with slightly higher wealth at all ages in 2006. Annualized wealth remains relatively flat until around age 75 or so, and then it tends to rise throughout the remainder of retirement. The rise in annualized wealth is especially apparent in 2006, which shows an increase of 30 to 40 percent from ages in the early 70s to those in the late 80s. This pattern of rising annualized wealth suggests that households are not consuming their stocks of wealth as quickly as their survival probabilities are falling.[32]

Figure 2 shows the estimated age profiles of our adequacy measures. Here we see a bit of divergence between the two years: in 1998, the poverty measure of adequacy falls a bit until about age 75, while in 2006 it holds fairly steady. After 75, it rises, particularly in 2006. This could reflect the different experiences of housing wealth in the respective time periods—for example, the run-up in housing wealth by 2006 could lead to rapidly increasing adequacy measures among older households, if housing wealth were increasing faster than older households could consume it. The replacement rate measure shows a similar profile in both 1998 and 2006, remaining flat until about 75 and then increasing rapidly. In addition to the effect of the housing boom, replacement rates can rise with age due to cohort differences: older cohorts typically received lower real earnings than younger cohorts.

6 Sensitivity Analysis and Simulations

6.1 Real and Nominal Interest Rates

Table 6 shows how our calculations of comprehensive and annualized wealth would differ under different assumptions on real and nominal interest rates. As described in the appendix, real rates are used to discount inflation-indexed streams of income such as Social Security and welfare benefits (as well as future poverty lines), while nominal rates are used to discount unindexed streams (such as most private pension income). Our baseline assumption is a real rate of 2.5 percent and a nominal rate of 4.5 percent. Reducing the real rate by 1.5 percentage points increases our wealth measures by 8 to 9 percent, while decreasing the real rate by 1.5 percent decreases the measures by about 7 percent. Changing our inflation assumption has a more modest effect. Decreasing inflation from 2 percent to 0.5 percent increases our wealth measures by about 1 percent, while increasing inflation by the same amount leads to a reduction in our wealth measures of about 1 percent.

6.2 Housing, Social Security, and Medical Costs

Next, we consider more carefully the roles played by housing, Social Security, and medical costs in our estimates of wealth. Table 7 shows the impact on our wealth and adequacy measures of

[32]Below, we test whether this pattern holds up within households over time in a regression context. We also examine the possible role of differential mortality in driving these patterns.

four experiments: counting only half of nonfinancial wealth, setting the real growth of nonfinancial wealth between 1998 and 2006 to zero,[33] counting only 75 percent of Social Security wealth, and subtracting the expected present value of out-of-pocket medical expenses from wealth.

The housing experiment is meant to capture two phenomena: first, that housing wealth is imperfectly liquid and many households may be unwilling or unable to fully annuitize its value, and second, that housing prices have dropped significantly since their peak in 2006.[34] We find that counting only half of nonfinancial assets takes about 10 to 20 percent off of the annualized value of wealth, with the largest effect on older households, for whom nonfinancial assets make up a larger share of wealth. Moving to the experiment where we set the real growth of nonfinancial assets to zero, we see that the highest wealth households experience the largest drop in wealth adequacy. The lowest wealth categories, in contrast, actually show a slight increase in adequacy, which would make sense if lower wealth households depleted some of their housing wealth over the 8-year sample period. At the median, zero housing growth induces about a 5 percent decline in our wealth adequacy measures.

The Social Security experiment is meant to capture the effects of an (unexpected) 25 percent cut in Social Security benefits on household wealth. This is a fairly simplistic policy simulation meant to capture the effects of reforms that might be necessary in order to restore the Social Security program to long-run solvency.[35] This simulation produces similar results to the housing experiment, except that the Social Security cuts have the largest impact on younger households (who have larger Social Security wealth in present value, due to higher survival probabilities).

The medical expense experiment is meant to capture the effects of rising medical costs on household wealth. To the extent that medical costs represent largely exogenous shocks to household resources, our standard measure of annualized wealth could overstate available resources for other consumption goods; if medical costs are rising over time, the adequacy of a given stock of wealth could be lower than it appears. We implement this experiment by subtracting from wealth the present value of expected out-of-pocket medical costs, computed as the trend expenses implied by a random effects regression of observed log medical costs on age, education, sex, and a set of time dummies. The results indicate that adjusting for expected medical costs has only a modest effect on annualized wealth in absolute terms, reducing it by between $1,000 and $2,000 across the percentile distribution. At the lowest percentiles, however, this absolute reduction implies a large drop in percentage terms, in the range of 10 to 20 percent of annualized wealth.

[33] As Robert Shiller notes (2006), the real price of houses in the U.S. remained almost unchanged from 1890 to the end of the 1990s. Setting the real growth of financial assets to zero is meant to approximate the long-run trend in house prices. We construct our measures of wealth adequacy for this counterfactual experiment by choosing a balanced panel of households in 1998 and 2006 and replacing the 2006 value of nonfinancial assets with the 1998 value, adjusted for inflation.

[34] Between June 2006 and January 2008, the Case-Shiller composite index of house prices fell about 13 percent.

[35] We characterize the experiment as unexpected because we are not modeling any household saving responses. In practice, any benefit cuts would likely be phased in gradually for younger workers.

In our final simulation, we estimate the effect of adjusting for housing, Social Security, and medical costs all at the same time. The cumulative effect of these changes can be substantial, ranging from 25 to 40 percent of the unadjusted measure of annualized wealth. In general, the biggest percentage reductions occur at the 10th percentile of the distribution for pre-retirement households, who tend to have the lowest levels of financial wealth and future pension income.

