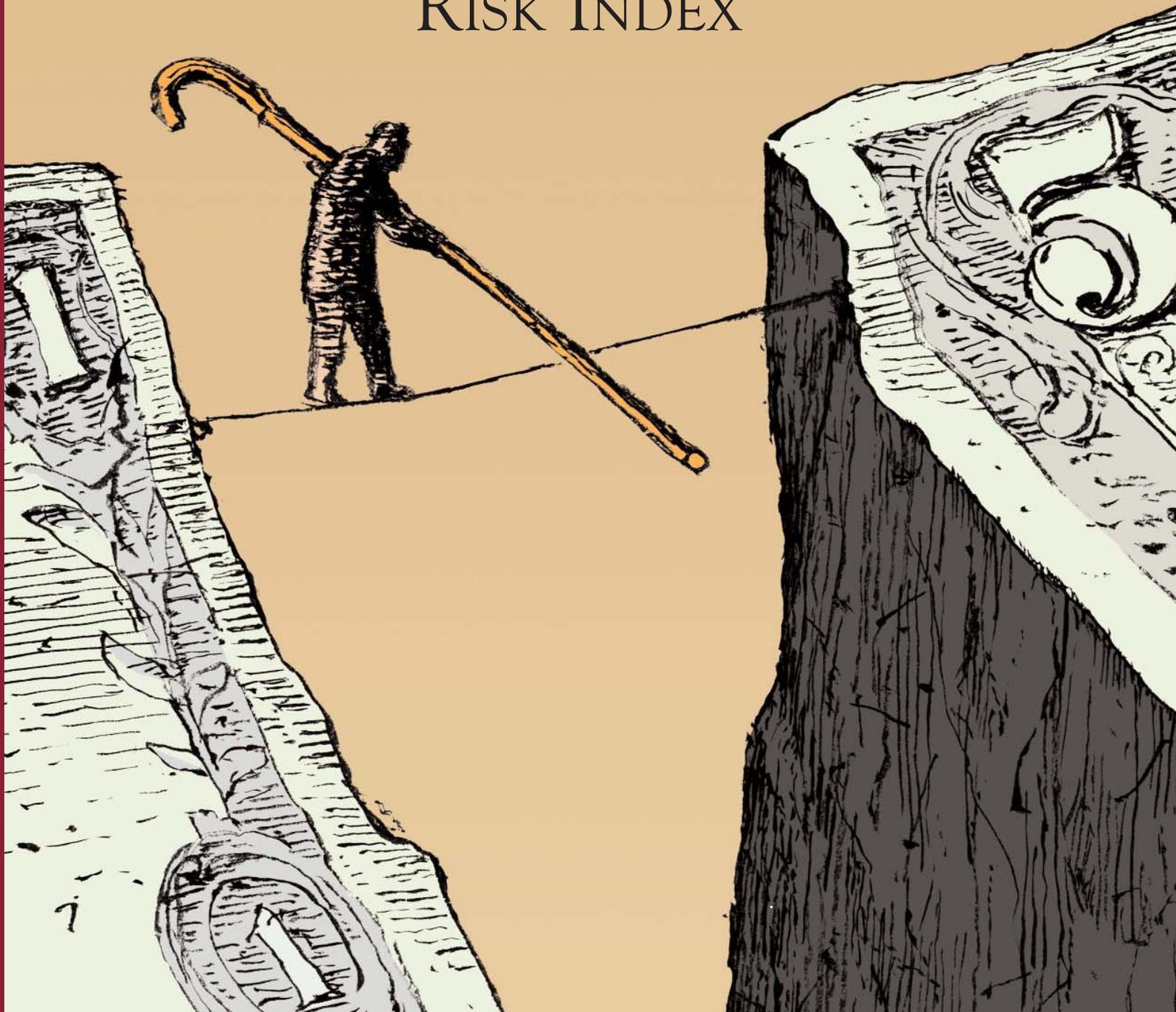


JUNE 2006



RETIREMENTS AT RISK: A NEW NATIONAL RETIREMENT RISK INDEX



EXECUTIVE SUMMARY

The retirement income landscape is changing dramatically. The length of retirement is increasing as the average retirement age hovers at 63 for men and 62 for women while life expectancy rises. At the same time, the amount of money people will have in retirement relative to their pre-retirement earnings is likely to decline as Social Security becomes less generous and people have to rely increasingly on 401(k) balances, which to date have been quite modest.

Given these changes, this is a good time to take stock of where Americans are today and where they will be in the future as they approach retirement. The National Retirement Risk Index does just that. It measures the percentage of working-age households who are at risk of being financially unprepared for retirement at age 65. The Index is calculated by comparing projected replacement rates for a nationally representative sample of households — projected retirement income as a percent of pre-retirement income — with target rates. The target rates — which vary by household type — would allow the household to maintain its pre-retirement living standard in retirement. If a household falls short of this target by more than 10 percent, it is considered "at risk."

The results show that even if households work to age 65 and annuitize all their financial assets including the receipts from reverse mortgages on their homes, 43 percent will be at risk (see Table). In the case of the Early Boomers, 35 percent will probably not have enough to maintain their living standard in retirement. This figure increases to 44 percent for the Late Boomers. And it rises to 49 percent for Generation Xers. Those with low incomes are more at risk than their high-income counterparts. And those without pensions are much more at risk than those with either a defined benefit plan or a 401(k).

The situation is not hopeless, however. Sensitivity analyses of the Index results show that changing retirement and savings behavior can have a major impact. For example, if people were to retire at age 67 rather than the assumed base case of 65, the share of households at risk would drop by 11 percentage points. Similarly, if people could save 3 percent more from an early age, the percent at risk would decline eventually by 11 percentage points. The purpose of the National Retirement Risk Index is to provide today's workers with the information they need to change their behavior so that they and their families can enjoy a secure retirement.

TABLE. PERCENT OF HOUSEHOLDS "AT RISK" AT AGE 65 BY BIRTH COHORT AND INCOME GROUP

Income group	All	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	43%	35%	44%	49%
Top third	36	33	35	42
Middle third	40	28	44	46
Bottom third	53	45	54	60

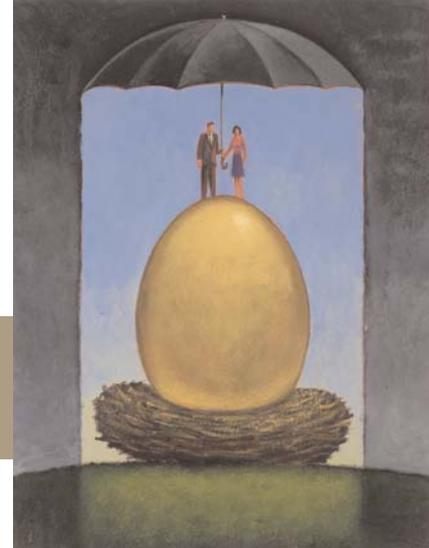
Source: Authors' calculations.

PREFACE

The National Retirement Risk Index was conceived as a way to raise the profile of a host of issues that affect Americans' preparedness for retirement. While ensuring retirement security for an aging population is one of the most compelling challenges facing the nation, no single widely-used measure defines the size and scope of the problem. This issue is particularly important now because, while many current retirees are doing quite well, the retirement landscape is changing rapidly. These changes make the outlook for retiring Baby Boomers and Generation Xers far less sanguine. Unfortunately, many current workers do not appear to understand the nature of the problem that they are likely to confront in retirement.

In response to the challenges ahead, the Center for Retirement Research at Boston College developed the idea for a nationally representative Index that would gauge retirement preparedness, would cover all major sources of retirement income, and would be updated periodically. The need for such an Index was also recognized by Nationwide Mutual Insurance Company. The Center gratefully acknowledges Nationwide for its exclusive support of this project.

CONTENTS



EXECUTIVE SUMMARY.....	i
PREFACE	ii
INTRODUCTION	I
PROJECTING REPLACEMENT RATES	2
ESTABLISHING REPLACEMENT RATE TARGETS.....	9
THE NATIONAL RETIREMENT RISK INDEX.....	II
SENSITIVITY ANALYSES.....	13
CONCLUSION.....	16
ENDNOTES.....	17
REFERENCES.....	21
APPENDIX A. SELECTED CHARACTERISTICS OF SCF HOUSEHOLDS	22
APPENDIX B. METHODOLOGY FOR COMPUTING REPLACEMENT RATE TARGETS.....	23
APPENDIX C. OTHER MEASURES OF RETIREMENT PREPAREDNESS	25
BIOS OF NRRI RESEARCH TEAM.....	28
BIOS OF NRRI ADVISORY BOARD.....	30

INTRODUCTION

The retirement income landscape is changing dramatically. The length of retirement is increasing as the average retirement age hovers at 63 for men and at 62 for women and life expectancy rises.¹ At the same time, the amount of money people will have in retirement relative to their pre-retirement earnings is declining for a number of reasons. First, at any given retirement age, Social Security benefits will replace a smaller fraction of pre-retirement earnings as the Normal Retirement Age rises from 65 to 67.² Second, while the proportion of the workforce covered by a pension has not changed over the last quarter of a century, the type of coverage has shifted from defined benefit plans, where workers receive a life annuity based on years of service and final salary, to 401(k) plans, where individuals are responsible for their own saving. In theory 401(k) plans could provide adequate retirement income, but individuals make mistakes at every step along the way and the median balance for household heads approaching retirement is only \$60,000.³ Third, most of the working-age population saves virtually nothing outside of their employer-sponsored pension plan. And fourth, bond yields have declined over the past two decades and many observers believe that stock returns will also be lower than they have been in the past, so a given accumulation of retirement assets will yield less income. In addition to a rising period of retirement and falling replacement rates, out-of-pocket medical expenses are projected to consume an ever greater proportion of retirement income.

