Retirement vulnerability of new retirees:

The likelihood of outliving their assets

by Ernst & Young LLP
for Americans for Secure Retirement

July 2008

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Executive summary

Many of the 77 million baby boomers retiring over the next few years will face unprecedented challenges in maintaining their standard of living in retirement. Middle-income Americans are most at risk as longer life spans, the decline of guaranteed sources of retirement income and the fact that nearly half of older Americans lack employer-based retirement plans contribute to increased retirement risks.

Given the difficult environment facing future American retirees, Americans for Secure Retirement asked Ernst & Young LLP to analyze the likelihood that middle-income Americans would outlive their financial assets in retirement. Many studies have focused on the inadequacy of American families' savings. Other studies have documented other risks that could result in households outliving their assets: longevity, volatile investment returns and high inflation. This report is the first to combine all of these factors to determine the likelihood of middle-income Americans – including those who are near retirement and those who have recently retired – outliving their financial assets.

The analysis finds that almost three out of five middle-class new retirees can expect to outlive their financial assets if they attempt to maintain their current pre-retirement standard of living. To avoid outliving their financial assets, middle-class retirees will have to reduce their standard of living, on average, by 24 percent.

Key findings of the analysis include:

- **Guaranteed income is projected to cover a decreasing share of retirement income, leaving households with increased responsibility for their retirement and at increasing risk of retirement vulnerability.** Social Security is the main source of guaranteed retirement income of individuals aged 65 and older (40 percent of retirement income), followed by pensions and annuities (20 percent).[1] Non-guaranteed sources of income include wages and salaries (25 percent) and income from assets (14 percent).
- **Americans' increased reliance on defined contribution pension plans and personal savings and the trend away from defined benefit pension plans and other guaranteed sources of retirement income raises serious sustainability challenges.** The study finds that those with guaranteed retirement income beyond Social Security, such as defined benefit plans and annuities, are much better prepared in retirement than those without. While married couples with guaranteed retirement income beyond Social Security making $75,000 at retirement have a 31 percent chance of outliving their assets if they retain their pre-retirement standard of living, those with Social Security as their only guaranteed income have a 90 percent chance of outliving their assets during retirement.
- **Many Americans will have to reduce their standard of living significantly due to fluctuating investment returns and the probability of spending more years in retirement.** Many Americans envision a leisurely lifestyle in retirement, but the lifestyle reductions that will be necessary to make savings last will likely hinder that expectation. Middle-income Americans entering retirement without a guaranteed source of income beyond Social Security will, on average, have to reduce their standard of living by 32 percent to minimize the likelihood of outliving their assets. This reduction will be necessary even when assuming that retirees can maintain the same standard of living with income equal to 59 to 71 percent of their pre-retirement wages.
- **The next wave of retirees (5-10 years from now) will have a higher risk of outliving their financial assets than those currently at retirement age.** Unless workers aged 55 to 59 increase their saving substantially or work beyond age 65, they will be unable to maintain their current standard of living and will have to reduce their standard of living significantly more than today's retirees to minimize the risk of exhausting their financial assets.

Tax laws provide powerful incentives for retirement savings through employer-provided defined benefit plans, traditional and Roth Individual Retirement Accounts, 401(k) defined contribution plans, and Keogh retirement plans. These retirement savings vehicles address one side of the risk equation that affects Americans' ability to maintain their standard of living during retirement.

Yet savings is just one aspect affecting retirement readiness. A less recognized but equally critical retirement vulnerability is the risk of outliving one's financial assets due to people living longer in retirement and market fluctuations affecting retirement asset values. Social Security is an important source of guaranteed lifetime income, but it provides, on average, just 40 percent of retirement income. With the decline of employer-provided defined benefit pension coverage, however, many near and new retirees will not have another source of guaranteed lifetime income unless they purchase a lifetime guarantee using their private savings.

As this study shows, households approaching retirement face many uncertainties that increase the risk of outliving their assets. The very real possibility of living to age 90 or 100 combined with the volatility of inflation and investment returns means that the risk of outliving one's assets is quite high. Without additional guaranteed lifetime income streams, such as income provided by an annuity, middle-income Americans are at high risk of outliving their financial assets and living their final years in poverty. A greater focus on increasing retirement savings and vehicles that provide a guaranteed lifetime income stream will play a significant role in reducing the retirement vulnerability of retirees in the future.

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I. Introduction

Many of the nation's 77 million baby boomers will face two unprecedented challenges when they reach retirement: the increased risk of not being able to keep the same standards of living as during their working life and outliving their financial wealth. Longevity risks, the weakening of guaranteed sources of retirement income, and the fact that nearly half of older Americans lack employer-based retirement plans are major contributors to these increased retirement risks.

Retirement security risks are greater for middle-income working households, which are more likely to have high standards of living compared to the availability of financial resources required to maintain such standards. Given the challenging environment facing future American retirees, Ernst & Young LLP was asked by Americans for Secure Retirement to analyze the likelihood that middle-income Americans would outlive their financial assets in retirement. The analysis examines typical middle-income households nearing retirement or on the brink of retirement, and calculates the range of retirement outcomes depending on how long they live and the volatility of investment returns.

This study presents national estimates of the potential retirement vulnerability of middle-income near and recent retirees outliving their financial assets. A number of studies have focused on the inadequacy of American savings. Other studies have documented at least three other risks that could result in households outliving their assets: longevity, volatile investments returns and high inflation. Outliving one's financial assets would mean a significant reduction in one's standard of living later in life.