6.3 Differential Mortality by Education and Marital Status

We use the official SSA life tables because these are carefully constructed to be useful for analysis of the probabilities of surviving to very old ages. These tables condition on age and gender, but not on race, wealth, or marital status. To understand how differential mortality across these dimensions might affect our annualized wealth calculations, we experiment with an alternative calibration of the survival function. We calculate differential mortality probabilities using the reported coefficients from the Urban Institute's Model of Income in the Near Term, Version 5 (Smith, Favreault, Ratcliffe, Butrica, and Bakija, 2007), which estimates demographic transitions using pooled data from the 1990–2001 Surveys of Income Program Participation and SSA files of previous earnings and benefits.

The mortality hazard model in MINT5 (Table 2-5 in the report) includes estimates for age, education, and marital status. Using the SSA life tables as a baseline,[36] we construct a function that maps a household's demographic characteristics into a vector of unconditional survival probabilities that we then use in computing new annualizing factors. After adjusting for differential mortality, we find that our measures of annualized wealth change only slightly, generally on the order of less than 5 percent of the unadjusted values. Lower income households experience a slight increase in annualized wealth with the adjustment (due to their higher rates of mortality). The effect is small, however, because these households tend to rely predominantly on Social Security benefits, which provide the same annuity income regardless of our assumptions about mortality. High school graduates experience a rise in annualized wealth relative to college graduates, and single households experience a rise relative to married households.

7 Regression Results

The life cycle model predicts that the amount of household wealth observed at any given point in time should be a function of preferences, lifetime earnings, a history of shocks, and a set of factors that affect future consumption decisions, such as bequest motives, changes in health status, longevity, and other sources of precautionary saving. To see how some of these factors affect

[36]Setting the benchmark survival probabilities in the MINT to those of a married household with a high school education, we adjust the SSA probabilities by multiplying them by the ratio of the MINT probabilities associated with a given age, education, and marital status to the benchmark MINT probabilities.

annualized wealth within households across time, we take advantage of the panel dimension of our data and estimate regressions of log annualized wealth on household characteristics.

We use each of the 1998–2006 waves in the HRS (5 waves in total) and exclude observations with respondents younger than 55. The covariates include information about age, education, race, self-reported health, expectations about leaving bequests, expectations of longevity relative to life-table predictions, and the shares of financial and annuity wealth (e.g. DB and Social Security). In addition, we include a full set of time dummies. The dependent variable of interest is the natural logarithm of annualized wealth, truncated at zero.[37]

Our analysis treats married households and singles separately, and for each type of household, we present estimates from both random effects and fixed effects regressions. The random effects approach has the advantage that it uses both "between" and "within" information about households to construct the coefficient estimates. For our purposes, this is helpful because it allows us to generate estimates for important household variables, such as education and race, that do not change over time. The random effects specification does, however, have a well-known drawback. Since the estimator integrates out the unobserved random effects, it only produces unbiased estimates if the unobservables are uncorrelated with the observables. In the context of our analysis, potential sources of correlated unobserved heterogeneity include the relationship between risk aversion and savings behavior, strategic altruism tying bequests to implicit (and unobserved) "insurance" provided by one's children, and links between risk aversion, health, and longevity. The fixed effects specification allows one to control for this type of unobserved heterogeneity by differencing out the observed and unobserved fixed effects altogether. The cost, however, is a loss of between-household information and generally a loss of precision.

Table 8 reports the coefficient estimates for each specification. Beginning with the first column—the random effects regression for married couples—the estimates indicate a positive and significant age trend on annualized wealth. That is, even within households, annualized wealth tends to increase over time, suggesting that older households have not been spending down their wealth as quickly as their survival probabilities are falling.

College graduates tend to have about 48 percent more annualized wealth than high school dropouts, and high school graduates have about 21 percent more. We find sharp differences by race, with annualized wealth of non-whites about 17 percent lower than that of whites, and annualized wealth among Hispanics lower by about 23 percent. Households with respondents in fair health report 4 percent less in annualized wealth, while those in poor health are 9 percent lower. On the other hand, respondents in the middle third of the medical expense distribution report about 3 percent higher annualized wealth, and those in the top third report 4 percent more wealth. This result is likely picking up the "luxury good" aspect to some medical expenses, such as private nursing homes.

[37]The truncation eliminates only the handful of observations with negative comprehensive wealth holdings.

Households strongly expecting to leave a bequest larger than $100,000 have about 25 percent more annualized wealth relative to households not anticipating leaving a bequest. If we add the bequest estimates for the spouse, the effects are even stronger. According to the standard life cycle model, a bequest motive should increase annualized resources as a household ages because the intended bequest remains roughly constant while the number of life years over which it is annualized shrinks with each passing year.

The HRS asks respondents about the probability of living about 10 more years. Interestingly, however, we find no statistically significant effect of expected longevity on annualized wealth, and the negative signs on the respondent's coefficients are generally inconsistent with the predictions of the life cycle model (i.e. households that expect to die earlier should draw down their assets more rapidly) and the effects of differential mortality (i.e. lower-wealth households can generally expect to die sooner than higher-wealth households).

The composition of assets is also related to the level of annualized wealth. We find that those with higher shares of financial wealth (relative to nonfinancial wealth) are more wealthy: a percentage point higher financial wealth share is associated with about 0.3 percent more annualized wealth. Those with higher annuitized wealth shares (i.e. wealth in the form of Social Security, pensions, etc.) are less wealthy: a percentage point higher annuitized wealth share is associated with 0.5 percent less annualized wealth.