Given these changes, this is a good time to take stock of where Americans are today and where they will be in the future as they approach retirement. The National Retirement Risk Index does just that. It measures the percentage of working-age households who are at risk of being financially unprepared for

retirement today and in coming decades.⁴ The Index calculates for each household a replacement rate — projected retirement income as a percent of pre-retirement income — and compares that replacement rate with a benchmark rate that would allow the household to maintain its pre-retirement living standard in retirement. Households with replacement rates that fall more than 10 percent below the target are considered "at risk."

The results show that — even if they work to 65 and annuitize all their financial assets including the receipts from reverse mortgages on their homes — 36 percent of the Early Boomers (those born between 1946 and 1954) are at risk. This figure increases to 43 percent for the Late Boomers (those born between 1955 and 1964). And it rises to 49 percent for Generation Xers, those born after 1964. This pattern of increasing risk reflects the longevity and retirement income issues discussed above. Those with low incomes are more at risk than their high-income counterparts. And those without pensions are much more at risk than those with either a defined benefit plan or a 401(k).

This report first describes the construction of the National Retirement Risk Index, which involves two separate steps: projecting replacement rates for each household and determining a target replacement rate. It then compares the projected replacement rates to the targets to determine the Index results. While the Index itself covers *all* working-age U.S. households, the results also include the percentage of different types of households that are at risk, by both birth cohort and income group and for those with and without pension coverage. Finally, the report offers some sensitivity analyses to isolate the impact of key assumptions.

*“THE RETIREMENT INCOME
LANDSCAPE IS CHANGING
DRAMATICALLY.”*

PROJECTING REPLACEMENT RATES

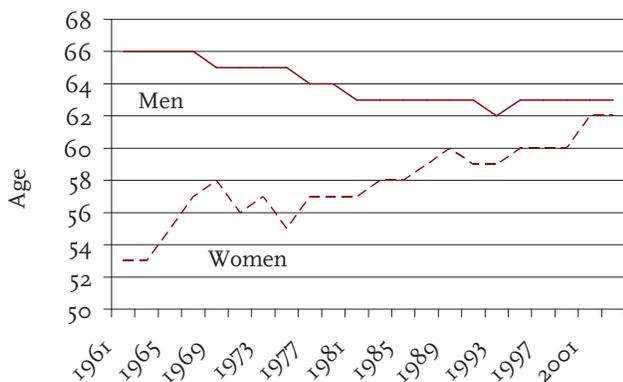


Projecting replacement rates involves two calculations. The first is estimating how much income households will have as they enter retirement. The second is estimating their pre-retirement income.

The exercise starts with a nationally representative sample of 4,500 households from the Federal Reserve's 2004 *Survey of Consumer Finances (SCF)*.⁵ This survey has been conducted every three years since 1983. It questions households about their income, wealth, pension coverage, and a host of other variables and provides a comprehensive snapshot of American families' financial position today.

The Index requires projecting where these households will be at age 65.⁶ Selecting 65 as the retirement age is a conservative assumption given that the average retirement age today is 63 for men and 62 for women (see Figure 1). But, in the future, households will

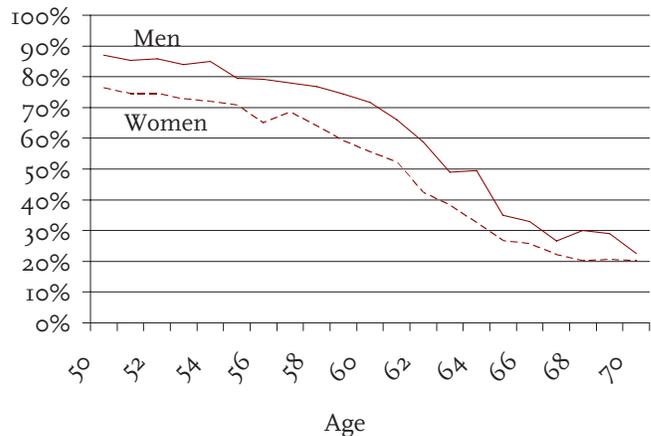
FIGURE 1. AVERAGE RETIREMENT AGE^a, BY AGE AND GENDER, 1961-2003



Source: Bureau of Labor Statistics and Bureau of the Census (1962-2004) and authors' calculations.

a. Retirement is defined as the age at which more than 50 percent of the cohort is out of the labor force as in Burtless and Quinn (2002).

FIGURE 2. LABOR FORCE PARTICIPATION RATE BY AGE AND GENDER, 2004



Source: Bureau of Labor Statistics and Bureau of the Census (2005).

have to retire later if they are to have an adequate income. Sensitivity analysis in the final section shows the impact of earlier and later retirement.

Projecting Retirement Income

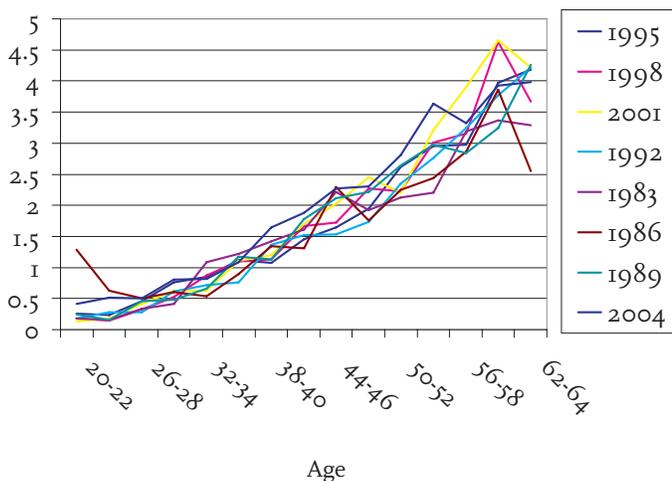
Retirement income is defined broadly to include income from financial assets both in 401(k) plans and saved directly (net of non-mortgage debt), housing (net of mortgage debt), defined benefit plans, and Social Security. The Index does not include income from work, since labor force participation declines rapidly as people age (see Figure 2).

The general methodology is to use wealth-to-income patterns in the *Survey of Consumer Finances* to project where today's younger households will be tomorrow in terms of financial and housing wealth — the

assets reported in the SCF. The fact that each of the eight surveys since 1983 provides a very similar picture suggests that the relationships have been stable over time. For example, all the surveys show a median wealth-to-income ratio for a 35-year-old household of about one and a median for an older household of about four (see Figure 3). Thus, a very direct way to estimate the wealth-to-income ratio for today's 35-year-old at age 65 is simply to assume a growth pattern consistent with the pattern experienced by today's 65-year-olds during their work lives.⁷

This approach is essentially the one adopted, but instead of estimating total wealth directly it builds up wealth from the individual components. Balances in 401(k) plans, other financial assets net of non-mortgage debt, housing wealth, and housing equity are projected based on wealth-to-income ratios from the SCF. The *Survey of Consumer Finances* does not include "wealth" from defined benefit pensions and Social Security, so the income from these sources is estimated directly.

FIGURE 3. MEDIAN RATIO OF WEALTH TO INCOME FOR THE SURVEYS OF CONSUMER FINANCES, 1983-2004



Source: Authors' calculations from the various *Surveys of Consumer Finances*.

401(k) and Other Financial Assets

As just described, the ratio of 401(k) and other financial assets relative to income is projected to age 65 using the patterns in the SCF. 401(k) wealth includes Individual Retirement Accounts (IRAs) balances, since most of the money in IRAs is rolled over from 401(k) plans.⁸ Financial wealth includes stocks, bonds, checking and money market accounts, mutual funds, etc. Non-mortgage debt is subtracted from financial wealth.

