

## The Impact of Deferring Retirement Age on Retirement Income Adequacy

*By Jack VanDerhei and Craig Copeland, Employee Benefit Research Institute*

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### EXECUTIVE SUMMARY

**UPDATE OF RSPM—POST-65 RETIREMENT AGES:** The EBRI Retirement Security Projection Model® (RSPM) was developed in 2003 to provide an assessment of national retirement income prospects. The 2011 version of RSPM adds a new feature that allows households to defer retirement age past age 65 in an attempt to determine whether retirement age deferral is indeed sufficiently valuable to mitigate retirement income adequacy problems for most households (assuming the worker is physically able to continue working and that there continues to be a suitable demand for his or her skills). The answer, unfortunately, is not always “yes,” even if retirement age is deferred into the 80s.

**LOWEST-INCOME LEVELS, 50-50 CHANCE OF ADEQUACY:** RSPM baseline results indicate that the lowest preretirement income quartile would need to defer retirement age to 84 before 90 percent of the households would have a 50 percent probability of success. Although a significant portion of the improvement takes place in the first four years after age 65, the improvement tends to level off in the early 70s before picking up in the late 70s and early 80s. Households in higher preretirement income quartiles start at a much higher level, and therefore have less improvement in terms of additional households reaching a 50 percent success rate as retirement age is deferred for these households.

**LOWEST-INCOME LEVELS, HIGHER CHANCES OF ADEQUACY:** If the success rate is moved to a threshold of 70 percent, only 2 out of 5 households in the lowest-income quartile will attain retirement income adequacy even if they defer retirement age to 84. Increasing the threshold to 80 percent reduces the number of lowest preretirement income quartile households that can satisfy this standard at a retirement age of 84 to approximately 1 out of 7.

**IMPORTANCE OF DEFINED CONTRIBUTION RETIREMENT PLANS:** One of the factors that makes a major difference in the percentage of households satisfying the retirement income adequacy thresholds at any retirement age is whether the worker is still participating in a defined contribution plan after age 65. This factor results in at least a 10 percentage point difference in the majority of the retirement age/income combinations investigated.

**FACTORING IN RETIREMENT HEALTH COSTS:** Another factor that has a tremendous impact on the value of deferring retirement age is whether stochastic post-retirement health care costs are excluded (or the stochastic nature is ignored). For the lowest preretirement income quartile, the value of deferral (in terms of percentage of additional households that will meet the threshold by deferring retirement age from 65 to 84) decreases from 16.0 percent to 3.8 percent by excluding these costs. The highest preretirement income quartile experiences a similar decrease, from 12.8 percent to 2.6 percent.

Jack VanDerhei is research director of the Employee Benefit Research Institute. Craig Copeland is senior research associate at EBRI. This *Issue Brief* was written with assistance from the Institute's research and editorial staffs. Any views expressed in this report are those of the authors and should not be ascribed to the officers, trustees, or other sponsors of EBRI, EBRI-ERF, or their staffs. Neither EBRI nor EBRI-ERF lobbies or takes positions on specific policy proposals. EBRI invites comment on this research.

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## Table of Contents

Introduction .....	5
Brief Description of RSPM.....	5
Brief Review of Previous Results From the 2010 Retirement Readiness Ratings.....	6
Baseline by Age Cohort.....	6
Baseline by Preretirement Income Groups .....	10
Baseline by Future Years of Eligibility in a Defined Contribution Plan.....	10
Analyzing the Importance of Retirement Age .....	11
The Impact of Deferring Retirement Age on Retirement Income Adequacy .....	12
The Value of Participating in a Defined Contribution Plan After Age 64 .....	15
The Impact of Nursing Home and Home Health Care Costs on the Results .....	16
Summary and Conclusion .....	20
Brief Chronology of RSPM .....	24
Retirement Income and Wealth Assumptions .....	25
Defined Benefit Plans.....	25
Defined Contribution Plans .....	26
Social Security Benefits.....	26
Expenditure Assumptions.....	26
Deterministic Expenses.....	26
Health .....	27
Stochastic Expenses.....	27
Total Expenditures .....	28
References .....	29
Endnotes.....	31