The random effects estimates for single households share the signs and significance levels of the estimates for married couples, but with slightly larger magnitudes. In the fixed effects specification, many of coefficient estimates are much less precisely estimated. Self-reported health, bequests, and the shares of financial and annuity wealth remain significant and maintain the same sign pattern as in the random effects specification. In addition, the coefficient estimate on age for married couples increases when we move to the fixed effects specification, but the estimate is not significant at the 5-percent level.

8 Conclusions

Comparing comprehensive wealth to poverty-line wealth, and the annualized value of wealth to pre-retirement earnings, we find that the median older U.S. household appears to hold adequate resources. Median household wealth is about 3.9 times poverty wealth in 2006, and the median "replacement rate" of earnings is about 105 percent. However, about 18 percent of households have less wealth than would be needed to generate 150 percent of poverty-line income over their expected future lifetimes, and 13 percent of households experience replacement rates of less than 50 percent. Most of the households with "inadequate" resources are single.

Comparing the leading edge of the baby boom generation to their immediate elders, we find that overall, the baby boomers have slightly less wealth, but are generally about as well situated as their elders were at the same age. Again, the main group of concern is single households: the incidence of “inadequate” resources among single boomers is fairly high, and is a bit higher than that of their elders at the same age. On the other hand, we find that even among single boomers, the median household appears to have reasonably adequate wealth. Thus the concern might be limited to the lower half of the single boomer distribution. One implication for these households might be that they find they will not be able to retire as early as they expect to. Since we value their future compensation according to their self-report on when they expect to begin Social Security receipt, these households can significantly improve their adequacy outlook by delaying retirement longer than they say they will.

Finally, we find a rising age profile of annualized wealth, even within households over time and after controlling for other factors, such as bequest motives, health, longevity, and medical costs. We interpret this as suggesting that older households are not spending their wealth as quickly as their survival probabilities are falling.

We close with a few caveats about our results. First, our measures of adequacy are based on expected values, and thus do not account for the utility value of substantial risks that arise from uncertain lifetimes, medical expenses and asset returns. Thus a risk-averse household with “adequate” wealth by our measures may not have enough wealth after accounting for the effect of these risks on utility. Second, our analysis focuses on households aged 55 and older in 1998–2006, which includes the leading edge of baby boomers, but not younger boomers or succeeding generations. Our findings therefore do not provide evidence about the adequacy of retirement savings among younger cohorts. Finally, our results should not be taken to imply that current household savings are necessarily sufficient in the long-run macroeconomic sense. Given the broad demographic trends at work over the next half century, including declining fertility and increasing longevity, a higher household savings rate could, by increasing the size of the capital stock, significantly reduce the burden of higher taxes or lower spending that will otherwise fall on following generations.

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A1: Data Source and Calculation Methods

Data Source

Our primary data sources are the RAND HRS Data File, and the 1998–2006 RAND-Enhanced Fat Files. The Fat Files are HRS data files that have been compiled by RAND and are often easier to use than the raw HRS data files. The RAND HRS Data File is a longitudinal file in which selected variables have been linked across the eight waves of the HRS. This file includes RAND-generated imputations of missing values. Many variables necessary for our analysis, notably including detailed DB and DC pension information, are not included in the RAND HRS Data File. For these variables, we use the RAND-Enhanced Fat Files, which include virtually all of the raw HRS data.

A number of income and wealth variables from the RAND-Enhanced Fat File are missing for some households, but in the later waves, the HRS design includes "unfolding brackets" that provide ranges of values for many of the variables that are missing. We use the brackets to assign imputed values for households who indicate that they have a certain type of income or asset, but do not report the actual amount. If we have information indicating that a respondent should have a value for a particular variable but no information on a range for that value then we assign the missing value a zero. Otherwise, we apply a hot-deck imputation to the unfolding brackets in order to match the distribution of actual values given by respondents.

Note that variables taken from the RAND HRS Data File are imputed by RAND using a different methodology. RAND uses a model-based imputation method and imputes more values than we do. However, we have compared the RAND imputation distribution to our imputation distribution for several variables and cannot find any significant differences. For more specific information on the RAND imputation method, please refer to their HRS Data Documentation, Version H. In all calculations, we use the HRS household analysis weights.

Present Value Calculations

Defined Benefit Pensions

Calculating the actuarial present value of future DB pension payments requires a few assumptions. The HRS includes questions about both current pension benefits (for retirees) and expected future pension benefits (for those still working). Households are asked about the (current or expected) pension amount (and start date, if they have not yet begun), cost-of-living adjustments (COLAs), and survivors' benefits.[38] In the case of working households, we use the expected pension at retirement; this serves to include the value of benefits not yet accrued. This is parallel to our inclusion of expected future compensation in our calculation of comprehensive wealth.