The actual process for estimating future wealth-to-income ratios for each individual household is somewhat more complicated than reading numbers from Figure 3. It involves two steps. The first step combines the data from all eight SCFs to estimate an equation that has the wealth-to-income ratio of each household as the dependent variable and age and birth cohort of each household as the explanatory variables. Separate equations were estimated for the top, middle, and bottom third of the income distribution. The purpose of this equation is to isolate the effect of age on the build-up of the wealth-to-income ratio. The equation for each third of the income distribution and for each component of wealth — 401(k), financial, gross housing, and net housing wealth — is as follows:⁹

$$1) \quad WR_i = a + \sum_{j=1}^{20} b_j COHORT_{ij} + \sum_{k=1}^{10} c_k AGEIND_{ik}$$

Where WR is the wealth-income ratio, a is a constant, b_j are 20 coefficients for households belonging to the 1918-20 to the 1978-80 birth cohorts, and $COHORT_{ij}$ is a dummy variable taking the value one if the household belongs to birth cohort j , zero otherwise. The coefficients for the age dummy variables are c_k , and $AGEIND_{ik}$ is a series of ten indicator variables for age.¹⁰

With the results from the first equation, it is possible to project the wealth-to-income ratio for each household at 62, assuming that its accumulation pattern

follows that of the average household.¹¹ For example, the average 35-year-old household in the middle third of the income distribution has a 401(k)-to-income ratio of 0.53. Summing the coefficients for the age indicators for age 36 onwards provides the total contribution of age to wealth accumulation, which in this case is 1.07. Thus, as shown in equation 2, the average 35-year-old household that participated in a 401(k) plan at any stage in its working life is projected to have a 401(k)-to-income ratio of 1.60 at age 62.¹²

$$2) \quad 401(k)/Y \text{ at age } 62 = 401(k)/Y \text{ at age } 35 \\ + \sum_{k=2}^{10} c_k \text{ AGEIND}_{ik} = 0.53 + 1.07 = 1.60$$

But households with less than average wealth will likely continue to accumulate wealth less rapidly than the average, and households with more than average wealth will continue to accumulate wealth more rapidly. Therefore, the rate of accumulation of each category of wealth is assumed to be proportional to current wealth, subject to upper and lower bounds.¹³ That is, if a household were at 80 percent of the average for the middle third in terms of its ratio of 401(k) balances to income in 2004, the assumption is that the household would be at 80 percent of the average projected for the middle third when the household reaches retirement. A similar procedure was adopted for the top and bottom thirds of the income distribution. With this approach, it was also necessary to constrain the maximum and minimum accumulation rates so that the mean agrees with the predictions of the econometric model and the variance of projected wealth at retirement was consistent with that of households currently retiring.

Having completed the projections for 401(k) wealth and financial wealth (net of non-mortgage debt) at retirement, the next step is to estimate how much income that wealth will produce. The assumption is that households purchase an inflation-indexed annuity — that is, an annuity that will provide them with a

payment linked to the Consumer Price Index for the rest of their lives.¹⁴ For couples, the annuity provides the surviving spouse two-thirds of the base amount. While inflation-indexed annuities are neither readily available nor popular with consumers, they provide a convenient tool for converting a lump sum of wealth into a stream of income. And while inflation-indexed annuities provide a smaller initial benefit than nominal annuities, over time they protect a household's purchasing power against the erosive effects of inflation.

Over time, the amount that succeeding cohorts of retirees receive in annuity income from a given accumulation will change as interest rates vary and as life expectancy increases. Higher interest rates will increase monthly payments, while longer life expectancy will reduce them.

Housing

In retirement, homeowners can receive two types of income from their home. (Homeowners generally hold onto their home until they die. If they do sell, the sale usually does not occur until late in retirement following a precipitating shock such as ill health or the death of a spouse¹⁵.) The first type of income is the benefit of living in their home rent free, what economists call "imputed rent." The second is access to the "reversionary interest," the present value of the eventual sales proceeds, through a reverse mortgage. One of the key factors affecting the amount of this reversionary interest is the expected period of the reverse mortgage. For example, if a couple retires together at age 65, one spouse may well be alive and living in the house at age 90. So, the lender would determine the maximum amount of the loan by using a formula based on the expected value of the home at the end of this 25-year period, discounted back to the present. At current interest rates, this formula yields a reverse mortgage amount equal to about 45 percent of the value of the house at age 65.¹⁶

To calculate both the imputed rent and reversionary interest requires projecting the housing wealth-to-income ratio (using the equations described above), applying imputed rental rates to that value, and annuitizing the reversionary interest.¹⁷ Although the take-up of reverse mortgages remains very low, the income from such a mortgage is included to reflect the maximum income available to the household.

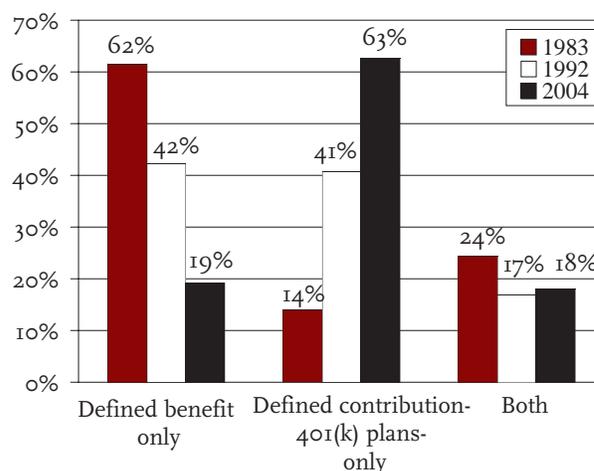
Homeowners often have mortgages as they enter retirement (see Table 1). Projected mortgage debt equals the projected gross housing wealth minus projected housing equity.¹⁸ The mortgage debt is subtracted from the amount obtainable from a reverse mortgage; if the mortgage balance exceeds the reverse mortgage amount, the balance is deducted from projected financial wealth.

TABLE 1. HOMEOWNERSHIP AND MORTGAGE DEBT BY AGE OF HOUSEHOLD HEAD, 2004

Age of household head	Percent homeowners	Median value of home	Percent of homeowners with mortgage	Median value of mortgage
35-44	68.3 %	\$160,000	92.0%	\$110,000
45-54	77.3	170,000	83.7	97,000
55-64	79.1	200,000	64.4	83,000
65-74	81.3	150,000	39.5	51,000
75-84	85.8	120,000	26.1	30,000
85+	83.5	141,000	8.9	40,000

Source: Authors' calculations from 2004 *Survey of Consumer Finances*.

FIGURE 4. WORKERS WITH PENSION COVERAGE BY TYPE OF PLAN, 1983-2004



Source: Authors' calculations based on the *Surveys of Consumer Finances*.

Defined Benefit Pension Income

SCF data are used to calculate the benefits that households could expect to obtain from both current and past coverage in defined benefit pension plans. While pension coverage tends to increase with age, successive birth cohorts are much less likely to be in a defined benefit plan. Twenty five years ago, defined benefit plans (together with certain types of traditional defined contribution pension plans — such as employer-funded profit-sharing plans and money purchase plans) were workers' primary source of private pension coverage. Since then, however, the pension landscape has changed dramatically. Most workers covered by an employer plan now have a 401(k) as their primary or only plan (see Figure 4). At the same time, the share of the workforce covered by any type of pension plan has remained unchanged at slightly less than 50 percent for private sector workers.

The shift from defined benefit to defined contribution plans is likely to continue. The only question is the speed at which this shift will occur. The baseline assumption for the Index is that coverage under defined benefit plans in the private sector will decline at an ever decreasing rate and that coverage in state and local plans will remain unchanged. The result of these assumptions is that overall lifetime defined benefit coverage will eventually stabilize at 25 percent for the youngest households in the SCF (those ages 21-23 in 2004).

To calculate future defined benefit income requires projecting benefits for those with defined benefit coverage and projecting both coverage and benefits for those currently expected to pick up coverage over their work life. For example, defined benefit pension coverage among households currently 33-35 years old is 25 percent compared to projected lifetime coverage of 28 percent for that birth cohort. Therefore, the first step is to assign pension coverage to an additional 3 percent of households. The next step is to assign a benefit amount. The SCF data suggest that the generosity of defined benefit plans is declining with successive birth cohorts.¹⁹ When imputing defined benefit pension benefits, amounts are drawn from appropriate birth cohorts to ensure that imputed values reflect this decline in generosity.²⁰

Social Security

The first step in calculating Social Security benefits is to take the earnings history, described below, for each member of the household. Calculating the individual's Primary Insurance Amount, the Social Security benefit before adjustments for early or late retirement, involves three steps. First, a worker's previous earnings to age 60 are restated in terms of today's wages by indexing past earnings to wage growth. Second, earnings for the highest 35 years are then averaged and divided by 12 to calculate Average Indexed Monthly Earnings. Finally, projected benefit formulas

under current law are applied to the Average Indexed Monthly Earnings. The assumption is that single individuals and the older member of a couple claim benefits at 65. The younger spouse is assumed to claim at the same time as the older spouse, but no earlier than 62.²¹ As noted in the introduction, due to the increase in the Normal Retirement Age, benefits relative to pre-retirement earnings at 65 will become less generous over time.

When calculating Social Security benefits, it was necessary to recognize that Social Security faces a financial shortfall. The system can pay full benefits until 2040, after which current payroll taxes can cover only about 70 percent of benefits promised.²² The decision was to assume full payment for those who retire until 2040 and only about 70 percent thereafter. Under this assumption, none of the households currently included in the Index are affected by Social Security's financial shortfall since the youngest people considered are those age 32 in 2004, who will reach 65 in 2037. However, if a reform plan is enacted that reduces benefits for current workers, it will have a noticeable effect on Social Security replacement rates.²³ If no new legislation is enacted, workers who turn 65 in 2040 or thereafter — as well as those who are already retired and drawing benefits at that time — will receive only about 70 percent of promised benefits.