## Figures

Figure 1, Baseline EBRI Retirement Readiness Rating™ (RRR) vs. National Retirement Risk Index (NRRI).....	8
Figure 2, Auto-Enrollment With Auto-Escalation vs. Voluntary Enrollment: <u>50th</u> Percentiles (assuming future eligibility <u>IS</u> a function of current eligibility and historic equity returns) .....	8
Figure 3, Auto-Enrollment With Auto-Escalation vs. Voluntary Enrollment: <u>50th</u> Percentiles (assuming future eligibility is <u>NOT</u> a function of current eligibility and historic equity returns).....	9
Figure 4, Auto-Enrollment (With 2009 Formulas) vs. Voluntary Enrollment (With 2005 Formulas): <u>50th</u> Percentiles (assuming future eligibility <u>IS</u> a function of current eligibility) .....	9
Figure 5, Impact of Income Group on At-Risk* Probability.....	13
Figure 6, Impact of Age and Future Years Eligible for Participation in a Defined Contribution Plan on At-Risk Probabilities .....	13
Figure 7, Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>50%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles .....	14
Figure 8, Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>70%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles .....	14
Figure 9, Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>80%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles .....	17
Figure 10, Value of DC Participation After Age 64: Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>50%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles.....	17
Figure 11, Value of DC Participation After Age 64: Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>70%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income Quartile.....	18
Figure 12, Value of DC Participation After Age 64: Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>80%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income Quartile.....	18
Figure 13, Value of DC Participation After Age 64: Relative Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>50%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income .....	19
Figure 14, Value of DC Participation After Age 64: Relative Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>70%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income .....	19
Figure 15, Value of DC Participation After Age 64: Relative Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate Retirement Income for at Least <u>80%</u> of Simulated Life Paths After Retirement Age, by Preretirement Income .....	22
Figure 16, Impact of Excluding Nursing Home Costs at Retirement Ages 65 and 84, by Preretirement Income Quartile: <u>50%</u> Probability of Success .....	22

Figure 17, Impact of Excluding Nursing Home Costs at Retirement Ages 65, and 84, by Preretirement Income  
Quartile: 70% Probability of Success .....23

Figure 18, Impact of Excluding Nursing Home Costs at Retirement Ages 65 and 84, by Preretirement Income  
Quartile: 80% Probability of Success .....23

## Introduction

Since 2003, EBRI has been producing national estimates of retirement income adequacy through its Retirement Security Projection Model® (RSPM). Prior publications using this model have focused on quantifying the relative likelihood that various cohorts will be “at risk” of having inadequate retirement income and estimating the additional amount of savings these households would need to undertake each year until age 65 to have a 50, 70, or 90 percent probability of a “successful” retirement outcome. Unfortunately, many of these cohorts (especially those very close to retirement age, those in the lowest preretirement income quartile and those with limited attachment to employer-sponsored retirement plans) would require an additional savings rate that would be too large to be feasible (in many cases more than 25 percent of compensation annually).

In this *Issue Brief*, RSPM is modified to allow retirement at ages other than 65 and assess the value of deferring retirement age for increasing the probability of retirement income adequacy. The report starts with a review of RSPM and the Retirement Readiness Ratings used to measure those “at risk.” It then reviews some of the major findings from the 2010 version of RSPM and discusses how the model was updated and modified to produce the 2011 version.

At that point, RSPM simulations are presented showing the percentage of households with adequate retirement income for retirement ages varying from 65 to 84. Alternative simulations are run to show the impact of increasing the probability of a successful retirement income from 50 percent to 70 percent and then to 80 percent.

Once the value of deferring retirement age has been demonstrated for various preretirement income quartiles, the value of participation in defined contribution plans after age 64 is analyzed. This is followed by a final analysis isolating the impact of nursing home and home health costs.

## Brief Description of RSPM

One of the basic objectives of RSPM is to simulate the percentage of the population that will be “at risk” of having retirement income that is inadequate to cover basic expenses and pay for uninsured health care costs for the remainder of their lives once they retire.<sup>1</sup> However, the EBRI Retirement Readiness Rating™ also provides information on the distribution of the likely number of years before those at risk “run short of money,” as well as the percentage of compensation they would need in terms of additional savings to have a 50, 70, or 90 percent probability of retirement income adequacy.

The appendix to this *Issue Brief* describes how households (whose heads are currently ages 37–63) are tracked through retirement age, and how their retirement income/wealth is simulated for the following components:

- Social Security.
- Defined contribution balances.
- Individual retirement account (IRA) balances.
- Defined benefit annuities and/or lump-sum distributions.
- Net housing equity.<sup>2</sup>

A household is considered to run short of money in this model if aggregate resources in retirement are not sufficient to meet aggregate minimum retirement expenditures, which are defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income), and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). This version of the model is constructed to simulate “basic” retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living calculations, and other ad hoc thresholds.

The version of the model used in this *Issue Brief* assumes all workers retire at age 65 and immediately begin to withdraw money from their individual accounts (defined contribution and cash balance plans, as well as IRAs) whenever the sum of their basic expenses and uninsured medical expenses exceed the after-tax<sup>3</sup> annual income from Social Security and defined benefit plans (if any). If there is sufficient money to pay expenses without tapping into the tax-qualified individual accounts,<sup>4</sup> the excess is assumed to be invested in a non-tax-advantaged account where the investment income is taxed as ordinary income.<sup>5</sup> The individual accounts are tracked until the point at which they are depleted; if the Social Security and defined benefit payments are not sufficient to pay basic expenses, the entity is designated as having “run short of money” at that time.