We express the actuarial present value of DB payments for a plan that pays an annual amount

[38] Thus, we are using self-reported pension data to calculate pension wealth. The HRS also includes supplementary employer-provided pension data that in some cases may provide a more accurate measure of pension benefits (see Gustman and Steinmeier (1999)). The main differences between the self-reported measures that we use and the supplemental data involve workers' expectations of future pensions. Because most of our sample consists of retirees who are currently receiving pensions, we expect our results to be robust to our reliance on the self-reported data for workers.

d as

$$\text{(A-1)} \qquad DBPV = d \sum_{\tau=a_r}^{119} \delta^{\tau-a_r} \big\{ \psi^r(\tau, a_r) + \theta[1-\psi^r(\tau, a_r)]\psi^s(\tau+\Delta, a_s) \big\},$$

where δ is the discount factor, a_r and a_s are the ages of the respondent and the spouse at the time of the survey, and θ is the fraction of benefits that will be passed on to the spouse in the event that the respondent dies.[39] The term $\psi^r(\tau, a_r)$ is the probability of the respondent's living to age τ conditional on being alive at age a_r, while $\psi^s(\tau+\Delta, a_s)$ represents the conditional survival probability of the spouse, where Δ is the age difference between the spouse and the respondent. Thus, the actuarial present value of pension wealth is just the annual pension benefit multiplied by the sum of discounted annual survival probabilities, with an extra term accounting for any payments made to the spouse after the death of the respondent.[40]

The conditional survival probabilities are based on the one-year age- and sex-specific conditional death probabilities in the Social Security Administration's 2002 Period Life Table (SSA, 2006b). Period life tables provide a snapshot of the mortality conditions prevailing in a single year, rather than the expected mortality experience of a given cohort over time. For young cohorts (e.g. children born in 2002), one might expect actual longevity to be significantly greater than shown in the 2002 period life table, since longevity generally improves over time. However, since our sample is of Americans aged 55 and older in 1998-2006, we conclude that the 2002 period table is a reasonable estimate of our sample's expected mortality experience.[41]

For DB plans with COLAs (about 40 percent of the reported plans), we use a discount factor δ equal to $1/(1+r)$, where r is the real interest rate. For plans without COLAs, we set δ equal to $1/(1+i)$, where i is the nominal interest rate. The baseline results in the paper assume a baseline nominal interest rate of 4.5 percent and a real interest rate of 2.5 percent, implying 2 percent inflation.

The HRS collects information on multiple pension plans for respondents and their spouses. Applying equation (A-1), we compute present values for each of these and then sum them to arrive at our final calculation for current pensions. Some current workers report that they expect to receive lump-sum payouts from their DB plans upon retirement. To include these plans, we simply discount the lump sum back to the current age.

[39] We ignore non-spouse beneficiaries. If there is no spouse, we set θ to zero.

[40] Bernheim (1987) argues that actuarial discounting is inappropriate for risk-averse individuals facing imperfect annuity markets, because such individuals would attach additional value to the otherwise unavailable insurance product. He suggests straight discounting (ignoring the probability of death) instead. However, he points out that his analysis rests on the premise that individuals place no value on the death-contingent value of assets (i.e. that there are no bequest motives). We treat the household as a unit, and explicitly value the death-contingent component of each individual's assets (e.g. survivors' benefits and life insurance). Thus we use the actuarial present value of DB and Social Security benefits. Note that we are only computing the amount of wealth, and not the utility value of that wealth. Similarly, we make no adjustment for the utility value of risk (e.g. longevity risk or the risk of a large medical-expense shock).

[41] Note that these survival probabilities average together all households. Thus, to the extent that, for example, lower-wealth respondents face lower survival probabilities than higher-wealth respondents, our calculations will overstate the pension wealth of the lower-wealth groups, while understating the pension wealth of the higher-wealth groups. This bias could, in turn, affect the distributional calculations performed later in the paper. Section 6 above discusses how our results change with differential mortality by education and marital status.

Social Security

Computing the present value of of Social Security is quite similar to calculating DB wealth. The HRS includes questions about both current benefits for retirees and expected benefits for workers. Let ss^r_τ and $ss^s_{\tau+\Delta}$ denote the current or expected annual social security benefits of the respondent and the spouse at ages τ and $\tau+\Delta$ respectively. The actuarial present value of household Social Security benefits is given by

$$SSPV = \sum_{\tau=a_r}^{119} \delta^{\tau-a_r}\left[\Psi_1(ss^r_\tau + ss^s_{\tau+\Delta}) + \Psi_2 \max(ss^r_\tau, ss^s_{\tau+\Delta})\right], \tag{A-2}$$

where

$$\Psi_1 = \psi^r(\tau, a_r)\psi^s(\tau+\Delta, a_s)$$

is the conditional probability of both household members being alive, and

$$\Psi_2 = \psi^r(\tau, a_r) + \psi^s(\tau+\Delta, a_s) - 2\psi^r(\tau, a_r)\psi^s(\tau+\Delta, a_s)$$

is the conditional probability of exactly one household member being alive.[42] The first bracketed term in equation (A-2) captures the fact that if both household members are alive, their total benefits will generally equal the sum of their individual amounts. The second term in the brackets reflects the rules governing survivors benefits, whereby a retirement-age widow or widower typically receives 100% of the spouse's benefits if these exceed their own benefit amount.[43] Since Social Security benefits are adjusted for inflation, we discount using the real interest rate: $\delta = 1/(1+r)$.

Respondents in the HRS are asked directly about the amount of current or expected spousal benefits. We take these amount at face value and assume that the reported benefits already reflect any adjustments due to the Social Security rules (e.g. the fact that individuals are typically entitled to the maximum of their own benefits and 50% of their spouse's).

Insurance, Annuities, and Welfare

Life insurance wealth is a bit different from DB or Social Security wealth because life insurance is a contingent asset and therefore less liquid than other wealth components. Nonetheless, to ignore it would be to understate the total resources available to finance household consumption in retirement. We only include policies in which the spouse is named as a primary beneficiary.