These vulnerabilities are related. Without adequate personal savings upon retirement, it is unlikely that a retiree will maintain his or her standard of living even if they earn expected investment returns, if inflation is not too high and they live to the average life expectancy. The same retiree may not outlive his or her financial assets if death comes prematurely. On the other hand, a retiree with a relatively large amount of personal savings might still outlive his or her financial assets due to low investment returns, high inflation or living to age 100.

The study accounts for all of these risks, and summarizes a household's retirement vulnerability in two measures:

- the probability of outliving one's financial assets
- the necessary reduction in consumption, beginning at retirement, to reduce the probability of outliving one's financial assets

The analysis is based on the Retirement Analytics™ model, developed by Ernst & Young. This retirement measurement tool uses advanced modeling techniques to reflect the volatility of investment returns, inflation, and mortality possibilities for individual households. The model captures the risks of different life spans, volatile investment returns and volatile inflation during retirement with 2,000 possible outcomes. The probability of outliving one's financial assets can be determined as the percentage of the possible outcomes where one's pre-retirement standard of living cannot be sustained.

The study evaluates retirement vulnerability for 36 different types of typical middle-class households, at three income levels ($50,000, $75,000 and $100,000 of pre-retirement income); for married couples, single males and single females; by employer-provided defined benefit pension coverage status; and by age (near and new retiree). The near retiree is age 58 and planning to retire at age 65. The recent retiree is age 65, and has just entered retirement. Based on publicly-available data from the government, the study estimates the key financial and income information for these 36 household types. Based on the relative weights of the different household examples, the study estimates the national overall retirement vulnerability of middle-class near and new retirees.

II. Measures of retirement vulnerability

Near and recent retirees face many retirement risks. The sizes of these risks depend on individual characteristics (e.g., age, gender, marital status, health) and economic characteristics (e.g., income, total savings and type of investments).

The vulnerability of American retirees is well known by policy-makers. Various studies have cited major retirement risks: replacement rate risk, longevity, investment risk and inflation risk.[2] These risks are related. The replacement rate risk deals with the possibility that retiree income will not be enough to cover their needs, which could happen because of insufficient guaranteed income, insufficient asset real rates of returns and longevity without guaranteed income. Retirement vulnerability risks can be summarized in two ways: the risk of insufficient savings to keep the same standard of living as during their working life, and the risk of outliving their assets due to the uncertainty of longevity, inflation and investment uncertainties.

Social Security is the main source of guaranteed retirement income for individuals age 65 and older (40 percent of retirement income), followed by pensions and annuities (19 percent of retirement income).[3] Non-guaranteed sources are essentially wages and salaries (25 percent of retirement income), and income from assets (14 percent of retirement income). Guaranteed income is projected to cover a decreasing share of retirement income sources, leaving households with increased responsibility for their retirement and at increasing risk of retirement vulnerability.

Two main retirement income risks

The first risk is the inability to keep the same standard of living before and after retirement, due to insufficient retirement savings. Americans have been warned that adequate retirement planning includes not only Social Security and an employer pension plan, but also their own personal savings. It is much easier to build adequate savings by investing regularly throughout one's work life due to the power of compound investment returns. Making up for low personal savings when nearing retirement may be possible, but requires much larger annual savings in the years leading up to retirement.

Insufficient retirement savings can also be a result of low investment returns. Retirement savings with longer time horizons can grow faster with a balanced composition of equity and bond investments, which can weather ups and downs of the bond and stock markets. An undiversified retirement portfolio, however, can have very large swings that could reduce savings just before retirement. Most financial advisors recommend diversified portfolios with a higher proportion of equities for investors with longer retirement horizons, and a higher proportion of fixed income assets, such as bonds, as people near retirement. Very conservative investments, such as short-term money market funds, are unlikely to grow much faster than inflation.

With the increasing use of defined contribution (DC) plans, including 401(k)s, to provide for their retirement coverage, employees are increasingly taking responsibility (and the inherent risk) of saving enough, investing properly for their retirement and converting these accounts into retirement income.[4]

The second major retirement income risk is longevity risk without guaranteed lifetime payments. This risk has become increasingly important in the last decade, with the decline of employer-provided defined benefit pension coverage. From 1992 to 2005, the percentage of private industry workers participating in an employer-provided defined benefit plan declined from 32 percent to 21 percent.[5]

Social Security is a government-provided defined benefit retirement plan. It provides guaranteed income for life, plus Social Security payments are indexed for inflation. Unlike most employer-provided defined benefit pension payments, which are not indexed for inflation, and thus buy fewer goods and services each year due to inflation, Social Security

provides a base of inflation-protected guaranteed income. However, due to the progressive nature of the Social Security benefit payments, Social Security covers a smaller portion of the retirement needs as income rises.

We use two summary measures to evaluate Americans' retirement vulnerability to the above risks: the probability of outliving one's financial assets and the reduction in consumption necessary to achieve a low probability of not outliving one's financial assets.

Probability of outliving one's financial assets

To measure the risk of outliving one's financial assets, it's necessary to specify the future level and path of consumption spending. This study sets the retirement consumption target equal, in inflation-adjusted dollars, to the standard of living during pre-retirement years.