Estimating Pre-Retirement Income

As just described, retirement income consists of income from 401(k) and other financial assets (net of non-mortgage debt), imputed rent, and the annuitized value of the "reversionary interest" from housing (net of interest paid on mortgage debt), defined benefit pension income, and Social Security benefits. The next step is to calculate a measure of pre-retirement income to use as the denominator of the replacement rate.

*“INCOME INCLUDES
HOUSING AS WELL AS THE
USUAL SUSPECTS.”*

The items that comprise pre-retirement income include earnings, the return on 401(k) plans and other financial assets (net of non-mortgage debt), and imputed rent from housing (net of interest paid on mortgage debt).²⁴ In essence, with regard to wealth, income in retirement equals the annuitized value of all financial assets (net of non-mortgage debt) and housing assets (net of mortgages); income before retirement is simply the return on those same assets.²⁵

The SCF provides limited data on historical earnings — individuals are asked to state their current earnings and their earnings when they quit their last job. Therefore, to construct earnings profiles it was necessary to turn to the *Health and Retirement Study*, which has administrative Social Security earnings records — a highly reliable historical record of earnings.²⁶ Median earnings histories were estimated separately for men and women. It was assumed that all men and women in the SCF had this average earnings profile.²⁷ Given current earnings, all previous years' earnings can be estimated. Individuals reporting zero current earnings were assigned zero earnings back to the date they quit their last job. For those who reported earnings on both their current and last job, if earnings on the last job differed from imputed earnings, then earnings for all previous years were adjusted up or down proportionately.

The earnings profiles are obtained by excluding years of zero earnings. So people reporting that they are currently working are initially not assigned any years of zero earnings. To make the number of years of zero earnings equal to that observed in the *Health and Retirement Study* data, people are randomly assigned zero years.

The earnings histories are indexed to reflect the growth in wages and averaged over the life of the household. Average annual income from wealth is calculated by applying a real return of 4.6 percent to pre-retirement assets.²⁸ This number, combined with

average wage-indexed lifetime earnings, then serves as the denominator for each household's replacement rate.

Replacement Rates for Households by Cohort, Income Level, and Pension Coverage

With projections of pre- and post-retirement income, it is possible to calculate the projected replacement rate for each household when the head reaches 65. Table 2 summarizes the median for three birth cohorts — the Early Boomers, the Late Boomers, and Generation Xers. For the cohorts as a whole, the median replacement rate declines over time from 77 percent for the Early Boomers who are just about to retire, to 69 percent for the Late Boomers, and 65 percent for Generation Xers. This decline reflects the factors enumerated in the introduction — declining Social Security replacement rates, the demise of defined benefit plans in an environment of flat pension coverage rates, and longer life expectancies. Though these median replacement rates may generally seem respectable, it is important to keep two things in mind. First, by definition, the median identifies the middle of the distribution, which means that half of the population has values above and half has values below. Second, as noted earlier, these replacement

TABLE 2. MEDIAN REPLACEMENT RATES AT AGE 65 BY BIRTH COHORT AND HOUSEHOLD TYPE

Household type	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	77%	69%	65%
Couples	73	68	64
One earner	91	94	87
Two earner	71	66	61
Singles	80	71	68
Men	79	70	70
Women	83	71	67

Source: Authors' calculations.

rates are calculated at age 65, while most people retire well before that age and would see substantially lower levels of replacement.

Table 2 also shows how the replacement rate varies by household type. The replacement rate is sharply higher for those couples where only one spouse works than for couples where both spouses have earnings.²⁹ This outcome is virtually inevitable in a Social Security system that provides a 50-percent spouse's benefit. As women go to work, they increase pre-retirement earnings but often fail to increase the benefit received. Among single individuals, replacement rates are very close between men and women. Women generally receive higher replacement rates from Social Security due to the progressivity of the benefit formula, but men receive greater retirement income from their higher financial and housing wealth.

Table 3 reports replacement rates by income group. Two patterns are evident. First, replacement rates are relatively flat across income groups, suggesting that employer-sponsored and other saving compensate for the progressivity of the Social Security benefit formula. The exception is the very high replacement rate for the middle third of Early Boomers. This rate reflects the importance of housing in the portfolio of middle income families, who benefited enormously from the recent boom in home prices, relative to their incomes. Second, replacement rates consistently decline over time for all income groups. This decline reflects the

TABLE 3. MEDIAN REPLACEMENT RATES AT AGE 65 BY BIRTH COHORT AND INCOME GROUP

Income group	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	77%	69%	65%
Top third	71	68	64
Middle third	82	69	67
Bottom third	77	69	65

Source: Authors' calculations.

TABLE 4. MEDIAN REPLACEMENT RATES AT AGE 65 BY BIRTH COHORT AND PENSION COVERAGE

Pension coverage	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	77%	69%	65%
Pension	81	73	70
DB only	91	83	82 ^a
DC only	65	62	63
Both	92	84	78 ^a
No pension	69	63	58

Source: Authors' calculations.

a. To offset probable under-estimates of expected benefits at retirement by the Generation Xers, their expected benefit amounts were increased by the assumed growth in wages over their worklives.

reduction in Social Security replacement rates and increased reliance on modest 401(k) plan balances discussed earlier.³⁰

Table 4 shows the importance of pension coverage. The median replacement rates decline from 69 percent to 58 percent for those with no pension coverage compared to 81 percent to 70 percent for those with a pension. Within the pension group, those with a defined benefit plan generally have higher replacement rates than those with a defined contribution plan. Interestingly among the Baby Boomers — those currently approaching retirement — households relying only on a defined contribution plan have replacement rates lower than those without a pension. The explanation for this anomaly is that this group includes higher earners than those with no pension and therefore receives a lower level of replacement from Social Security, and this group's 401(k) balances do not provide enough retirement income to offset this effect.

The shift from defined benefit to defined contribution plans is part of the reason for the decline in replacement rates for younger cohorts (see Table 5).³¹ As discussed earlier, the other factor is the scheduled decline in Social Security replacement rates.



TABLE 5. PERCENT OF HOUSEHOLDS WITH PENSION COVERAGE BY TYPE OF PLAN AND BIRTH COHORT

Pension coverage	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
Pension	66%	67%	65%
DB only	19	14	14
DC only	25	34	35
Both	22	20	18
No pension	34	33	35

Source: Authors' calculations.

ESTABLISHING REPLACEMENT RATE TARGETS

To estimate the proportion of the population at risk requires comparing projected replacement rates with a benchmark rate. A commonly used benchmark is the replacement rate needed to allow households to maintain their pre-retirement standard of living in retirement. People clearly need less than their full pre-retirement income to maintain this standard once they stop working. One big difference before and after retirement is the extent to which income is taxed. When people are working, their earnings are subject to both Social Security payroll taxes and federal personal income taxes. After retirement, they no longer pay Social Security taxes, and they pay lower federal income taxes because only a portion of Social Security benefits are taxable.³² A second reason why retirees require less than their full pre-retirement income is that they no longer need to save a portion of that income for retirement. In addition to contributing to 401(k) plans, many households try to pay off their mortgage before they retire. In retirement, these households no longer need to save and, in fact, can draw on their accumulated reserves. Thus, a greater

share of their income is available for spending. A final factor often mentioned is that work-related expenses, such as clothing and transportation, are either no longer necessary or are much reduced. Although this factor often tops many analysts' lists, it is relatively small compared to taxes and saving.

While all analysts cite the same factors for why retirees need less than their full pre-retirement income, they employ different approaches to calculating precisely how much less. For example, the RETIRE Project at Georgia State University has been calculating required replacement rates — that is, retirement income as a percent of pre-retirement earnings — for decades.³³ For an array of pre-retirement earnings levels, they calculate federal, state, and local income taxes and Social Security taxes before and after retirement. They also use the Bureau of Labor Statistics *Consumer Expenditure Survey* to estimate consumer savings and expenditures for different earnings levels. As of 2004, the Project estimated that a one-earner couple with an income of \$60,000 needed 75 percent of pre-retirement earnings to maintain the same level of consumption. The comparable target for those earning \$90,000 was 78 percent and for those earning \$20,000 was 86 percent. Low-income couples require a higher replacement rate because they save very little before retirement and enjoy less in the way of tax savings.

The approach for estimating adequate replacement rates for the Index extends the Georgia State calculations to include housing wealth and defined benefit pension plans and extends the analysis within the traditional life cycle model. The question becomes what percent of pre-retirement lifetime income do households need in retirement to sustain their pre-retirement consumption. Social Security provides a base, and workers must save the additional amount to accomplish this smoothing of lifetime consumption.

Thus, the definition of an adequate level of replacement will vary by type of household. For example, low-income households get most of their retirement income from Social Security and therefore need do little saving before retirement. The result is that they get little break from no longer having to save in retirement. Similarly, low-income households pay little in taxes, so they receive little in the way of tax saving in retirement. Thus, low-income households need a high replacement rate in retirement. Similarly, those with a defined benefit pension need a higher replacement rate than those without, because they were required to save less before retirement and gain less from the decline in required saving upon their retirement.