We compute the actuarial present value of household life insurance as follows:

$$\begin{aligned} INPV = \sum_{\tau=a_r+1}^{119} \delta^{\tau-a_r}\big\{&\psi^r(\tau-1, a_r)[1-\psi^r(\tau, a_r)]\psi^s(\tau+\Delta, a_s)FV_r - \psi^r(\tau, a_r)P_r \\ &+ \psi^s(\tau+\Delta-1, a_s)[1-\psi^s(\tau+\Delta, a_s)]\psi^r(\tau, a_r)FV_s - \psi^s(\tau+\Delta, a_s)P_s\big\}, \end{aligned} \tag{A-3}$$

where FV_r and FV_s denote the face values of the insurance policies owned by the respondent and the spouse, and P_r and P_s are the corresponding annualized premiums. The first term in equation

[42] To see the intuition of this expression, note that the equation for Ψ_2 is simply a rearrangement of $\psi^r(1-\psi^s) + \psi^s(1-\psi^r)$.

[43] Widows older than 60 but under the full retirement age generally receive 71-99% of the workers benefit amount.

(A-3) is the expected payout of the respondent's insurance policy at age τ, where the expectation is taken over the probability that the respondent dies at a particular age τ while the spouse is still alive. The second term in the equation is the expected value of the premium payment, which occurs in the event that the respondent is still alive at age τ. The third and fourth terms are the same expectations applied to the spouse's policy.

Note that the actuarial present value of insurance would be zero if premiums were actuarially fair and perfectly observed in the data. However, the calculation of life insurance wealth is constrained by data limitations. We do not observe in the HRS the length of term policies, or their premiums.[44] In the absence of any data, we assume that term policies will remain in force throughout retirement, and that their premiums have been pre-paid (i.e. are zero in each year going forward). Thus, the only premiums that we account for are those associated with whole life policies. In addition, the HRS does not collect information on the cash value of whole life policies. As a result, we treat term life insurance and whole-life insurance identically in this calculation. That is, we ignore the cash value of whole life policies and instead calculate the present expected value of the face value, regardless of the type of policy.[45]

Our calculations of wealth from annuities and welfare payments are more straightforward. The formula for calculating the actuarial present value of annuities ($ANPV$) exactly parallels equation (A-1), where we make similar adjustments for COLAs and survivor benefits. Our measure of expected welfare payments includes veteran's benefits, food stamps, Supplemental Security Income (SSI), and other welfare. In this calculation, we assume that individuals who are currently receiving these payments will continue to receive the same inflation-indexed welfare payments as long as they live, and that those not currently receiving these payments never will—i.e. we do not model transitions in and out of welfare-receipt status. Since welfare benefits are typically indexed to inflation, we discount this stream of expected welfare payments using the real interest rate and the relevant conditional survival probabilities.

[44]Term life insurance policies simply pay out the face value to the beneficiary in the event of the death of the insured, while whole life policies also include a cash-value account in which assets accrue that can be borrowed against or redeemed upon cancellation of the policy.

[45]Note that if we *were* able to include cash values as a separate liquid asset, we would need to adjust down the measure of face value accordingly in order to prevent double counting. We do not estimate the extra utility value of more liquid wealth in any of our measures.

Table 1: Components of Comprehensive Wealth for Households Aged 55 and Older

	1998				2006			
	Mean	Share of HHs[1]	Share of CW[2]	Top 10 Share[3]	Mean	Share of HHs[1]	Share of CW[2]	Top 10 Share[3]
Wage Wealth	115.2	0.28	0.14	0.47	156.1	0.32	0.14	0.46
Financial Wealth	122.8	0.89	0.15	0.53	147.9	0.91	0.14	0.59
Nonfinancial Wealth	202.6	0.89	0.24	0.44	352.7	0.90	0.33	0.55
Retirement Accounts	76.2	0.42	0.09	0.58	120.2	0.44	0.11	0.68
DB Pension Wealth	102.9	0.52	0.12	0.37	86.1	0.49	0.08	0.35
Annuity & LI Wealth	5.4	0.05	0.01	0.34	12.8	0.12	0.01	0.51
Soc. Sec. Wealth	188.3	0.97	0.23	0.18	188.0	0.95	0.17	0.17
Other Transfer Wealth	14.4	0.15	0.02	0.20	16.8	0.14	0.02	0.12
Total: Comp. Wealth	827.7	1.00	1.00	0.40	1080.4	1.00	1.00	0.47

Means reported in thousands of 2006 dollars. See text for details of wealth calculations. Sample size is 12,676 in 1998 and 11,106 in 2006.

[1]Share of households with nonzero value of this wealth.

[2]Aggregate share of this wealth in comprehensive wealth.

[3]Share of this wealth held by the top 10% of households (ranked by CW).

Table 2: Summary of Wealth and Adequacy Measures

	1998			2006		
	Percentiles of Wealth and Adequacy Measures					
	10th	50th	90th	10th	50th	90th
Comprehensive Wealth	117.5	500.0	1753.4	118.9	591.0	2005.3
Annualized Comp. Wealth	10.8	32.9	94.3	10.4	35.7	116.9
Ratio of CW to Poverty Wealth	1.09	3.51	10.16	1.05	3.91	12.52
Ratio of ACW to Pre-Ret. Earn.	0.45	1.08	2.89	0.43	1.05	3.22
	Percent Distribution of Adequacy Measures					
	$\leq$1.5	1.5-3.0	$\geq$3.0	$\leq$1.5	1.5-3.0	$\geq$3.0
CW to Poverty Wealth	0.18	0.25	0.57	0.18	0.21	0.61
	$\leq$0.5	0.5-1.0	$\geq$1.0	$\leq$0.5	0.5-1.0	$\geq$1.0
ACW to Pre-Retirement Earnings	0.12	0.32	0.55	0.13	0.33	0.53

Dollar figures in thousands of 2006 dollars. Sample size is 12,676 in 1998 and 11,106 in 2006.