## **Brief Review of Previous Results From the 2010 Retirement Readiness Ratings**

The definition of “at risk” of inadequate retirement income depends to a large extent on the type of model used to analyze the various contingencies. For example, some studies project retirement income and wealth to a particular age, and then simply compare the annuitized value of the various components with a threshold based on some type of replacement rate analysis.<sup>6</sup> While this is a useful metric to determine what percentage of the households being studied will achieve certain benchmarks, it is difficult (if not impossible) to accurately integrate the concepts of longevity risk, post-retirement investment risk, and uninsured post-retirement health care risk in such a formulation.

The EBRI Retirement Readiness Rating,<sup>TM</sup> as well as other results in this *Issue Brief*, are based on an updated version of RSPM. As explained briefly below (and in much more detail in the appendix), this model was originally developed in 2003 to provide detailed micro-simulation projections of the percentage of preretirement households “at risk” of having inadequate retirement income to finance basic retirement expenditures, as well as uninsured retiree health care expenses (including nursing home care). This model benefits greatly from having access to administrative records on tens of millions of 401(k) participants,<sup>7</sup> dating back in some cases to 1996, to permit simulating the accumulations under the most important component (but also the most complicated in terms of modeling) of future wealth generated by the employer-sponsored retirement system. These household projections are combined with the other components of retirement income/wealth (such as Social Security, defined benefit annuities and lump-sum distributions, IRA rollovers, non-rollover IRAs, and net housing equity) at retirement age, and run through 1,000 alternative retirement paths to see what percentage of the time the households “run short of money” in retirement. The present value of the deficits generated in retirement are also computed and divided by the accumulated remaining wages of the household to provide a percentage of compensation that would need to be saved in each year (in addition to any employee contributions simulated to be made to defined contribution plans and/or IRAs) to provide alternative probabilities of adequate retirement income.

While knowing the percentage of households that are “at risk” (as well as their composition by age, income levels, and level of participation in defined contribution plans) is obviously valuable, it does nothing to inform policymakers, employers, or workers of how much additional savings is required to achieve the desired probability of success.

Similar to the concepts applied in VanDerhei and Copeland (2003), the analysis in VanDerhei and Copeland (2010) also models how much additional savings would need to be contributed from 2010 until age 65 (the baseline retirement assumption) to achieve adequate retirement income 50, 70, and 90 percent of the time for each household. While this concept may be difficult to comprehend at first, it is important to understand that a retirement target based on averages (such as average life expectancy, average investment experience, average health care expenditures in retirement) would, in essence, provide the appropriate target only if one was willing to settle for a retirement planning procedure with approximately a 50 percent “failure” rate. Adding the 70 and 90 percent probabilities allows more realistic modeling of a worker’s risk aversion.

### ***Baseline by Age Cohort***

Figure 1 provides the baseline analysis for the 2010 Retirement Readiness Ratings in terms of the percentage of the population simulated to be “at risk” for three age cohorts:<sup>8</sup>

- Early Boomers (born between 1948–1954, now ages 57–63).

- Late Boomers (born between 1955–1964, now ages 47–56).
- Generation Xers (born between 1965–1974, now ages 37–46).

In 2010, nearly one-half (47.2 percent) of the oldest cohort (Early Boomers) are simulated to be at risk of not having sufficient retirement income to pay for “basic” retirement expenditures as well as uninsured health care costs.<sup>9</sup> The percentage at risk drops for the Late Boomers (to 43.7 percent) but then increases slightly for Generation Xers to 44.5 percent.

In contrast, the National Retirement Risk Index (NRRI) shows significantly higher at-risk percentages for the younger cohorts (Munnell, Webb, and Golub-Sass, 2009).<sup>10</sup> They use 2007 Survey of Consumer Finances information, with a modification for asset values based on broad market averages, and conclude that 41 percent of the Early Boomer households are “at risk” of not having enough to maintain their living standards in retirement, but 48 percent of the Late Boomers are at risk and 56 percent of Generation Xers are at risk.

There are several reasons for the different trends between these two models.<sup>11</sup> However, the most likely difference is the treatment of defined contribution account balances with respect to future time periods. While NRRI projects financial assets in 401(k) plans and other accounts “based on wealth-to-income patterns by age group from the 1983–2004 SCF surveys,”<sup>12</sup> RSPM has been completely revamped since the original 2003 model to account for the trends toward automatic enrollment (AE) in 401(k) plans, automatic escalation of contributions, and the increased utilization of target-date funds (TDFs) whether through qualified default investment accounts (QDIAs) or through participant-directed investments. Holden and VanDerhei (2005) demonstrated the large impact AE would likely have on employees eligible to participate in 401(k) plans, especially at the lower-income quartiles. VanDerhei (September 2007) used the Pension Protection Act (PPA) safe harbors to show how much larger balances in auto-enrolled 401(k) plans would likely be for eligible employees as a result of automatic escalation of employee contributions. VanDerhei and Copeland (2008) used a version of RSPM to model the impact of automatic enrollment and automatic escalation of employee contributions for all workers (whether or not they are currently 401(k) participants or eligible nonparticipants).