Pre-retirement standard of living (or pre-retirement consumption) is equal to wages and salaries less payroll and income taxes, savings and work-related expenses such as transportation, parking and work apparel. Maintaining pre-retirement standard of living is estimated to require 59 to 71 percent of wages and salaries (after paying for income taxes in retirement). This range is consistent with conventional wisdom's rule of thumb that 65 to 75 percent of the last year's pre-tax wages and salaries (sometimes called the replacement ratio) is necessary to maintain an individual's standard of living in retirement. A married couple's target consumption is assumed to fall by 25 percent upon the death of the spouse.[6]

The probability of outliving one's financial assets is calculated as the percentage of the 2,000 scenarios in which a household is unable to achieve its desired consumption goal in any retirement year. If a household in a particular scenario does not have sufficient financial assets to meet the consumption target in any single year, then that scenario is counted as failing – and thus outliving their assets. The model does not include the option of borrowing to maintain the consumption level in anticipation of higher income at a future date.

Percent reduction in pre-retirement standard of living necessary to reduce the failure rate to five percent

The probability of outliving one's financial assets identifies situations where a retiree would run out of financial assets and is subsequently forced to cut back consumption to the amount of Social Security payments and/or employer-provided pension payments. This reduction will likely result in a sharp and immediate drop in the retiree's standard of living.

Another possibility is that retirees could anticipate the prospect of outliving their assets and decide to reduce their consumption at the beginning of retirement to minimize the likelihood of outliving their assets. The retiree's standard of living would be below his or her pre-retirement standard of living, but there would be a steady consumption level throughout retirement, adjusted for inflation, thus avoiding a sharp, immediate drop in living standards.

This report presents an alternative measure of retirement vulnerability: the percent reduction in target consumption necessary to reduce the probability of outliving one's assets to only five percent. Households can reduce the probability of outliving their assets by reducing their consumption at the beginning of retirement below 100 percent of their pre-retirement standard of living. This measure shows the extent to which the standard of living would have to be reduced to minimize the probability of outliving one's assets to only five percent.

III. Representative examples of middle-class near and recent retirees

This study evaluates the retirement vulnerability of 36 representative middle-class households, defined by three income levels ($50,000, $75,000 and $100,000); married couples, single males and single females; employer-provided defined benefit pension coverage status and near and new retirees. Near retirees are age 58 and planning on retiring at age 65. New retirees are age 65 and have just entered retirement.

The income and wealth characteristics of the 36 household models are developed from analysis of the Federal Reserve Board of Governors' 2004 *Survey of Consumer Finances* (SCF), a nationally representative survey of American households. The SCF analysis looked at the distribution of income of Americans aged 55 to 64, with significant wage income.[7] An approximate set of income quarterlies for workers' pre-retirement income resulted in the choice of $50,000, $75,000, and $100,000 for pre-retirement income.

Key financial information about the households

The 2004 SCF includes detailed information on the wealth and composition of the wealth of American households. To have a sufficient number of households for reliable estimates, households with $40,000 to $60,000 were combined to represent a $50,000 household; $65,000 to $85,000 for a $75,000 household, and $90,000 to $110,000 for a $100,000 household.

Although there is great variation among households in their income and financial assets, this study tries to capture the key relationships affecting retirement vulnerability. By presenting results for households with three different income levels, with and without an employer-defined benefit plan, and different marital and gender status, the 36 sample groups represent the major socio-economic characteristics of older households in America. All other variables are held constant across the 36 groups to permit comparisons. Sensitivity analysis can be conducted around any of the major variables.

The analysis of the 2004 SCF data did not find significant, systematic differences in average financial assets between couples and singles, and for those with employer-provided benefit plans and those without, for working households ages 55 to 65. Thus, the amount of financial assets was permitted to vary only by pre-retirement income. The analysis calculated the value of the average financial assets for workers age 55 to 59 for the near retiree, age 58, and the value of the average financial assets for workers age 60 to 64 for the new retiree, age 65. The financial assets for the three different income levels are shown below. Using the lower average financial values, rather than the median value, makes the estimates of retirement vulnerability lower (more conservative).

Table 1: Average value of financial assets at different income levels for near and new retirees		
Income	**Near retiree**	**New retiree**
$50,000	$105,000	$175,000
$75,000	$175,000	$315,000
$100,000	$280,000	$585,000

The 2004 SCF data allowed the composition of financial assets to be determined. Again, significant differences across most of this age group were not evident, except for those covered under employer-provided defined benefit plans and those without a defined benefit pension plan. Households without a defined benefit pension plan were more likely to have a greater percentage of their financial assets in tax-favored retirement vehicles, such as tax deductible Individual Retirement Accounts, Keogh plans and 401(k) plans.

Some of the other key financial parameters include:

- Wages and salaries represent, on average, 91.5 percent of income.[8]
- Near-retirement working households contribute five percent of wages and salaries in defined contribution accounts (e.g., 401(k)s, traditional IRAs, Keoghs) and about four percent of wages and salaries in other savings.[9]
- Defined benefit pension payments, on average, represent about one-third of pre-retirement wages and salaries.
- The amounts of Social Security income at retirement reflect the formula provided by the Social Security Administration.[10]
- Net work-related expenses (transportation, apparel and services) represent, on average, two percent of pre-tax wages and salaries.[11]

Appendix Table A-1 shows the key financial and income variables for each of the 36 representative households.

Composition of near and recent retirees

The summary measure of retirement vulnerability of near and recent retirees for middle-income households is based on 18 underlying household types as determined by the 2000 *Census of Population and Housing*. The proportion of middle-income Americans covered by defined benefit plans is based on the 2001 *Survey of Income and Program Participation*.