Table 3: Measures of Wealth, by Age and Marital Status

	Percentiles:	1998 10th	1998 50th	1998 90th	2006 10th	2006 50th	2006 90th
		Comprehensive Wealth					
Age 55-62	Single	129.4	422.7	1278.6	116.8	389.5	1256.5
	Married	470.8	1191.9	2841.6	464.4	1180.3	3086.8
Age 63-75	Single	104.4	284.8	933.3	100.6	303.9	1146.1
	Married	317.0	796.1	2065.0	331.4	905.9	2555.3
Age 76+	Single	58.9	194.0	661.6	54.5	214.9	975.1
	Married	209.0	531.9	1498.4	199.9	602.6	1870.9
		Annualized Comprehensive Wealth					
Age 55-62	Single	7.9	25.7	82.1	7.3	23.6	76.5
	Married	15.6	39.7	95.6	15.4	39.7	103.6
Age 63-75	Single	9.0	24.6	83.0	8.7	26.4	98.2
	Married	14.9	36.0	91.2	14.7	40.2	114.0
Age 76+	Single	10.2	32.5	119.1	10.4	38.5	175.9
	Married	15.6	39.6	113.0	15.8	47.5	150.1

Figures in thousands of 2006 dollars. Married shares by age group are .57, .50, and .33 in 1998 and .61, .54, .35 in 2006. Sample size is 12,676 in 1998 and 11,106 in 2006.

Table 4: Measures of Wealth Adequacy, by Age and Marital Status

		1998			2006		
	Percentiles:	10th	50th	90th	10th	50th	90th
		Ratio of CW to Poverty Wealth					
Age 55-62	Single	0.77	2.48	7.95	0.71	2.28	7.40
	Married	1.85	4.72	11.36	1.83	4.70	12.43
Age 63-75	Single	0.89	2.42	8.10	0.86	2.61	9.63
	Married	1.77	4.30	10.91	1.76	4.80	13.60
Age 76+	Single	0.93	2.98	10.61	0.95	3.57	16.13
	Married	1.76	4.46	12.79	1.76	5.28	17.00
		Ratio of ACW to Pre-Retirement Earnings					
Age 55-62	Single	0.35	0.89	1.79	0.27	0.82	2.15
	Married	0.60	1.10	2.15	0.54	1.02	2.04
Age 63-75	Single	0.35	0.92	2.59	0.32	0.90	2.71
	Married	0.51	1.18	3.10	0.56	1.13	2.85
Age 76+	Single	0.49	1.47	7.33	0.44	1.56	7.82
	Married	0.61	1.64	6.55	0.57	1.52	6.93

See text for details of adequacy measures. Married shares by age group are .57, .50, and .33 in 1998 and .61, .54, .35 in 2006. Sample size is 12,676 in 1998 and 11,106 in 2006.

Table 5: Distributions of Adequacy Measures, by Age and Marital Status

		Distribution of CW Ratio					
		1998			2006		
		≤1.5	1.5-3.0	≥3.0	≤1.5	1.5-3.0	≥3.0
Age 55-62	Single	0.30	0.28	0.42	0.34	0.27	0.39
	Married	0.06	0.19	0.74	0.07	0.17	0.75
Age 63-75	Single	0.31	0.29	0.41	0.32	0.24	0.44
	Married	0.07	0.23	0.70	0.07	0.21	0.73
Age 76+	Single	0.24	0.26	0.50	0.23	0.22	0.55
	Married	0.06	0.23	0.70	0.07	0.19	0.75
		Distribution of ACW Ratio					
		1998			2006		
		≤0.5	0.5-1.0	≥1.0	≤0.5	0.5-1.0	≥1.0
Age 55-62	Single	0.18	0.42	0.40	0.24	0.38	0.38
	Married	0.06	0.34	0.60	0.08	0.40	0.52
Age 63-75	Single	0.21	0.33	0.46	0.23	0.32	0.45
	Married	0.10	0.30	0.61	0.07	0.34	0.59
Age 76+	Single	0.11	0.24	0.65	0.12	0.21	0.67
	Married	0.06	0.20	0.74	0.07	0.23	0.69

See text for details of adequacy measures. Married shares by age group are .57, .50, and .33 in 1998 and .61, .54, .35 in 2006. Sample size is 12,676 in 1998 and 11,106 in 2006.

Table 6: Sensitivity to Interest Rate Assumptions in 2006

	Percent Change in:	
	CW	ACW
Real=1.0%, Nom.=3.0%	8.3	9.2
Real=4.0%, Nom.=6.0%	-7.3	-7.0
Real=2.5%, Nom.=3.0%	1.1	0.8
Real=2.5%, Nom.=6.0%	-0.8	-1.1

Table entries show percent change from the 2006 baseline of a 2.5% real rate and 4.5% nominal rate. Sample size is 11,106 in 2006.