To determine the targets for the Index, a model was developed to compute optimal replacement rates for households with various characteristics.³⁴ From the model, four household groups (single male, single female, married with two earners, and married with one earner) and three income groups (low, middle, and high) were chosen. Then, to reflect the fact that people with defined benefit pensions and those who own their homes need a higher replacement rate, each of the 12 categories was weighted by the share of individuals with defined benefit coverage and home ownership rates. Table 6 summarizes the target replacement rates for the 12 categories.³⁵

TABLE 6. TARGET REPLACEMENT RATES BY INCOME GROUP AND HOUSEHOLD TYPE

Household type	All	Income group		
		Bottom third	Middle third	Top third
All	73%	81%	72%	67%
Couples	73	81	72	67
One earner	76	85	75	68
Two earner	72	77	71	67
Singles	72	81	71	65
Men	70	76	70	65
Women	73	82	71	65

Source: Authors' calculations.

THE NATIONAL RETIREMENT RISK INDEX



With measures of adequacy established by the life-cycle analysis, the final step is to compare each household's projected replacement rate with the appropriate target. Those whose projected replacement rates fall more than 10 percent below the target are deemed to be at risk of having insufficient income to maintain their pre-retirement standard of living. For example, a household with a 70-percent target rate would be classified as “at risk” if its projected replacement rate fell below 63 percent of its pre-retirement income. The Index is simply the percentage of *all* working-age households that fall more than 10 percent short of the target. The 10 percent threshold was chosen as a conservative standard by which to assess retirement readiness. So, for example, if a household is projected to miss the target by only 5 percent, it is not considered at risk. The results for a more or less stringent standard than 10 percent are presented in the final section of this report.

The percentage of households at risk for the three birth cohorts and various household types is presented in Table 7.

The most important result is that a large percentage of households — 43 percent — are at risk of having inadequate retirement income.³⁶ And these results are based on the optimistic assumptions that people work to age 65 and annuitize all their financial wealth, including the receipts from a reverse mortgage on their home. For the Early Boomers, 35 percent of all households are at risk. That is, 35 percent of households in this age group are likely to have retirement income that falls more than 10 percent below the target needed to maintain their pre-retirement living standard. And an increasing proportion of households are at risk over time for the reasons enumerated in the introduction. Specifically, the percentage of households at risk rises to 44 percent for the Late Boomers and to 49 percent for members of Generation X.

TABLE 7. PERCENT OF HOUSEHOLDS “AT RISK” AT AGE 65 BY BIRTH COHORT AND HOUSEHOLD TYPE

Household type	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	35%	44%	49%
Couples	36	43	49
One earner	22	25	22
Two earner	38	45	53
Singles	35	47	48
Men	30	46	41
Women	37	47	52

Source: Authors' calculations.

The pattern by household type is also predictable. One-earner couples, with their more generous Social Security benefits, are less likely than two-earner couples to be at risk. Single women are more likely to be at risk than single men because a greater proportion of single women are in the bottom third of the income distribution, where the probability of being “at risk” is the highest.

Table 8 presents “at risk” results by birth cohort and income group. As anticipated, the households who are most at risk are those in the bottom third of the income distribution. As noted previously, these households rely almost exclusively on Social Security benefits that are scheduled to decline sharply relative to pre-retirement income. Interestingly, a large share of households in the middle and top thirds of the income distribution are also at risk. It is important to note that the practical meaning of “at risk” differs by a household’s level of income. For example, at risk households in the lowest income group may have trouble affording life’s basic necessities. In contrast, at risk households in the highest income group are not in danger of falling into poverty. However, they do face the prospect of a difficult adjustment that may require them to lower their expectations of their retirement lifestyle. And the median income for this group is \$100,000, which means that many of these households are not particularly rich.

TABLE 8. PERCENT OF HOUSEHOLDS “AT RISK” AT AGE 65 BY BIRTH COHORT AND INCOME GROUP

Income group	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	35%	44%	49%
Top third	33	35	42
Middle third	28	44	46
Bottom third	45	54	60

Source: Authors’ calculations.

Table 9 shows the “at risk” results by birth cohort and pension coverage. Having a pension of any sort is the key to a secure retirement. But even those with a pension are increasingly at risk as defined contribution plans replace defined benefit plans.

TABLE 9. PERCENT OF HOUSEHOLDS “AT RISK” AT AGE 65 BY BIRTH COHORT AND PENSION COVERAGE

Pension coverage	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	35%	44%	49%
Pension	28	37	40
DB plan	15	20	30
DC plan	49	52	48
Both	12	21	25
No pension	50	60	65

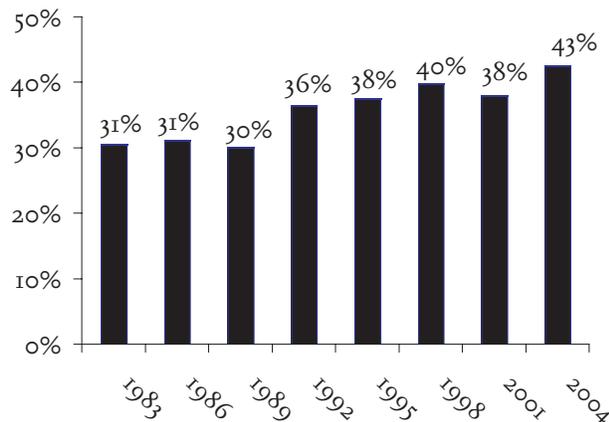
Source: Authors’ calculations.

Finally, Figure 5 presents movements in the Index over the 1983 to 2004 period. This exercise involves taking the population in, say, the 1983 *Survey of Consumer Finances* and estimating projected wealth-to-income ratios based on the equation that combines all eight SCFs. These ratios are then converted into income streams using 1983 cohort life tables.³⁷ Next, the results are combined with estimates of defined benefit pension plan replacement rates, based on information in the 1983 *Survey of Consumer Finances*. Finally, estimates of Social Security replacement rates are based on 1983 Social Security law and earnings histories.

SENSITIVITY ANALYSES

The clear message is that retirement risk has generally risen steadily over time.³⁸ The most important reasons for this trend relate to changes in Social Security replacement rates. First, the percentage of two-earner couples has risen significantly. Two-earner couples tend to have lower replacement rates than one-earner couples as the second earner adds to the household's pre-retirement income but often does not increase the size of the Social Security benefit. Second, the gradual increase in Social Security's Normal Retirement Age began to affect expected benefits during this period. Other factors, such as increasing life expectancy and lower interest rates, have also contributed to the rise in retirement risk over the past two decades.

FIGURE 5. THE NATIONAL RETIREMENT RISK INDEX, 1983-2004



Source: Authors' calculations.

The National Retirement Risk Index is based on a number of assumptions. Changes in these assumptions can affect the Index scores for better or for worse. For example, while the base case shows that a large share of households is at risk, the situation is not hopeless. Households have control over key decisions, such as their retirement age and saving rates, that could substantially improve their retirement security. On the other hand, the outlook could also be worse than depicted in the base case, particularly if people fail to respond to the changing retirement landscape. This section presents four different sensitivity analyses, which show the impact of the following factors on Index results: the retirement age, the saving rate, the threshold measure used for defining "at risk", and a "less favorable" scenario in which several assumptions are varied together.

Retirement Age

The retirement age determines the actuarial reduction or increase in Social Security benefits, the extent to which savings are augmented or drawn down, and the length of the period over which the household has to support itself on accumulated retirement resources.

The baseline assumption for the Index is that single individuals and the older member of a couple claim benefits at 65. The younger spouse is assumed to claim at the same time as the older spouse, but no earlier than 62. Table 10 shows the impact of moving the retirement age for singles and for the older member of the couple to 63, the typical retirement age for men today, or to 67, Social Security's ultimate "Normal Retirement Age." The effect is dramatic. For example, retiring at 67 instead of 65 reduces the households at risk by 11 percentage points. On the other hand, retiring at age 63 increases those at risk by 10 percentage points.

TABLE 10. PERCENT OF HOUSEHOLDS “AT RISK” BY ASSUMED RETIREMENT AGE

Household type	Retirement age		
	63	65	67
All	53%	43%	32%
Couples	51	43	32
One earner	34	23	11
Two earner	53	45	34
Singles	56	42	32
Men	50	39	30
Women	59	44	32

Source: Authors' calculations.

Saving Rates

Households that save consistently in 401(k) plans could accumulate substantial assets by retirement, yet household heads approaching retirement in 2004 held an average of only \$60,000 in their 401(k)/IRA accounts. The failure of 401(k) plans to live up to their potential to date is a result of mistakes that households make at many stages. Households fail to participate, fail to save enough, invest too conservatively, or concentrate excessively on employer stock, and fail to roll over their plan balances on job change.³⁹ For this reason, the National Retirement Risk Index focuses on accumulations based on the wealth-to-income ratios, rather than on what households could potentially achieve if they got every stage of the process right.

A number of reforms have been introduced to make 401(k) plans more automatic and easier. Automatic enrollment, automatic escalation of the contribution rate, and life cycle funds should all improve participation, contribution, and investment decisions. On the other hand, it is also possible that households will feel more squeezed in the future due to rising costs on items such as higher education and health care and, therefore, will actually save even less than they do today. Therefore it is useful to investigate the impact of both higher and lower levels of saving.