Appendix Table A-2 shows the national distribution of the 18 representative working households age 55 to 64, in the three representative middle-income groups ($50,000, $75,000 and $100,000). The same weights are applied to the 18 representative households for both near retirees and new retirees.

About 35 percent of near-retirement households with middle-income (i.e., in the three representative income groups spanning $40,000 to $110,000 of income) are covered under an employer-defined benefit pension plan. About 36 percent of households in the lower income group ($50,000) are covered under a defined benefit pension, compared to 38 percent in the middle income group ($75,000) and 26 percent in the higher income group ($100,000).

Most near retirement households with middle-income are married (76 percent), with 13 percent of households composed of single women and 11 percent single men. Among the three marital status/gender groups considered, single women are the most likely to be covered with employer-defined benefit pension (44 percent), and single men are the least likely to be covered under a defined benefit pension (28 percent), compared to 35 percent of married couples covered under such plans.

IV. Modeling retirement vulnerability

Modeling uncertain outcomes

Retirement Analytics™ uses advanced modeling techniques to incorporate the uncertainty and volatility of investment returns, inflation and mortality. Retirement planning increasingly is using Monte Carlo simulation analysis to capture the possible multiple outcomes that individuals face during their future retirement.

The Retirement Analytics™ model generates 2,000 scenarios for each household. Investment returns and inflation rates are developed using current economic scenario generation methods. Monte Carlo simulation (i.e., the use of random numbers to simulate a sequence of events) is used to reflect the timing of death.

The combination of these techniques allows Retirement Analytics™ to model the key risks that a household's retirement will be exposed to over the lifespan of the individual or couple.

The EY Retirement Analytics™ model is described more fully in Appendix B. A number of additional assumptions are necessary to specify the model. For instance, the asset allocation between bonds, different types of stocks and cash investments must be specified. The model uses target maturity fund portfolio allocations from the four largest providers of these types of funds (Fidelity, Vanguard, T. Rowe Price and Principal Financial Group), and changes the portfolio allocation every five years, with portfolio riskiness decreasing with age.

The model has the capability of simulating occurrences of major medical expenses. Catastrophic medical costs were not included as part of this study, since it would add an additional layer of complexity to the analysis. If catastrophic medical costs had been included, the estimates of the probability of outliving one's assets would be higher.

Ability to do sensitivity analysis

A major benefit of having an explicit model is the ability to do sensitivity analysis of different data parameters and assumptions. Given the complexity of modeling retirement outcomes with varying uncertainties, the specific results of the model are subject to many parameters and assumptions. Showing the full distribution of possible outcomes can provide some sensitivity analysis to a particular result and indicate the robustness of the general finding.

Figure B-1 in Appendix B gives an example of the sensitivity analysis possible with the Retirement Analytics™ model.

V. Retirement vulnerability of middle-class near and recent retirees

Table 2 summarizes the two measures of retirement vulnerability for each of the 36 representative household types. The probabilities of outliving one's assets are shown in the first column for near retirees and the third column for new retirees.

Table 2: Retirement vulnerability of 36 representative households (unweighted)

			Near retiree		At retirement	
Employer pension (defined benefit)	**Marital status/gender**	**Income group**	**Probability of outliving their assets**	**% reduction in pre-retirement standard of living necessary to reduce failure rate to only 5%**	**Probability of outliving their assets**	**% reduction in pre-retirement standard of living necessary to reduce failure rate to only 5%**
			(1)	(2)	(3)	(4)
Covered (with DB)	Married	$50,000	53%	-23%	22%	-10%
		$75,000	57%	-26%	31%	-14%
		$100,000	51%	-25%	13%	-8%
	Single male	$50,000	20%	-10%	2%	0%
		$75,000	20%	-11%	4%	0%
		$100,000	21%	-13%	3%	0%
	Single female	$50,000	27%	-13%	4%	0%
		$75,000	27%	-14%	7%	-2%
		$100,000	28%	-17%	5%	0%
Uncovered (without DB)	Married	$50,000	94%	-46%	91%	-34%
		$75,000	93%	-49%	90%	-38%
		$100,000	90%	-49%	71%	-33%
	Single male	$50,000	73%	-37%	61%	-24%
		$75,000	69%	-38%	58%	-27%
		$100,000	66%	-40%	35%	-23%
	Single female	$50,000	78%	-38%	66%	-25%
		$75,000	75%	-40%	63%	-29%
		$100,000	72%	-42%	43%	-25%

Source: Ernst & Young calculations.

For example, a married couple with $75,000 of pre-retirement income and a defined benefit pension plan have a 31 percent probability of outliving their financial assets as new retirees. A similar couple at age 58, seven years away from retirement, is estimated to have a 57 percent probability of outliving their assets. The higher percentage is due to a number of factors, including: 1) wage inflation from age 58 to age 65 increasing pre-retirement standard of living; 2) market volatility between age 58 and age 65 creates scenarios where assets earn below average returns; and 3) the savings rate is not high enough to result in the same relationship of assets to income as in the case of the new retiree couple.

A near retiree at age 58 would need to significantly increase his or her savings to achieve the same retirement preparedness as a new retiree at age 65. For example, a married couple near retirement with $75,000 of income and covered with defined benefit pension would need to increase savings from 9 percent to 30 percent for the next seven years to reduce their probability of outliving assets to the same level as the retired couple. Half of these necessary additional savings are due to the first retirement risk (insufficient savings) and the other half is due to the second retirement risk (financial market volatility).