Table 7: Simulations

Age	Pctile	Baseline	-50% Housing	No House Growth	-25% SS	-Med. Costs	Combined
		Annualized Wealth (thous. 2006 $)					
Age 55-62	10th	9.7	9.1	11.0	8.4	9.0	7.2
	50th	34.5	31.2	33.1	31.9	33.9	28.2
	90th	93.6	82.9	85.2	90.2	93.3	79.0
Age 63-75	10th	10.5	9.8	10.7	8.6	9.9	7.4
	50th	34.0	29.1	32.6	30.8	33.4	25.4
	90th	105.3	87.1	93.3	102.2	104.6	82.7
Age 76+	10th	11.6	10.9	12.6	9.3	10.9	8.1
	50th	42.6	33.6	41.7	39.4	42.0	30.3
	90th	167.2	132.5	154.4	164.5	166.7	128.0
		Ratio of CW to Poverty Wealth					
Age 55-62	10th	0.98	0.92	1.13	0.88	0.93	0.74
	50th	3.87	3.48	3.75	3.61	3.82	3.15
	90th	10.66	9.47	9.47	10.37	10.58	9.05
Age 63-75	10th	1.09	1.01	1.12	0.88	1.02	0.76
	50th	3.79	3.23	3.61	3.45	3.73	2.80
	90th	11.88	9.79	10.30	11.43	11.79	9.26
Age 76+	10th	1.09	1.03	1.23	0.89	1.04	0.77
	50th	4.17	3.35	4.17	3.86	4.12	3.01
	90th	16.50	12.93	14.95	16.09	16.37	12.50
		Ratio of ACW to Pre-Retirement Earnings					
Age 55-62	10th	0.39	0.37	0.43	0.36	0.38	0.30
	50th	0.95	0.86	0.91	0.88	0.93	0.78
	90th	2.08	1.80	1.79	1.95	2.06	1.65
Age 63-75	10th	0.42	0.38	0.42	0.35	0.40	0.29
	50th	1.05	0.90	0.99	0.94	1.03	0.78
	90th	2.78	2.31	2.54	2.65	2.77	2.14
Age 76+	10th	0.51	0.45	0.53	0.43	0.49	0.36
	50th	1.54	1.28	1.50	1.42	1.52	1.13
	90th	7.56	5.83	6.88	7.10	7.39	5.66

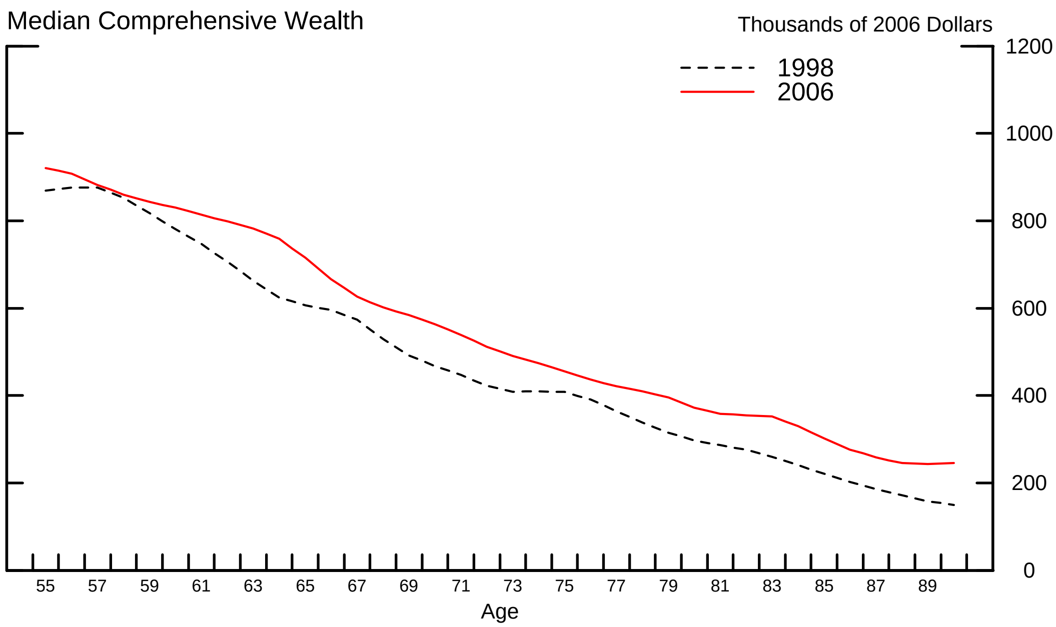
*"Baseline" is the original specification; "-50% Housing" counts only 50% of nonfinancial assets; "No House Growth" assumes zero real growth in non-financial assets between 1998 and 2006 (for this category, we compute statistics based on a balanced sample of households that were present in both survey years); "-25% SS" imposes a 25% across-the-board cut in the PV of Social Security benefits; "-Med. Costs" subtracts the expected present value of out-of-pocket medical costs, where the trend is computed from a random effect regression of log medical costs on household characteristics and time dummies; and "Combined" computes comprehensive wealth with all of the adjustments except for the zero real housing growth.