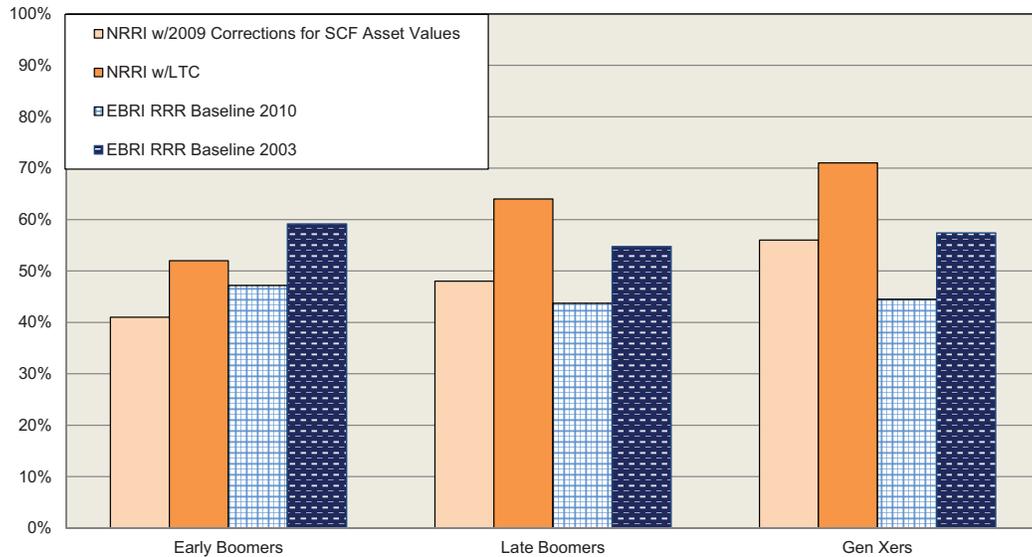
Figures 2 and 3 provide the median post-PPA 401(k) accumulations as a multiple of final earnings for both voluntary enrollment (VE) and AE plans with automatic escalation as a function of current age. The older cohort will have only minimal accumulations due to their proximity to retirement; but even for those currently in their late 50s, the median multiples are approximately twice as large for the AE plans when compared with the VE plans. Differences in type of 401(k) plan obviously have the largest impact on the youngest cohorts, who would have the most time in the work force to experience the difference. For those currently ages 25–29, the difference in the median multiples would be approximately 2.39 times final salary in an AE plan, as opposed to a VE plan, if one assumes that future eligibility is not a function of current eligibility. This value increases to 2.56 times final salary if, instead, one assumes that future eligibility is related to current eligibility.<sup>13</sup>

Finally, VanDerhei (April 2010) uses actual plan-specific data from sponsors that have converted from traditional types of 401(k) plans to AE from 2005 (the year before enactment of PPA) to 2009, inclusive. Previous EBRI research<sup>14</sup> has demonstrated the propensity of defined benefit plan sponsors that have either recently frozen their defined benefit plan or closed it to new employees, or planned to do so soon after the enactment of PPA in 2006, to adopt AE provisions in their 401(k) plans. However, until recently there was little, if any, direct empirical evidence of whether the overall employer contribution rates to AE plans would be more or less generous than their VE counterparts. Figure 4 provides the median post-2009 401(k) accumulations as a multiple of final earnings for both VE plans (with the 2005 plan formulas) and AE plans (with the 2009 plan formulas) as a function of current age. For those currently ages 25–29, the difference in the median multiples would be approximately 4.52 times final salary in an AE plan relative to a VE plan.

Given the extremely large differences in simulated 401(k) balances (and IRA rollovers resulting from 401(k) balances), especially for younger cohorts, it is difficult to understand how a model based primarily on pre-PPA historical behaviors and trends in defined contribution plans would be able to accurately project what 401(k) and IRA balances would accumulate to in the future.