The second retirement vulnerability measure is the percentage reduction in the target consumption level necessary to reduce the probability of outliving one's assets to only five percent. These measures are shown in column two for near retirees and column four for new retirees. Single individuals newly retired with defined benefit pensions have very low probabilities of outliving their assets, and would not need to reduce their standard of living upon retirement. However, new retirees without defined benefit pensions have fairly high probabilities of outliving their assets. This occurs because withdrawals from private savings in combination with only Social Security payments are not enough to sustain pre-retirement standards of living throughout retirement. These new retirees may need to reduce their standard of living by one-quarter to one-third upon retirement to minimize the likelihood of a precipitous drop in their consumption once their financial assets are exhausted.

Table 3 summarizes the retirement vulnerability metrics of American middle-class near retirees and new retirees for the 36 different household types.

Table 3: Retirement vulnerability of near retirees and new retirees

	Near retirement		At retirement	
	Probability of outliving their assets	**% reduction in pre-retirement standard of living necessary to reduce failure rate to only 5%**	**Probability of outliving their assets**	**% reduction in pre-retirement standard of living necessary to reduce failure rate to only 5%**
	(1)	(2)	(3)	(4)
Marital status/gender				
Married	79%	-39%	65%	-26%
Single male	57%	-30%	42%	-16%
Single female	55%	-28%	38%	-14%
Employer pension coverage				
Covered	47%	-21%	18%	-8%
Uncovered	89%	-45%	81%	-32%
Income				
$50,000	74%	-36%	60%	-23%
$75,000	74%	-37%	61%	-27%
$100,000	75%	-41%	51%	-25%
Total	**74%**	**-37%**	**59%**	**-24%**

Source: Ernst & Young calculations. Group weights shown in Appendix Table A-2.

Probability of outliving one's assets (or "Probability of failure")

Table 3 shows the probability of outliving one's assets for American middle-class near retirees in column 1 and new retirees in column 3.

- Six out of ten middle-class new retirees can expect to outlive their financial assets, if they attempt to maintain their current pre-retirement standard of living.
- Almost three quarters of middle-income households seven years from retirement can expect to outlive their financial assets, if they attempt to maintain their standard of living.
- Households without an employer pension plan to supplement Social Security and other savings are much more likely to outlive their assets than those that have a pension.
- Married couples are more likely to outlive their financial assets, due to their longer joint life spans, than single households. Despite longer life expectancies, females on average are slightly less likely to outlive their assets than single males, because working single females are more likely to have employer pension coverage.
- For households at retirement age, those with $100,000 of pre-retirement income are less likely than those with lower income to outlive their assets.

Reduction in standard of living necessary to achieve a low probability of outliving one's assets

Table 3 shows the reduction in standard of living necessary to achieve a low probability of failure of American middle-class near retirees (column 2) and new retirees (column 4).

- Near retirees would have to reduce their standard of living by 37 percent to reduce the likelihood of outliving their assets to only a five percent failure rate. This reduction would be less severe for single women (28 percent) and single males (30 percent) than for married couples (39 percent).
- New retirees would have to reduce their standard of living by 24 percent to reduce the likelihood of outliving their assets to only a five percent failure rate. This reduction would be less severe for single women (14 percent) and single males (16 percent) than for married couples (26 percent).
- To reduce the likelihood of outliving their assets to a five percent failure rate, households with an employer pension would have to reduce their standard of living by a smaller percentage than households without an employer pension.
- Among near retirees, the necessary reduction in standard of living to reduce the failure rate to 5 percent is similar across income groups. Among new retirees, this reduction would be less severe for households with pre-retirement income of $50,000 compared to households with $75,000 or $100,000 of pre-retirement income.

VI. Retirement vulnerability by state

The degree of retirement vulnerability varies across the 50 states due to differences in employer pension plan coverage, income distributions and demographics. While almost 60 percent of middle-class new retirees can expect to outlive their financial assets if they attempt to maintain their current pre-retirement standard of living, the probability of outliving one's assets ranges from 39 percent in the District of Columbia to 72 percent in Montana. Similarly, the reduction in standard of living necessary to reduce the likelihood of outliving their financial assets to only a 5 percent failure rate ranges from 7 percent in the District of Columbia to 35 percent in Montana.

Table 4 summarizes the probability of outliving their financial assets and the percent change in standard of living necessary to reduce the failure rate to 5 percent for near and new retirees, and for all 50 states and the District of Columbia. Near and new retirees in the District of Columbia are less vulnerable to retirement risks than their peers in other states, since a high percentage of DC residents are covered by a government pension plan.

Table 4: State summary of retirement vulnerability

	Probability of outliving their financial assets		% reduction in pre-retirement standard of living necessary to reduce failure rate to only 5%	
State	**Near retirees**	**New retirees**	**Near retirees**	**New retirees**
United States	74%	59%	-37%	-24%
Alabama	74%	60%	-37%	-24%
Alaska	73%	58%	-36%	-33%
Arizona	76%	64%	-41%	-29%
Arkansas	78%	67%	-42%	-30%
California	73%	59%	-37%	-25%
Colorado	77%	66%	-43%	-30%
Connecticut	77%	65%	-42%	-30%
Delaware	72%	58%	-36%	-23%
District of Columbia	60%	39%	-21%	-7%
Florida	75%	61%	-39%	-26%
Georgia	76%	64%	-41%	-28%
Hawaii	73%	59%	-37%	-25%
Idaho	73%	58%	-34%	-21%
Illinois	74%	59%	-36%	-24%
Indiana	77%	66%	-41%	-29%
Iowa	77%	66%	-42%	-30%
Kansas	75%	61%	-38%	-25%
Kentucky	74%	60%	-37%	-24%
Louisiana	73%	57%	-35%	-22%
Maine	76%	64%	-40%	-27%
Maryland	72%	55%	-33%	-20%
Massachusetts	73%	57%	-35%	-22%
Michigan	73%	57%	-35%	-22%
Minnesota	75%	62%	-39%	-27%
Mississippi	77%	66%	-40%	-28%