Table 11 shows the impact on households of saving 3 percent more or less than assumed in the base case for the three birth cohorts. The ability of additional saving to reduce the percentage of households at risk increases with the period over which households engage in the higher saving. That is, additional saving reduces households at risk by only 3 percentage points for Early Boomers but by 11 percentage points for Generation Xers.

TABLE 11. PERCENT OF HOUSEHOLDS “AT RISK” AT AGE 65 BY ASSUMED SAVING RATE

Household type	401(k)/IRA accumulations		
	Lower saving rate (-3 percent)	Base case	Higher saving rate (+3 percent)
All	47%	43%	36%
Early Boomers	37	35	32
Late Boomers	50	44	38
Generation Xers	57	49	38

Source: Authors' calculations.

Different Standards for Defining "At Risk" Households

The base case scenario for determining whether a household is at risk is whether its projected replacement rate falls more than 10 percent below the target rate needed to maintain its pre-retirement standard of living. The Index results are clearly sensitive to this definition (see Table 12). For example, if the Index used a higher standard by eliminating the 10 percent threshold and requiring all households to meet the target, the share of households at risk would rise by 10 percentage points. Conversely, if the threshold were relaxed from 10 percent below the target to 20 percent below the target, the share of households at risk would drop by 12 percentage points.

A Less Favorable Scenario

The Index's base case scenario assumes that households retire at 65, annuitize their financial assets, and tap their housing wealth through a reverse mortgage. The notion is that these assumptions would allow households to take full advantage of their potential retirement resources. In practice, most households retire before 65, do not annuitize, and do not access their housing wealth. If, instead, households retired at age 63, did not annuitize and did not take out a reverse mortgage, the share at risk would soar from 43 percent under the Index base case to 66 percent (see Table 13).

TABLE 12. PERCENT OF HOUSEHOLDS "AT RISK" AT AGE 65 BY DEFINITIONS OF "AT RISK"

Household type	Definition of "at risk"		
	Higher standard (on target)	Base case (up to 10 percent below target)	Low standard (up to 20 percent below target)
All	53%	43%	31%
Couples	53	43	30
One earner	34	23	11
Two earner	56	45	33
Singles	54	42	32
Men	49	39	31
Women	57	44	34

Source: Authors' calculations.

TABLE 13. PERCENT OF HOUSEHOLDS "AT RISK" UNDER A LESS FAVORABLE SCENARIO*

Household type	All	Early Boomers 1946-1954	Late Boomers 1955-1964	Generation Xers 1965-1972
All	66%	57%	69%	71%
Couples	64	56	66	70
One earner	44	46	42	45
Two earner	66	57	68	73
Singles	69	59	77	73
Men	65	56	73	66
Women	72	60	79	79

*Note: This scenario assumes that — unlike the base case — households retire at 63, do not annuitize their financial assets, and do not take out a reverse mortgage.

Source: Authors' calculations.

CONCLUSION

Ensuring retirement security for an aging population is one of the most compelling challenges facing the nation. Currently, many retirees are doing quite well, but the retirement landscape is changing rapidly — making the outlook for retiring baby boomers and Generation Xers far less sanguine.

Unfortunately, the majority of today's workers do not understand the nature of the problem that they are likely to confront in retirement.

The National Retirement Risk Index is an attempt to quantify the changing retirement landscape. The Index is based on a nationally representative sample of the U.S. population as of 2004 and covers all major sources of retirement income. It measures the percent of households at risk of having retirement income that falls more than 10 percent short of a benchmark measure that would enable them to maintain their pre-retirement level of consumption. By this standard, 43 percent of all households are at risk.

The Index analysis shows that even among the Early Boomers, 35 percent of households are at risk of being unable to maintain their standard of living in retirement. The Early Boomers are the cohort best prepared for retirement, because many have acquired benefits under traditional defined benefit plans and they are not fully exposed to the increase in Social Security's Normal Retirement Age. As defined benefit plans fade in an environment where total pension coverage remains stagnant, Social

Security's Normal Retirement Age moves to 67, and life expectancy increases, the share of households at risk increases to 44 percent for the Late Boomers and 49 percent for members of Generation X. These numbers are a conservative estimate in that they are calculated for people retiring at age 65. In fact, most people retire earlier, which means they receive actuarially reduced Social Security benefits, their 401(k) plan and other savings have less time to grow, and they have to support themselves over a greater number of years. And these estimates assume that households annuitize all their financial wealth, including the proceeds from a reverse mortgage on their home.

The situation is not hopeless, however. Sensitivity analyses of the Index results show that changing retirement and savings behavior can have a major impact. For example, if people were to retire at age 67, the percent of households at risk would decline by 11 percentage points. Similarly, if people could save 3 percent beginning at an early age, the percent at risk ultimately would decline by 11 percentage points. The purpose of the National Retirement Risk Index is to provide today's workers with the information that they need to change their behavior so that they and their families can enjoy a secure retirement.

ENDNOTES

1 The average retirement age — defined as the age at which more than half of workers are not participating in the labor force — has remained steady at about 63 for men for the past twenty years. However, in recent years, labor force participation rates for men aged 55 and over have been increasing somewhat. To date, this increase has not translated into an increase in the average retirement age.

2 The Normal Retirement Age (NRA) is the age at which individuals are eligible to receive their full Social Security benefit. The increase in the NRA is a form of benefit cut — either individuals wait longer to claim their full benefit and receive it for fewer years or they claim before age 67 and receive a reduced benefit.

3 This amount includes Individual Retirement Account (IRA) balances, because most of the money in IRAs is rolled over from 401(k) plans.

4 For this study, working-age households are those between ages 32 and 58 in 2004. This group covers the entire Baby Boom generation and the older members of Generation X.

5 For a detailed description of the *Survey of Consumer Finances*, see Bucks, Kennickell, and Moore (2006). For selected demographic characteristics of the 2004 SCF households used in this report, see Appendix A.

6 In the case of couples, the assumption for calculating Social Security benefits is that the older spouse retires at age 65 and the younger spouse retires at the same time — with a minimum age of 62. For other components of retirement income, the retirement age is determined when the household head turns 65 — regardless of the age of the spouse.

7 In the actual calculations, wealth-to-income ratios are projected only to age 62, because income declines by large and unpredictable amounts between age 62 and 65. To arrive at a dollar amount for age 65, it is assumed that the resultant balances increase from age 62 to 65 by a percentage that reflects long-run average asset returns.

8 401(k) and IRA wealth are combined for individuals with a 401(k) plan. For someone without a 401(k), IRA assets are included with "other financial assets."

9 Initially, it was thought that the wealth-to-income ratios may have been affected by abnormal asset returns. For example, annual stock market returns between 1982 and 2000 averaged 13 percent (after inflation) compared to 7 percent over the period 1926-2004. So measures of abnormal stock and bond returns were also included in the equation. Since the life cycle model predicts that people should gradually consume any abnormal returns, the equation included weighted averages of past abnormal stock and bond returns. The impact of abnormal returns should also be the greatest for those with the most invested, so the measures of abnormal returns were interacted with the amounts invested, normalized by wealth, and controls were included for the amounts invested in these asset classes. Inclusion of these variables, however, had virtually no impact on the projected wealth-to-income ratios, so they were not included in the final equation. Similarly, Gale and Pence (2006) found that the financial market boom of the 1990s had no significant impact on the real wealth of households younger than age 55.

10 Age is entered as a spline where the indicator variable takes the value zero if the household is less than each of ten specified ages from 33 to 60, three if the household is three or more years older than that age, and the household's age minus the specified age otherwise. The predicted value for the wealth-to-income ratio at a particular age is obtained by multiplying the

age spline coefficients by the values of the indicator variables. For example, if a household is aged 37, the value of the age 33-35 indicator variable is three, that of the age 36-38 indicator variable is two, and those of all subsequent indicator variables, zero. So the coefficient on c_1 is multiplied by three, that on c_2 by two, and those on all $c_3 \rightarrow k$ by zero.

11 As noted earlier, wealth-to income ratios are projected only to age 62, because income declines by large and unpredictable amounts between age 62 and 65.

12 The methodology described here projects 401(k) balances at retirement assuming accumulation paths observed from an analysis of SCF surveys between 1983 and 2004, allowing for cohort-specific effects. There is an unresolved debate as to whether these accumulation paths will look significantly different in the future due to additional savings in 401(k) accounts that are not offset by reduced accumulations in other asset classes (see Poterba et al., 1998; and Engen et al., 1996).

13 Evidence from the *Health and Retirement Study* supports the hypothesis that within each income tercile, the percentage increase in wealth should not depend on initial wealth. One exercise involved sorting households in each income tercile into three terciles defined by initial wealth in 1992 and calculating the median percentage increase in wealth for each initial wealth tercile over the period 1992-2002. The results revealed that the percentage increases in wealth were roughly the same for each wealth tercile. The second exercise involved estimating econometric models for households in each income tercile with the percentage increase in wealth as the dependent variable and initial wealth as the explanatory variable. The results were consistent with the hypothesis that initial wealth within each income tercile has no effect on percentage wealth accumulation.

