

## Measuring Financial Literacy and Welfare through the Lens of a Lifecycle Model

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### Introduction

In this paper, we focus on a behavioral norm that leads to financial security, specifically, saving enough during working years to maintain pre-retirement living standards during retirement. We use an augmented lifecycle model to predict optimal wealth accumulation levels for a variety of populations. We then use data from the Health and Retirement Study to calculate deviations between these targets and observed wealth holdings; these calculated deviations provide a well-grounded measure of the degree to which households are preparing for retirement. Results indicate that, in 2008, 36 percent of retired Americans born before 1954 had saved less than their optimal targets. Economically disadvantaged households were significantly more likely than others to be under-saving, and therefore are natural targets for efforts to improve financial capabilities. Finally, we examine current popular savings advice and begin to develop rule-of-thumb guidance that more closely matches the results of the full-fledged dynamic optimization problem.

### A Model of Optimal Wealth Accumulation

In this paper we focus on saving enough during working years to maintain pre-retirement living standards during retirement. This standard ensures that households maximize their lifetime utility, given the resources they have available.

The lifecycle model is the foundation for the analysis. We model preferences, marriage, fertility, and the institutional environment including the tax system, transfers, Social Security, pensions, earnings, and the rate of return received in financial markets. For each household in the sample, we compute optimal decision rules for consumption (and hence asset accumulation) from the oldest possible age to the beginning of working life for any feasible realizations of the random

variables: earnings, health shocks, and mortality. The resulting measure of wealth includes net equity in housing.

If households are at or above their optimal targets, they are in a position, given their Social Security and defined benefit pension entitlements, to maintain the discounted marginal utility of consumption over time. In this case, “optimal” does not necessarily imply socially desirable, but simply suggests that given available resources, individuals are not consuming more than they should if they wish to maximize lifetime utility. For example, if a household’s income was below the poverty line during working years, that household would still likely have a below-poverty income during retirement, even when the household met its optimal targets—in short, families will have the financial resources to maintain their pre-retirement living standards in retirement.

### Are Retired Americans Financially Secure?

We use data from the Health and Retirement Study (HRS) to compare actual wealth holdings to the targets identified in the analytical model. HRS is a nationally representative panel study; we restrict the sample to households in which all members are retired, and divide the sample into five HRS cohorts.

For each cohort, the observed wealth values substantially exceeded the optimal targets, suggesting that most HRS respondents had accumulated the resources needed to maintain their living standards in retirement.

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#### Optimal vs. Actual Wealth

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	2008	2000
Median Target	\$96,445	\$111,302
Percent below target	36.0%	28.1%
Median conditional deficit	\$10,028	\$23,093

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However, a proportion of households had not met their wealth targets. In 2008, 36 percent of households had a net worth below their optimal targets. Conditional on not meeting the target, the magnitude of the deficit was \$10,028. There was little variation across cohorts in the fraction of the population that had under-saved—one-third of households (or slightly more) in every cohort were below their optimal targets. Results for the same households in 2000 show that a smaller fraction of households were below their optimal targets at that time—28 percent versus 36 percent—though the shortfall (\$23,093) conditional on not meeting the target was somewhat larger.

We ran additional analyses to determine which characteristics are associated with not achieving target wealth accumulation. Lifetime income, education, and moderate drinking (compared to not drinking at all) are significantly negatively correlated with under-saving. Age, gender, religion, and body mass index have no relationship to under-saving. African American and single households are more likely than others to be under-saving. In short, targeted intervention programs would do well to focus on the economically disadvantaged. Further analysis suggests that financial literacy (measured via literacy questions) either (a) is a mechanism through which income is related to under-saving, but the samples ( $n=387$ ) were not large enough to tease out distinct effects of literacy and income; or (b) has no additional explanatory power, once income is controlled.

### Target Replacement Rates

The target replacement rate—the amount of income in retirement needed to maintain pre-retirement living standards—is a workhorse concept in the financial planning literature. Typical advice suggests that replacement rates should be 70 to 85 percent of pre-retirement income.

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We used the model of optimal target wealth to calculate optimal replacement rates. The average optimal replacement rate for the sample, 95.7 percent, is somewhat outside the frequently noted target of 70 to 85 percent; however, the median optimal rate of 82.8 percent is consistent with general advice. For the average household, the target for private wealth accumulation (including housing equity) provides 37.6 percent of total income. The actual expected Social

Security replacement rate is 45 percent. On average, defined benefit pensions replace 13 percent of income. Put differently, Social Security and defined benefit pension entitlements cover about 60 percent of retirement income needs for the typical HRS household; private wealth accumulation must make up the rest.

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*For the average household, the target for private wealth accumulation (including housing equity) is 37.6 percent of the total income goal, while Social Security and defined benefit pension entitlements cover about 60 percent of retirement income.*

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Income, marital status, education, federal tax rates, medical expenses, and the presence and timing of earning shocks influence the optimal replacement rate. Combined, these factors result in a very wide range of optimal replacement rates: the 10th percentile optimal replacement rate is 37.1 percent, while the 90th percentile is 253.6 percent. The substantial variation in optimal target replacement rates presents a challenge for developing rules of thumb to calculate a sensible replacement rate. Conventional advice may overstate optimal targets by a factor of two, or understate retirement consumption needs by nearly a factor of three, depending on the idiosyncratic experiences of specific households.

### How Should Households Prepare for Retirement?

A number of online tools exist to help households assess the adequacy of their savings given a retirement income goal. The user provides basic financial information, and the calculator typically provides a user-adjustable default replacement rate ranging from 70 percent to 85 percent. Aside from the provision of a default value, there is no guidance about how to choose a target replacement rate or the factors upon which the target might depend. However, the idea that a single target replacement rate is appropriate for all households is contrary to the implications of the augmented lifecycle model.

In addition, there are many rules of thumb in the financial planning world that offer households guidance on achieving a secure retirement. We consider five of these rules: (1) accumulated assets should equal 12 times a household's current income, (2) net worth should equal an individual's age times pre-tax income divided by 10, (3) total savings should equal 20 times gross annual household income, (4) a household should save 10-20 percent of pre-tax income (depending on the desired lifestyle during retirement), and (5) a household should save half of all raises.

We compared these rules of thumb to the optimal wealth targets from our augmented lifecycle model; results indicate that these common rules do not do a particularly good job of matching the implications of the model. First, some of the rules provide miserably inappropriate, overly conservative guidance; second, several provide no insight about how to reach the desired target; third, the rules do not produce results that closely match the lifecycle pattern of optimal saving (saving less early in life and more closer to retirement).

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*Common rules of thumb in the financial planning world do not do a particularly good job of offering guidance about achieving a secure retirement. We propose two alternative rules that more closely mimic the optimal decision rules from our analytical model.*

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We propose two alternative rules that more closely mimic the optimal decision rules from our model. These simple rules perform better than rules that are currently in the literature, but at this point, they are meant to be illustrative. The first rule is for those who attended some college or more to save at the rate of  $0.05 + 0.0012 \times \text{age}$ . For example, a 40-year old would save 9.8 percent of income, while a 60-year old would save 12.2 percent. Those who did not attend any college should save at the rate of  $0.025 + 0.0012 \times \text{age}$ . The second rule recommends saving 4 percent from age 20 to 29; 6 percent from age 30 to 39; and 10 percent at age 40 and older. Those who have attended some college or more should add 4 percent to this rate; households with children should subtract 1 percent for each child currently living in the home. We are continuing to work on developing more effective rules.

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