Table 4: State summary of retirement vulnerability

	Probability of outliving their financial assets		% reduction in pre-retirement standard of living necessary to reduce failure rate to only 5%	
State	**Near retirees**	**New retirees**	**Near retirees**	**New retirees**
Missouri	74%	59%	-36%	-23%
Montana	80%	72%	-47%	-35%
Nebraska	74%	58%	-34%	-21%
Nevada	77%	69%	-45%	-34%
New Hampshire	76%	65%	-41%	-29%
New Jersey	75%	62%	-40%	-27%
New Mexico	72%	54%	-32%	-19%
New York	70%	52%	-31%	-17%
North Carolina	73%	57%	-33%	-20%
North Dakota	74%	56%	-33%	-20%
Ohio	72%	55%	-32%	-19%
Oklahoma	77%	64%	-40%	-28%
Oregon	71%	54%	-32%	-19%
Pennsylvania	74%	59%	-36%	-23%
Rhode Island	71%	54%	-32%	-19%
South Carolina	74%	59%	-36%	-23%
South Dakota	79%	72%	-46%	-35%
Tennessee	75%	62%	-38%	-26%
Texas	74%	58%	-36%	-23%
Utah	71%	51%	-28%	-14%
Vermont	76%	64%	-40%	-27%
Virginia	74%	59%	-37%	-24%
Washington	74%	59%	-36%	-24%
West Virginia	78%	67%	-42%	-30%
Wisconsin	76%	62%	-39%	-26%
Wyoming	80%	72%	-46%	-35%

Source: Ernst & Young calculations.

VII. Conclusion

Many Americans approaching retirement have heard the warnings of inadequate saving for retirement. Existing tax laws provide powerful incentives for individuals to save for their retirement through employer-provided defined benefit plans, traditional and Roth Individual Retirement Accounts, 401(k) defined contribution plans and Keogh retirement plans. These incentives help to address one of the two key risks to Americans in retirement: maintaining their standard of living after they retire.

A much less-recognized retirement vulnerability is the risk of outliving one's financial assets due to longevity and fluctuating asset values during retirement. Social Security is an important source of guaranteed lifetime income. With the decline of employer-provided defined benefit coverage, many near and new retirees will not have another source of guaranteed lifetime income unless they purchase a lifetime guarantee with their private savings.

This study shows that typical middle-income new retirees and near retirees have high probabilities of outliving their financial assets at some point during their retirement. If the typical middle-income household without a defined benefit pension wants to reduce the risk of outliving their assets, they would have to reduce their post-retirement standard of living significantly below their pre-retirement standard of living.

Households approaching retirement face an environment where the possibility of living to age 90 or 100 and the volatility of inflation and investment returns put them at high risk of outliving their assets. This study shows that the presence of a significant guaranteed lifetime income stream beyond Social Security can help. Increased focus on both increased retirement savings and the importance of a guaranteed lifetime income stream will reduce the retirement vulnerability of retirees in the future.

Appendix A: Key financial information about the representative households

Table A-1: Key financial information for the 36 representative households		
Age	**Income ($)**	**Financial assets ($)**
58	50,000	105,000
	75,000	175,000
	100,000	280,000
65	50,000	175,000
	75,000	315,000
	100,000	585,000
	Employment pension coverage	
Savings (% of financial assets)	**With**	**Without**
Non-qualified[1]	55%	45%
Qualified[2]	40%	50%
Tax-free[3]	5%	5%

1 Non-qualified assets include regular savings and retirement savings non-qualified for preferential tax treatment (e.g., stocks, stock mutual funds and other managed investments with equity interest, certificates of deposit, liquid assets, bond mutual funds, bonds).

2 Qualified assets include retirement assets qualified for preferential tax treatment and taxable on distributions (e.g., traditional IRAs, 401(k)s, Keogh accounts, rollovers, thrifts, employment pension accounts) and other assets not taxed on accumulations (saving bonds, other managed assets).

3 Tax-free assets include retirement assets qualified for preferential tax treatment and tax-free on distributions (e.g., Roth IRAs).

Table A-2: Distribution of middle-income US population age 55 to 64

Employer pension (defined benefit)	Marital status/gender	Income group	Population (in thousands)	Population (% of total)
Covered (with DB)	Married	$50,000	8,860	18.8%
		$75,000	2,621	5.6%
		$100,000	962	2.0%
	Single male	$50,000	1,052	2.2%
		$75,000	268	0.6%
		$100,000	97	0.2%
	Single female	$50,000	1,830	3.9%
		$75,000	610	1.3%
		$100,000	290	0.6%
Uncovered (without DB)	Married	$50,000	15,551	33.1%
		$75,000	4,598	9.8%
		$100,000	3,192	6.8%
	Single male	$50,000	2,432	5.2%
		$75,000	727	1.5%
		$100,000	483	1.0%
	Single female	$50,000	2,952	6.3%
		$75,000	418	0.9%
		$100,000	97	0.2%
		Total	**47,040**	**100%**

Source: Ernst & Young calculations. Population weights are based on the Decennial Census of Population and Housing (1% PUMS, 2000).