Table 8: Regressions of ACW on Household Characteristics

	Married				Single			
	Random Effects		Fixed Effects		Random Effects		Fixed Effects	
Explanatory Variable[1]	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Respondent Characteristics								
Age, resp	0.011***	0.001	0.001	0.006	0.023***	0.001	0.014	0.008
Sex, resp = male	0.066***	0.015	0.000	.	0.219***	0.016	0.000	.
High school, resp	0.206***	0.020	0.000	.	0.336***	0.019	0.000	.
College, resp	0.481***	0.024	0.000	.	0.738***	0.025	0.000	.
Resp non-white	-0.167***	0.021	0.000	.	-0.210***	0.019	0.000	.
Resp hispanic	-0.233***	0.029	0.000	.	-0.246***	0.030	0.000	.
Fair health, resp	-0.039***	0.009	-0.012	0.010	-0.043***	0.010	-0.008	0.011
Poor health, resp	-0.087***	0.012	-0.024	0.015	-0.112***	0.013	-0.030*	0.015
O.O.P. med, resp	0.027**	0.009	0.002	0.010	0.048***	0.010	0.002	0.011
O.O.P. high, resp	0.043***	0.010	0.006	0.011	0.073***	0.011	0.006	0.013
Prob beq med, resp	0.127***	0.011	0.031*	0.012	0.271***	0.012	0.096***	0.013
Prob beq high, resp	0.241***	0.011	0.068***	0.013	0.449***	0.013	0.134***	0.015
At life table, resp	0.013	0.009	0.005	0.010	-0.001	0.010	-0.006	0.011
Above life table, resp	-0.000	0.010	-0.004	0.011	-0.005	0.011	-0.004	0.012
Spouse Characteristics								
High school, spouse	0.130***	0.017	0.000	.				
College, spouse	0.373***	0.023	0.000	.				
Fair health, spouse	-0.028**	0.009	0.001	0.010				
Poor health, spouse	-0.060***	0.013	0.004	0.015				
O.O.P. med, spouse	0.027**	0.009	0.007	0.010				
O.O.P. high, spouse	0.014	0.010	-0.009	0.011				
Prob beq med, spouse	0.077***	0.010	-0.002	0.011				
Prob beq high, spouse	0.148***	0.011	0.002	0.012				
At life table, spouse	0.000	0.009	-0.007	0.010				
Above life table, spouse	0.018	0.010	0.011	0.011				
Household Characteristics								
Fin. Wealth Share	0.310***	0.023	0.337***	0.027	0.339***	0.022	0.418***	0.029
Ann. Wealth Share	-0.390***	0.021	-0.209***	0.024	-0.463***	0.016	-0.365***	0.019
Currently working	0.117***	0.010	0.102***	0.011	0.239***	0.013	0.200***	0.014
Constant	9.479***	0.070	10.600***	0.354	8.462***	0.067	9.438***	0.549
N	13,863		13,863		16,823		16,823	

[1] *Source*: 1998–2006 waves of the HRS. All regressions include a full set of year dummies. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. "Fair health" corresponds to "good" in the HRS question on self-reported health, and "Poor" corresponds to "Fair or poor." The OOP variables indicate the middle and top third of the out-of-pocket medical expense distribution. "At life table" indicates the respondent's subjective probability of survival is between 75% and 125% of the Social Security life table value, and "Above life table" indicates the respondent's subjective measure is over 125% of the life table value. "Fin. Wealth Share" is the share of non-wage comprehensive wealth accounted for by net financial wealth, including DC plans and IRAs. "Ann. Wealth Share" is the share accounted for by DB plans, Social Security, annuities, welfare, and veteran's benefits. "Currently working" is an indicator for whether the household receives current earnings.

Figure 1: Age Profiles of Wealth Measures



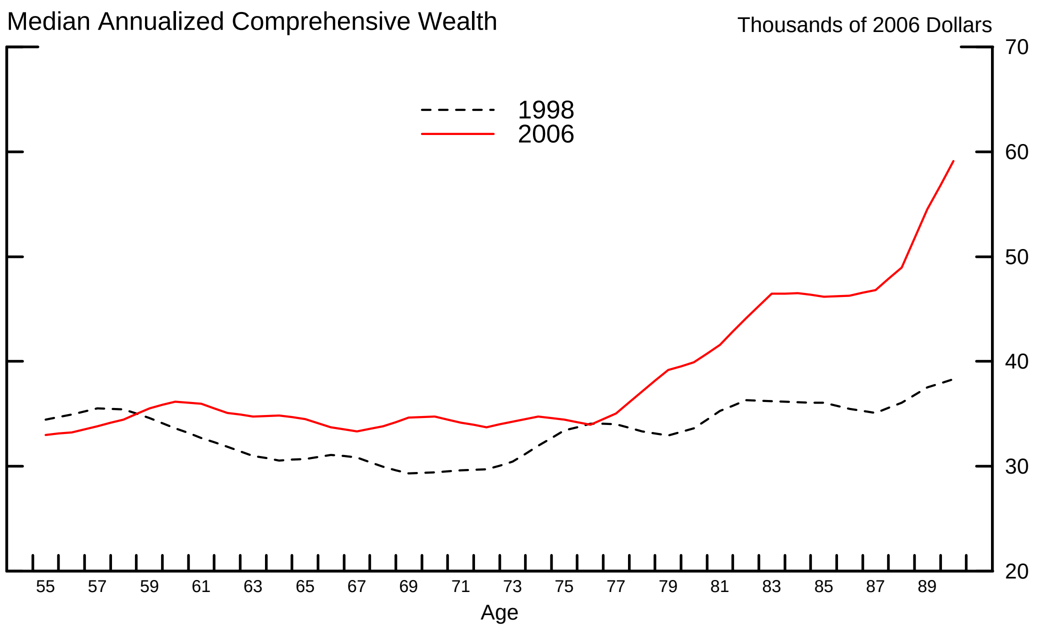


Figure 2: Age Profiles of Adequacy Measures