14 The Social Security Trustees' intermediate mortality decline assumptions are used to estimate market annuity rates for birth cohorts that are older or younger than those retiring today. For the cohort that is entering retirement today, the calculations

simply use current market rates for inflation-indexed annuities. At current rates, single men and women would receive annuity rates at 65 of 5.90 percent and 5.33 percent respectively, and married couples 5.27 percent. The differences are due to expected mortality — the highest rates are for those with the shortest expected durations.

15 For an extensive analysis of homeownership behavior at older ages, see Venti and Wise (2001).

16 This calculation depends on the interest rate used to compute the present value and on the assumed rate of appreciation of the house. Higher interest rates mean a lower value for reversionary interest. A higher rate of appreciation would mean a higher value for reversionary interest.

17 Again the assumption is that the household purchases an inflation-indexed annuity.

18 Projecting mortgage debt as the difference between net and gross housing wealth was easier than projecting mortgage debt directly. Modeling mortgage debt requires a more complicated specification that includes both the probability of having a mortgage and the amount outstanding. Mortgage debt tends to rise initially as households age and then decline, making it hard to fit a curve.

19 SCF households with current or past membership in defined benefit plans report the amounts they expect to receive, expressed either as a dollar amount, or as a percentage of salary. Analysis of these data shows benefits declining relative to pre-retirement income.

20 The adjustment for declining generosity has little overall impact on the aggregate replacement rate for a given cohort because a relatively small number have imputed pensions, and the assumed rate of decline in generosity is quite modest.

21 Previous research suggests that married couples often coordinate their retirement decisions (Johnson, 2004).

22 U.S. Social Security Administration (2006).

23 Social Security benefit cuts or tax increases will also reduce the target replacement rates used in determining the Index results because they will reduce a household's expected lifetime consumption. To the extent that households fail to adjust to these changes by reducing consumption during their working years, the percent of households unable to maintain their pre-retirement standard of living in retirement will increase.

24 One could argue that the employer's contribution to 401(k) plans and defined benefit wealth accruals should be included in income, but data are not available to make that calculation. Our targets include defined benefit income in retirement, and the effect of excluding defined benefit wealth accruals is to increase both target and realized replacement rates without affecting the percentage of households at risk. Our targets exclude both the employer's contribution to 401(k) plans, and the resultant income in retirement, the effect being to slightly understate the appropriate target and therefore the percentage of households at risk.

25 Since pre-retirement income includes earnings on 401(k) plans but not earnings on defined benefit plans, the replacement rates for households with 401(k)s are somewhat lower than the rates for comparable households with defined benefit coverage. However, this discrepancy does not produce any bias in the Index results, because households with defined benefit coverage are assigned a higher replacement rate target.

26 *The Health and Retirement Study* (HRS) is conducted by the Institute for Social Research at the University of Michigan. The HRS is a nationally-representative data set of about 12,650 individuals from about 7,600 households. This study began in 1992 by interviewing people ages 51-61 and their spouses (regardless of age). The survey has been re-administered every two years. For a detailed overview of the survey, see Juster and Suzman (1995).

27 The Index methodology measures how well prepared typical workers are for retirement, which assumes a typical age-earnings profile. It is important to note that there is actually enormous diversity in real-life earnings patterns, but trying to capture this diversity is outside the scope of this exercise. For further details, see Bosworth, Burtless, and Steuerle (1999).

28 Pre-retirement assets are estimated using projected wealth at age 62.

29 One-earner households, as defined here, are those households in which the non-working spouse has less than 40 quarters of covered earnings for Social Security purposes.

30 For example, Social Security's Normal Retirement Age (NRA) is scheduled to rise to 67. For all Early Boomers, the NRA is 66. For the Late Boomers, the NRA increases by two months per year starting for those born in 1955 until it reaches age 67 for those born in 1960. For all Generation Xers, the NRA is 67.

31 Since some of the decline reported in the SCF for those with defined benefit plans may simply reflect the tendency to respond in terms of today's wages, the benefit amounts for Generation Xers were assumed to increase with the growth in wages over their work-lives.

32 The percent of Social Security benefits subject to personal income taxation is as follows. Subject to phase out rules, individuals with "combined income" between \$25,000 and \$34,000 include 50 percent of benefits; over \$34,000 they include 85 percent. Couples with "combined income" between \$32,000 and \$44,000 include 50 percent of benefits; over \$44,000 they include 85 percent. Combined income is adjusted gross income as reported on tax forms plus nontaxable interest income plus one half of Social Security benefits.

33 Palmer (2004).

34 See Appendix B for further details on the method used to compute the targets.

35 Target replacement rates will vary somewhat by cohort for two reasons. First, younger birth cohorts have longer life expectancy, and they therefore have to sacrifice a greater number of dollars of pre-retirement consumption to maintain their consumption post-retirement. Second, younger cohorts will also receive lower Social Security replacement rates and have to save more on their own to achieve their optimal level of post-retirement consumption. Thus, they gain more from the need to no longer save, thereby reducing their target replacement rate.

36 In a recent study, Scholz, et al (2004) examined whether households were accumulating wealth optimally. Although their assumptions differ from those underlying the Index across a number of dimensions, they nonetheless reach similar conclusions. When they assume that one half of the house is available to finance post retirement consumption, a similar percentage to that currently obtainable through a reverse mortgage, they find that 57.9 percent of a somewhat older sample born between 1931 and 1941 had accumulated at least an optimal amount of wealth.

37 For people in a given birth year, these life tables will differ from 2004 cohort life tables only to the extent that Social Security Administration actuaries have revised their estimate of the mortality rate of people in that birth cohort.

38 The small decline in the Index between 1998 and 2001 may appear counter-intuitive given the onset of the bear market in 2000. However, movements in the stock market had relatively little effect on the trend in the Index during this period due to the timing of data collection for the SCF. Specifically, the 1998 SCF data were collected well before the March 2000 market peak, and the 2001 data well after the peak. In fact, the

S&P 500 index was at almost precisely the same level when the 1998, 2001, and 2004 surveys were conducted.

39 For more details on 401(k) missteps, see Munnell and Sundén (2006).

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APPENDIX A

SELECTED CHARACTERISTICS OF SCF HOUSEHOLDS USED IN NRRI SAMPLE

TABLE A1. DISTRIBUTION OF HOUSEHOLD TYPE WITHIN
INCOME TERCILE FOR HOUSEHOLDS AGED 32-58, 2004

Household type	Bottom tercile	Middle tercile	Top tercile
All	100.0%	100.0%	100.0%
Couples	34.5	68.1	91.2
One earner	11.6	8.5	12.8
Two earner	22.9	59.5	78.4
Singles	65.5	31.9	8.8
Men	18.4	14.2	5.3
Women	47.1	17.7	3.5

Source: Authors' calculations based on 2004 *Survey of Consumer Finances*.

TABLE A2. EARNINGS, INCOME, AND TOTAL WEALTH OF
HOUSEHOLDS AGED 32-58, 2004

Measure	Bottom tercile	Middle tercile	Top tercile
Median earnings	\$18,000	\$51,000	\$100,000
Mean earnings	18,230	51,019	106,611
Median income	25,000	56,000	117,000
Mean income	24,492	57,977	152,115
Median wealth	18,200	110,300	379,200
Mean wealth	65,467	215,666	894,787

Source: Authors' calculations based on 2004 *Survey of Consumer Finances*.

APPENDIX B

METHODOLOGY FOR COMPUTING REPLACEMENT RATE TARGETS

Target replacement rates are defined as the replacement rates that households need in retirement in order to maintain the same standard of living as that enjoyed during the households' working years.

CRR researchers calculate these targets using a simplified life-cycle model in which households smooth their wage-indexed level consumption across their lifetime. This means that households' real consumption rises across their working life to keep up with the general increases in living standards of society, measured by real wage growth. This is done to make the targets consistent with the observed replacement rates from the SCF — which use a wage-indexed measure in the denominator. The model takes into account earnings from employment, returns on investments, taxes, and the purchase of a house with the aid of a mortgage, Social Security and defined benefit pension income; and it allows households to save and borrow throughout their lives. The current structure of federal, state, and Social Security taxes is used.

During their worklives, households earn income from employment. The age profile of these earnings is obtained from an analysis of administrative data for individuals in the *Health and Retirement Study* born between 1931 and 1941. Households also receive investment income and imputed rent. Households pay taxes and mortgage interest and make mortgage repayments. They allocate the residual between savings and consumption.

Consider a two-earner household in the middle of the earnings distribution. During their worklives, their average earnings are about \$61,505, out of which they will consume \$45,491, or about 74 percent of their combined earnings (see Table B-1).

TABLE B-1. AVERAGE PRE-RETIREMENT EARNINGS AND CONSUMPTION, INDEXED TO WAGE GROWTH

INCOME	
Earnings	61,505
Imputed rent	2,594
Mortgage interest	-2,056
Investment income minus loan interest	-898
Total pre-retirement income (denominator)	61,146
OUTLAYS	
Federal tax	4,830
EITC	0
State tax	2,799
Social Security	4,705
House purchase	2,528
Savings	793
Total pre-retirement outlays	15,655
Consumption	45,491

Source: Authors' calculations.