States estimates

State estimates of the retirement vulnerability metrics were made based on the national estimates for the 36 different types of typical middle-class households and state-specific income, age and demographic information from the 2000 Census of the Population and Housing and employer pension coverage from the 2001 Survey of Income and Program Participation (US Census Bureau).

Appendix B: Description of the Ernst & Young Retirement Analytics™ Model and key data and assumptions

A number of the key model parameters of the Ernst & Young Retirement Analytics™ model are described below.

The economic variables were created using historical data through March 31, 2006. Table B-1 shows the different asset fund classes and the sources of the investment return data.

Table B-1: Source of return, dividend yield and expense data

Fund Class	Source of Return Data
Short-term treasury	1-year US Treasury Constant Maturities
Mid-term treasury	7-year US Treasury Constant Maturities
Long-term treasury	20-year US Treasury Constant Maturities
Large cap	S&P 500 Total Return Index
International	GFD World x/USA Price Index
Small cap	NASDAQ 100 Index
Money market	USA 1-year Constant Maturity Note
Bond	Dow Jones Corporate Bond Return Index

The key statistics for each fund category and inflation can be found in Tables B-2 and B-3.

Table B-2: Treasury and inflation rate return statistics

Treasury Type	Average	Standard deviation	Minimum return	Maximum return
Short-term (1 year)	5.00%	1.72%	1.16%	22.59%
Mid-term (7 year)	5.46%	1.46%	1.87%	19.59%
Long-term (20 year)	5.94%	1.17%	2.78%	15.68%
Inflation	4.00%	1.04%	1.89%	15.80%

Table B-3: Equity/fixed fund return statistics

Fund Class	Average	Standard deviation	Minimum return	Maximum return
Large cap	10.01%	16.94%	-42.50%	105.50%
International	8.49%	19.58%	-58.79%	163.44%
Small cap	12.58%	31.63%	-71.91%	249.90%
Money market	5.29%	1.80%	1.42%	23.63%
Bond	6.04%	8.16%	-23.85%	48.09%

Stochastic inflation methodology

The annual inflation rate is calculated by multiplying the one-year Treasury rate by a factor, with the factor depending on the level of the Treasury rate. Table B-4 displays the multiplicative factor used to calculate the inflation rate for various levels of the one-year Treasury rate.

Table B-4: Stochastic inflation formula factors by Treasury rate range

Treasury rate range	Multiplier applied to calculate inflation rate
0.00%-1.99%	1.25
2.00%-2.49%	1
2.50%-2.99%	0.9
3.00%-3.49%	0.85
3.50%-3.99%	0.8
4.00%-4.49%	0.7
4.50% +	0.68

On an annualized basis, the historical inflation rate is 4.62 percent over the 40 year period from 1965-2004. For validation, using the factor approach over the same historical period resulted in an annualized rate of inflation of 4.55 percent over the same period.

Retirement Analytics™ also includes a medical inflation factor to reflect that a larger than average portion of retiree spending goes towards medical costs, which are increasing at a faster pace than the average rate of inflation. The health inflation factor added to the inflation rate calculated using the formula above varies by age. For retirees 75 and under, this additional factor is 32 bps. For retirees age 76 and older, this factor is 44 bps.

Mutual fund allocations and expenses

Financial assets are assumed to be invested in mutual funds that follow an allocation strategy similar to target maturity funds. The portfolio asset allocations in Table B-5 were developed from target maturity fund portfolio allocations from the four largest providers of these types of funds (Fidelity, Vanguard, T. Rowe Price and Principal Financial Group).

At each of the durations noted in Table B-5, financial assets are reallocated to the specific allocation noted below.

Table B-5: Portfolio asset allocations							
	Years before retirement				Years after retirement		
Fund class	**15**	**10**	**5**	**Retirement**	**5**	**10**	**15**
Large cap	49%	43%	38%	29%	22%	21%	21%
International	13%	12%	10%	9%	5%	5%	5%
Small cap	12%	11%	10%	9%	8%	7%	7%
Money market	1%	3%	6%	11%	23%	24%	24%
Bond	25%	31%	36%	42%	42%	43%	43%

The annual investment management fee charged as a percentage of the financial assets is 0.64 percent. Like the portfolio allocations, this fee was developed from the average management fees charged by the four largest providers of target maturity funds.

Mortality table parameters

The mortality table used to simulate the ages of death is the IRS pension funding valuation table for annuitants. Some key statistics calculated from the mortality table are noted in Table B-6.