Figure 1  
**Baseline EBRI Retirement Readiness Rating™ (RRR) vs.  
 National Retirement Risk Index (NRRI)**

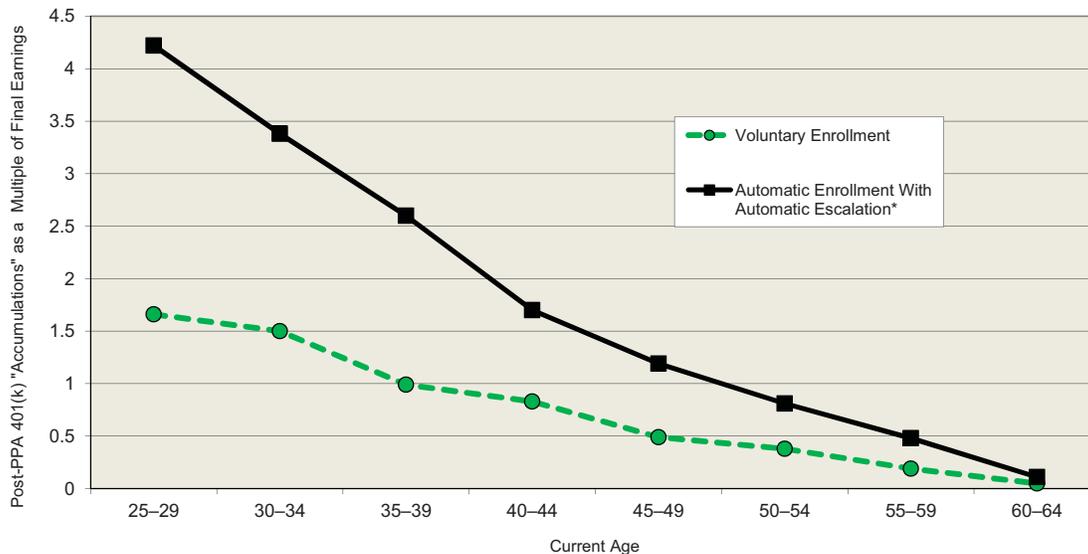
Percentage of population “at risk” for inadequate retirement income,



Sources: EBRI Retirement Security Projection Model™ versions 100504e and 100708e; *The National Retirement Risk Index: After the Crash*, Center for Retirement Research at Boston College, October 2009; *Long-term Care Costs and the National Retirement Risk Index*, Center for Retirement Research at Boston College, March 2009.

Figure 2  
**Auto-Enrollment With Auto-Escalation\*  
 vs. Voluntary Enrollment: 50th Percentiles**

(assuming future eligibility is a function of current eligibility and historic equity returns)

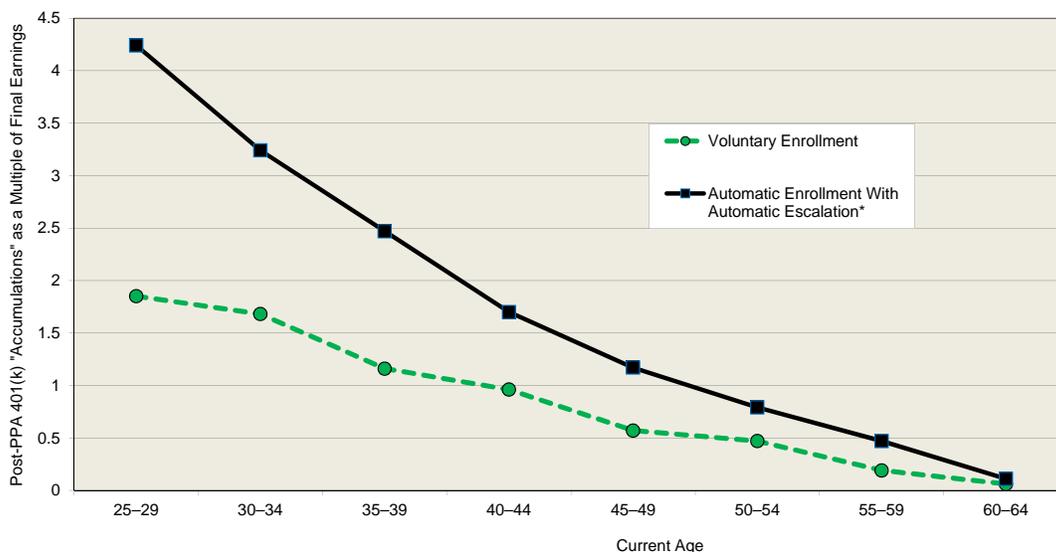


Source: VanDerhei and Copeland (2008).

\* There are several sensitivity analyses for automatic escalation described in this report. This figure assumes the most conservative set of assumptions: viz., that individuals will opt out of future increases as described in the empirical findings presented in VanDerhei (September 2007); that employers will limit the automatic increases to 6 percent of compensation; and that workers will start over from the default contribution when they change jobs.