Once households reach retirement, they will receive income from Social Security, housing (in the form of imputed rent plus an annuity purchased with the reversionary interest), employer pensions, and the annuitized value of saving minus borrowing. Table B-2 shows the retirement income necessary to maintain the same level of pre-retirement consumption (about \$45,491). This is less than the pre-retirement income because the household pays lower taxes and no longer needs to save for retirement.

The target replacement rate is calculated as the percentage of pre-retirement income needed in retirement to maintain a constant level of consumption. Continuing with the two-earner stylized household, the numerator will be the retirement income before taxes (\$46,246); the denominator will be pre-retirement income (\$61,146 from Table B-1). For the two-earner couple in the middle third of the earnings distribution that owns a home and has a defined benefit pension, this calculation results in a target replacement rate of 76 percent.

TABLE B-2. RETIREMENT INCOME AND CONSUMPTION

INCOME	
Social Security	24,517
House-imputed rent	2,876
House-reversionary interest	3,304
Annuity (savings-borrowing)	3,406
DB pension	12,143
Total retirement income (numerator)	46,246
OUTLAYS	
Taxes	755
Total retirement outlays	755
Consumption in retirement	45,491
Retirement income	46,246
Pre-retirement income	61,146
Replacement rate	75.6%

Source: Authors' calculations.

These calculations are done for singles, one-earner couples, and two-earner couples; by earnings levels (estimated from the SCF); by defined benefit pension coverage; and by homeownership. Table B-3 presents the target replacement rates, weighted by home ownership rates and defined benefit coverage numbers from the 2004 SCF.

TABLE B-3. TARGET REPLACEMENT RATES BY INCOME GROUP AND HOUSEHOLD TYPE

Household type	Income			
	All	Low	Medium	High
All	73%	81%	72%	67%
Couples	73	81	72	67
One earner	76	85	75	68
Two earner	72	77	71	67
Singles	72	81	71	65
Men	70	76	70	65
Women	73	82	71	65

Source: Authors' calculations.

APPENDIX C

OTHER MEASURES OF RETIREMENT PREPAREDNESS

The Nationwide Retirement Risk Index has a number of unique features that set it apart from other calculations of retirement readiness. First, it is based on household level data from the Federal Reserve Board's nationally representative *Survey of Consumer Finances*. Second, it is comprehensive, including all sources of retirement income. Third, the use of historical data facilitates the identification of longer term trends. Fourth, it uses a rigorous methodology developed by the Center for Retirement Research at Boston College, with input from an advisory board of academic experts.

Many financial institutions and research organizations have also published measures of financial preparedness for retirement. Some are based on nationally representative data, while others make use of client

data that are unrepresentative of the whole population. Some are one-time surveys, while others are compiled on an ongoing basis. In some cases, the surveys report objective measures of financial preparedness, but in others, they report households' attitudes, beliefs, and subjective assessments of preparedness.

Table C1 lists the principal surveys of which the Center for Retirement Research is aware, classified according to whether they make use of nationally representative data and whether they are compiled on an ongoing basis.

The following is a brief description of the methodology and content of each of the below surveys:

TABLE C1. ALTERNATIVE MEASURES OF FINANCIAL PREPAREDNESS FOR RETIREMENT

	Nationally representative	Not nationally representative
Single survey	<p><i>International Retirement Security Survey</i> (AARP)</p> <p><i>Nest Egg</i> (A.G. Edwards)</p> <p><i>Retirement Readiness Index</i> (Americans for a Secure Retirement)</p>	<p><i>Across Generations Retirement Income Survey</i> (New York Life)</p>
Periodic surveys	<p><i>EBRI-ERF Retirement Security Projection Model</i> (Employee Benefit Research Institute)</p> <p><i>Modeling Income in the Near Term</i> (MINT) (Urban Institute)</p> <p><i>Pension Microsimulation Model</i> (PENSIM) (U.S. Department of Labor)</p> <p><i>Retirement Confidence Survey</i> (Employee Benefit Research Institute)</p>	<p><i>Fidelity Retirement Index</i> (Fidelity)</p> <p><i>Retirement Preparedness Survey</i> (Merrill Lynch)</p> <p><i>Total Retirement Income at Large Companies: The Real Deal</i> (Hewitt Associates)</p>

Single Surveys Using Nationally Representative Data

International Retirement Security Survey (AARP)

This is a one-time study using nationally representative samples from the United States, the other G7 countries, and Australia. The focus is on individuals' plans and expectations, with some data on their confidence in retirement systems and attitudes to retirement policy issues. The survey contains little financial data and is not designed to forecast financial preparedness for retirement.

Nest Egg Index (A.G. Edwards)

This one-time nationally representative survey investigates how twelve factors that could be correlated with financial preparedness for retirement (for example, 401(k) participation rates) vary across states and metropolitan statistical areas. An index is then constructed based on a weighted average of these factors to measure the relative levels of preparedness of the above areas. The index does not directly measure financial preparedness for retirement.

Retirement Readiness Index (Americans for a Secure Retirement)

This index has not yet been published and little information is available. CRR researchers understand from discussions with Americans for a Secure Retirement that the index will be based on information regarding financial assets and that its likely focus will be on describing differences between cities and regions.

Single Surveys Not Using Nationally Representative Data

Across Generations Retirement Income Survey (New York Life)

This is a one-time survey of people aged 50 to 90 with a net worth of over \$100,000. It focuses on households' retirement income needs, financial goals, and use of financial advisers. It contains some data on current wealth, but does not cover Social Security or defined benefit pensions, important sources of retirement security for all but the most wealthy.

Periodic Surveys Using Nationally Representative Data

EBRI-ERF Retirement Security Projection Model (Employee Benefit Research Institute)

This model calculates the additional amounts that households must save in order to reduce to specified percentages the probability that the household will be unable to afford basic expenditures during retirement. EBRI-ERF conducts Monte-Carlo simulations assuming deterministic asset returns but a stochastic component to health care costs. Non-pension financial wealth is not included in the model. In the baseline scenario, housing wealth is disregarded. In their alternative scenario, housing wealth is annuitized at retirement.

Modeling Income in the Near Term (MINT) (Urban Institute)

This model projects the distribution of income in retirement for the 1931 to 1960 birth cohorts. MINT uses Social Security Administration data matched to the Survey on Income and Program Participation to project the demographic status, such as death and marital status, and retirement incomes, including

income from Social Security, private pensions, assets, and earnings. MINT can be used both to construct a baseline using alternative economic and demographic assumptions and to analyze the distributional consequences of a variety of Social Security policy changes.

Pension Microsimulation Model (PENSIM) (U.S. Department of Labor)

This model simulates life histories (including marriage, divorce, employment, earnings, disability, retirement, and death) for individuals born in 1935 or later. These life histories are used to calculate Social Security and employer pension benefits. It does not consider non-pension financial assets or housing wealth.

Retirement Confidence Survey (Employee Benefit Research Institute)

This is an annual nationally representative survey, now in its 16th year. It provides a comprehensive view of the attitudes and behaviors of American workers towards saving, retirement planning, and financial security. It is not designed to provide quantitative measure of retirement preparedness.

Periodic Surveys Not Using Nationally Representative Data

Fidelity Retirement Index (Fidelity)

This is an ongoing survey of households working full time and earning more than \$20,000 a year. The index shows the average replacement rate that participants in the survey will achieve, inclusive of Social Security and defined benefit pensions, based on current financial wealth and pension contribution rates, and simulated asset returns. This index excludes housing wealth and forecasts the replacement rates of those aged less than 55 by choosing the average of a large number of simulated outcomes.

Retirement Preparedness Survey (Merrill Lynch)

This is an annual nationally representative survey of households' beliefs and attitudes as they relate to retirement planning. It contains only limited financial data and does not include objective measures of retirement preparedness.

Total Retirement Income at Large Companies: The Real Deal (Hewitt Associates)

This is an annual analysis of wage and pension data collected from clients of Hewitt Associates. The data are not nationally representative and include only employees of major corporate clients of Hewitt. The data are used to project replacement rates. As the replacement rates are constructed from wage and pension records, they exclude the potential contributions from the house, the spouse's income, pensions from previous employments, and from financial assets other than those in the current pension plan.

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Alicia H. Munnell is the Director of the Center for Retirement Research at Boston College and the Peter F. Drucker Professor of Management Sciences at Boston College's Carroll School of Management. Previously, Prof. Munnell was a Member of the President's Council of Economic Advisers (1995-1997) and Assistant Secretary of the Treasury for Economic Policy (1993-1995). She spent most of her professional career at the Federal Reserve Bank of Boston, where she became Senior Vice President and Director of Research in 1984.

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BIOS OF THE NRRI ADVISORY BOARD

The Center for Retirement Research at Boston College established an advisory board of outside experts to provide guidance during the construction of the National Retirement Risk Index (see biographical sketches of the board members below). The Center gratefully acknowledges the efforts of the Board, which has offered extremely valuable suggestions and advice throughout the project. Of course, the findings and conclusions expressed in this report are solely those of the Center for Retirement Research at Boston College and do not necessarily reflect the views of the Advisory Board members.

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