Table B-6: Mortality table statistics	
Life expectancy at age 65	
Joint	89
Single Male	83
Single Female	85
Probability of a 65 year old living to age 85	
Joint	77%
Single Male	47%
Single Female	56%

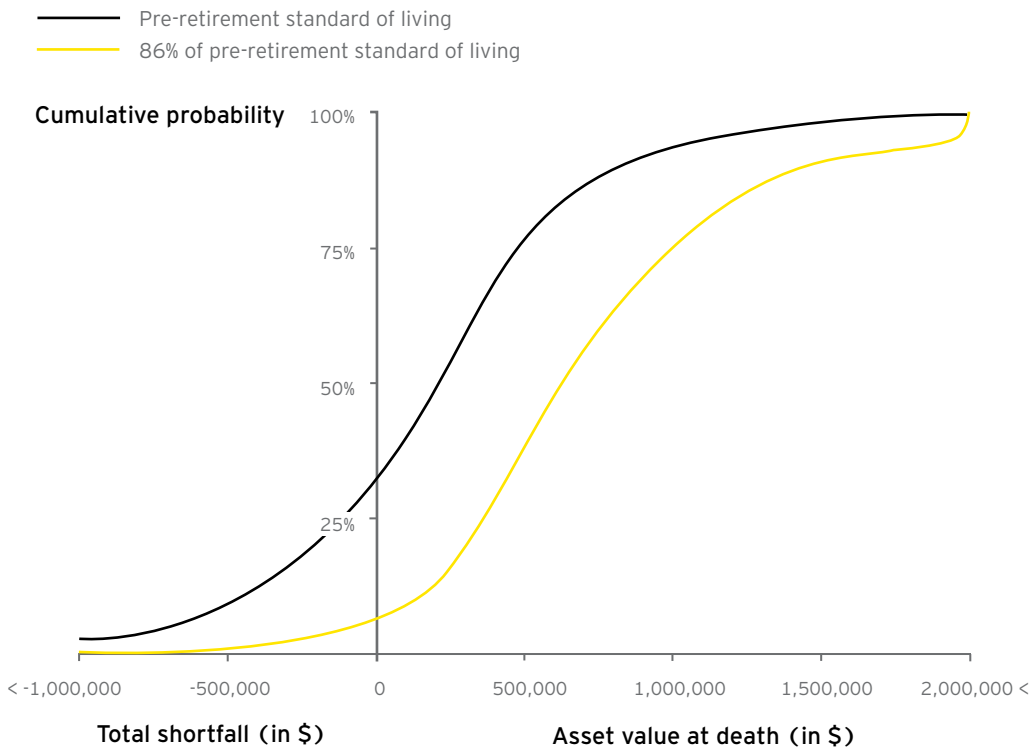
Sensitivity analysis

As described in the text, one of the benefits of modeling, and particularly Monte Carlo simulation modeling, is the ability to show the robustness of the results to different assumptions and data parameters.

Figure B-1 is an example of the full range of retirement outcomes for a newly-retired married couple with $75,000 of pre-retirement income and a defined benefit pension plan. The black line to the left of zero shows the share of retirement outcomes where the financial assets would be exhausted if the target consumption spending is maintained through retirement. In some cases the shortfall would be fairly modest, but in a number of scenarios the shortfall would be quite large. The graph also shows that the margin of error is relatively small for a number of scenarios where the assets were not exhausted, but would have been with some unexpected additional expenses.

The yellow line shows the same couple if they reduce their standard of living by 14 percent at retirement. That is the level estimated necessary to reduce the probability of outliving their assets to only 5 percent. The entire distribution shifts to the right as a result of the lower spending. The figure illustrates the trade-off facing vulnerable retirees who must choose whether to reduce their standard of living at retirement or face a high probability that they will exhaust their financial assets at some point during their retirement.

Figure B-1: Range of retirement outcomes: Cumulative probability of total shortfall and asset values at death for new retiree couple with $75,000 pre-retirement income and defined benefit plan.



Endnotes

[1] *Income of the Elderly Population Age 65 and Over, 2005* (2007), EBRI Notes 28(5), May.

[2] *ERISA at 30: The decline of private-sector defined benefit promises and annuity payments? What will it mean?* (2004), EBRI Issue Brief 269.

[3] *Income of the Elderly Population Age 65 and Over, 2005* (2007), EBRI Notes 28(5), May.

[4] Sleyster, Scott G. and Phil Waldeck (2006) provide evidence that a large number of DC plans' participants do not build the assets necessary for a secure retirement. The three principal reasons are a low participation rate (more than one fourth of eligible employees do not participate), insufficient contribution levels (low national savings rates, including retirement savings) and inappropriate investment allocation (little diversification, few adjustments over time, uncertainty on how much and how to allocate retirement savings). Sleyster, Scott G. and Phil Waldeck (2006): *Reinventing the Defined Contribution Plan: Research, Analysis and Recommendations*, Prudential Retirement, White Paper.

[5] *Monthly Labor Review*, Bureau of Labor Statistics, February 2006.

[6] Sources: The Actuarial Foundation, *Getting Ready to Retire: What You Need to Know About Annuities*, 2002; Charles D. Robinson, *A Phased-Income Approach to Retirement Withdrawals: A New Paradigm for a More Affluent Retirement*, Journal of Financial Planning, March 2007.

[7] An individual is considered "working" if their wages and salaries are at least $10,000.

[8] Non-wage income includes business income, rents, dividends, interests and capital gains, calculated for workers not receiving Social Security benefits.

[9] Using the 2004 Survey of Consumer Finances, we estimate that working, middle-class near retirees tend to save 4 percent of their wage income. This is twice as much as the national savings rate of 2 percent (BEA NIPA table 5.1, 2006).

[10] The index factor was based on 2006 for an individual age 65 in 2007, and on 2013 for an individual age 58 in 2006.

[11] Aon Consulting and Georgia State University (2004): *Replacement Ratio Study: A Measurement Tool for Retirement Planning*. The study estimate that, at the $50,000-$100,000 income levels, work-related expenses represent $766 at $50,000 of income, $1,582 at $70,000 of income and $1,727 at $90,000 of income. Net age-related expenses (essentially health care) are small because lower shelter costs offset higher health costs.

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