Figure 3  
**Auto-Enrollment With Auto-Escalation\***  
**vs. Voluntary Enrollment: 50th Percentiles**

(assuming future eligibility is NOT a function of current eligibility and historic equity returns)

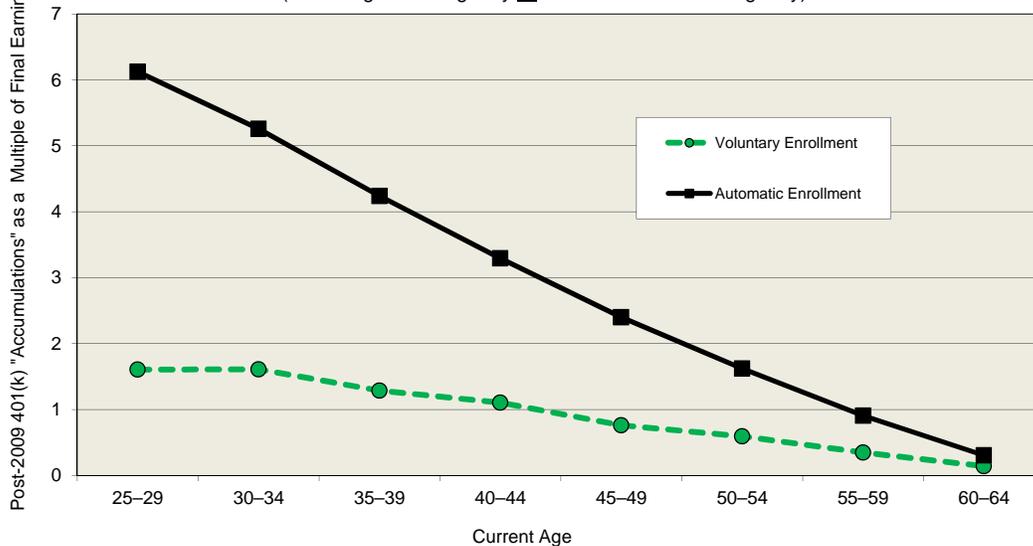


Source: VanDerhei and Copeland (2008).

\* There are several sensitivity analyses for automatic escalation described in this report. This figure assumes the most conservative set of assumptions: viz., that individuals will opt out of future increases as described in the empirical findings presented in VanDerhei (September 2007); that employers will limit the automatic increases to 6 percent of compensation; and that employees will start over from the default contribution when they change jobs.

Figure 4  
**Auto-Enrollment (With 2009 Formulas)**  
**vs. Voluntary Enrollment (With 2005 Formulas): 50th Percentiles**

(assuming future eligibility is IS a function of current eligibility)



Source: EBRI/ERF Retirement Security Projection Model,® versions 100205a1 and 100205b1. See text for explanations of models and assumptions.

A second NRRRI “at-risk” percentage is included for each age cohort in Figure 1. The original NRRRI did not explicitly include health care costs; however, this was modified in 2008 (Munnell et al., 2008), and the overall “at-risk” percentages for 2006 increased from 44 percent to 61 percent as a result. More recently (Munnell et al., March 2009), the NRRRI model was modified to attempt to incorporate long-term care into the model with two alternative strategies:

- Purchasing long-term care insurance.
- Refraining from taking a reverse annuity mortgage, so that housing equity is potentially available to fund long-term care.

The implementation of these alternative strategies in NRRRI produced very similar results, with the overall “at-risk” percentages for 2006 increasing to either 64 or 65 percent. In contrast, since its inception in 2003, RSPM has recognized that very few retirees actually have long-term care insurance and chooses to deal with this potentially catastrophic risk by stochastically generating both frequency and severity functions for each household in each of their 1,000 simulated life paths.<sup>15</sup>

For purposes of historical comparisons, the 2003 Retirement Readiness Ratings are also included in Figure 1. The Retirement Readiness Ratings show there has been a significant decrease in the “at-risk” levels for all three groups between 2003 and 2010, with the largest decrease (12.9 percentage points) experienced by the Gen Xers. The major reason for the large magnitude of these decreases is attributed to the projection of future defined contribution account balances (which would have the largest impact on the youngest group). As mentioned above, the 2010 Retirement Readiness Ratings fully reflect the trend to auto-enrollment, auto-escalation of contributions, and QDIAs as a result of PPA and subsequent regulations. While some plans had already adopted auto-escalation at the time of the 2003 model, the percentage of workers affected was minimal and hence not included in the simulations.

### ***Baseline by Preretirement Income Groups***

Although the 2010 Retirement Readiness Ratings show relatively little change in “at-risk” probability by age cohort, Figure 5 shows a significant impact of the relative level of preretirement income.<sup>16</sup> In this case, households in the lowest one-third when ranked by age-specific preretirement income are simulated to be “at risk” 70.3 percent of the time, while the middle-income group has an “at-risk” percentage of 41.6 percent. This figure drops to 23.3 percent for the highest-income group.

The 2010 Retirement Readiness Ratings show a much greater variation with income group than do similar results produced by NRRRI (Munnell et al., October 2009). In their model, the “at-risk” percentages vary only from 60 percent for the lowest-income group to 42 percent for the highest-income group. Again, there are several reasons to expect significant differences in the results of the two models, but one of the major differences no doubt stems from the two approaches to determine retirement wealth created by 401(k) and other defined contribution plans. RSPM provides annual micro-simulations for participation, contribution, asset allocation, and cash-out behavior, whereas as NRRRI is based solely on point-in-time extrapolations of the wealth-to-income patterns by age group based on historical data from 1983–2004 (a time period prior to virtually all of the experience under auto-enrollment, auto-escalation of contributions, and the creation of QDIAs and the explosive trend in target-date funds).

Again for historical comparisons, the 2003 Retirement Readiness Ratings by income group are included in Figure 5. Both the middle- and high-income cohorts experience a 16 percentage point decrease, while the low-income cohort has a Retirement Readiness Rating that decreases by only 9 percentage points between 2003 and 2010. While this may appear counterintuitive at first given the huge positive impact of auto-enrollment and auto-escalation of contributions on the low income (VanDerhei and Copeland, 2008 and VanDerhei, April 2010), Figure 8 in VanDerhei and Copeland (2010) demonstrates how far many of the lower-income cohorts are from the point they will no longer be classified as “at risk.”

### **Baseline by Future Years of Eligibility in a Defined Contribution Plan**

One of the advantages of a national retirement income adequacy model based on micro-simulation data such as RSPM is the ability to correlate statistics such as the “at-risk” percentages with other outcomes for the simulated households. Figure 6 provides an example of the large extent to which “at-risk” percentages are associated with the years of future eligibility in defined contribution plans. The “at-risk” percentages are categorized for each of the three age cohorts into one of the following levels, based on future years of eligibility (whether or not the employee actually chose to participate in a VE plan or opted out of an AE plan):

- Zero years of future eligibility.
- 1–9 years.
- 10–19 years.
- 20 or more years.

Given their current ages and the assumption under the runs in VanDerhei and Copeland (2010) that everyone retires at age 65, Early Boomers obviously can be in only one of the first two levels. When the results for this age cohort are bifurcated by future eligibility in a defined contribution plan, the difference in the “at-risk” percentages is quite large (16 percentage points), even after at most nine years of future eligibility. Late Boomers and Gen Xers are able to have significantly larger future periods of time eligible to participate in a defined contribution plan and therefore the differences are much larger. Late Boomers with no future eligibility are simulated to have an “at-risk” level 26 percentage points larger than those with 10–19 future years of eligibility. Gen Xers obviously have the largest differential (40 percentage points): Those with no future years of eligibility have an “at-risk” level of 60 percent, compared with only 20 percent for those with 20 or more years of eligibility.

### **Analyzing the Importance of Retirement Age**

Previous EBRI research into retirement income adequacy<sup>17</sup> analyzed the percentage of households at risk for insufficient retirement income as well as how much more at-risk households would need to save to achieve adequacy for a specified percentage of simulated retirements. Figures 20–22 in VanDerhei and Copeland (2010) present additional savings (expressed as a percentage of compensation) needed to achieve various probabilities of success for retirement age at 65. Unfortunately, the results for many combinations of age/income cohorts would be too high to be feasible.

If additional savings will not be sufficient for some households, it is possible that they may defer retirement age instead. The next section of this report will explore the likely impact on retirement income adequacy of taking this action, but it should be stressed that deferring retirement age will not always be feasible. For example, health problems of either the worker or the spouse may prevent this from happening or a suitable job for the worker’s skills may not be available. The Retirement Confidence Survey has consistently found that a large percentage of retirees leave the work force earlier than planned, and 45 percent of retirees reported in 2011 that they were in this situation.<sup>18</sup>

Prior to analyzing the impact of deferring retirement age, the 2010 version of the RSPM was updated with financial market information to January 1, 2011, and several employee behavior assumptions were updated from industry studies. A new subroutine was added to the 2011 version of the RSPM that would allow the expansion of the household’s accumulation period (i.e., the time in the work force prior to retirement) to be expanded beyond age 65. Unfortunately, this required the need for many wage and benefit assumptions for very elderly workers in areas where empirical data are quite limited. Therefore, this analysis starts with a set of assumptions that would be most favorable to deferring retirement age:<sup>19</sup>

- Wages:
  - No age/wage curves were assumed to exist after age 64; instead, it was assumed that the worker’s wages grow at average national wage growth.
- Job change, disability, unemployment:

- This was assumed to not take place after age 64.
- Nursing home or home health care expenses for the worker:
  - It was assumed that these costs are not incurred prior to retirement.
- Defined contribution plans:
  - In terms of employee contributions, it was assumed that the age 64 participating status and contribution rate is continued until retirement age. Implicitly, this means that any employee in an AE plan with auto-escalation has the escalation feature turned off at age 65.
  - For employer contributions, match rates are assumed to remain constant and nonelective contributions continue at the age 64 contribution rate.
- Social Security:
  - Initial receipt is deferred until the earlier of retirement age or age 70.<sup>20</sup>

### **The Impact of Deferring Retirement Age on Retirement Income Adequacy**

Figure 7 shows the value of deferring retirement age for Baby Boom and GenX households assuming that a 50 percent probability of “success” is sufficient (where success is defined as not running short of money in retirement). For the lowest preretirement income quartile, only 29.6 percent of these households would have sufficient resources to not run short of money in retirement 50 percent of the time; however, this increases to 34.6 percent if retirement is deferred until age 67 and 46.5 percent if retirement is deferred until age 69. The incremental increase in the percentage of households in the lowest preretirement income quartile having at least a 50 percent probability of success levels off for several years (in large part due to the elimination of the delayed retirement credits under Social Security) but then picks up again after age 75. Approximately one-half (49.1 percent) of the lowest preretirement income quartile households retiring at age 75 would have at least a 50 percent probability of success, but that increases to 61.7 percent at age 80 and 90.2 percent at age 84.

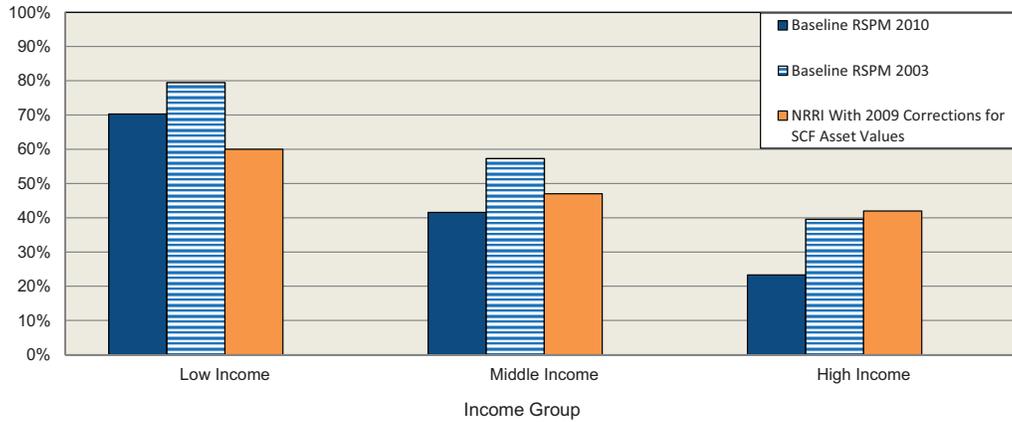
Given that the other preretirement income quartiles will start with a larger percentage of households achieving the 50 percent probability of success threshold in Figure 7, there will be less dramatic impacts (in terms of the additional households satisfying the thresholds). Focusing on the highest preretirement income threshold, 89.1 percent already have at least a 50 percent probability of success by age 65. This value increases to 94.5 percent by age 69 but then levels off for several years before finally reaching 98.4 percent age at 84.

The value of deferring retirement age on retirement income adequacy for the second and third preretirement income quartiles falls between these two extremes. In both cases, though, a significant percentage of the households that do not meet the 50 percent success threshold by age 65 will meet it if they defer retirement age until 69. For example, 39.4 percent of the households in the second preretirement income quartile do not meet the 50 percent success threshold at age 65, but that number decreases to 24.4 percent at age 69. In other words, 38 percent of the households not able to satisfy the threshold at age 65 will be able to satisfy it by age 69. The results are even more dramatic for the third preretirement income quartile, with 44 percent of these households that were not able to satisfy the threshold at age 65 being able to satisfy it by age 69.<sup>21</sup>

Figure 8 provides a similar analysis, although in this case the threshold for success increases to having adequate retirement income for at least 70 percent of the simulated life paths in retirement. As expected, each of the four lines from the Figure 7 will fall, given that fewer households will be able to meet the more stringent threshold at any specific retirement age. Only 6.0 percent of the households in the lowest preretirement income quartile will meet this new threshold of success (compared to 29.6 percent under the 50 percent threshold). By deferring retirement to age 69, 14.9 percent of these households would meet the 70 percent threshold (or an additional 9 percent of these households that had not met the threshold at age 65 would meet it by age 69). A total of 39.2 percent of the households in the lowest preretirement income quartile would meet the 70 percent threshold by age 84.

**Figure 5**  
**Impact of Income Group on At-Risk\* Probability**

Percentage of population "at risk" for inadequate retirement income, by age-specific remaining career income group (baseline assumptions)

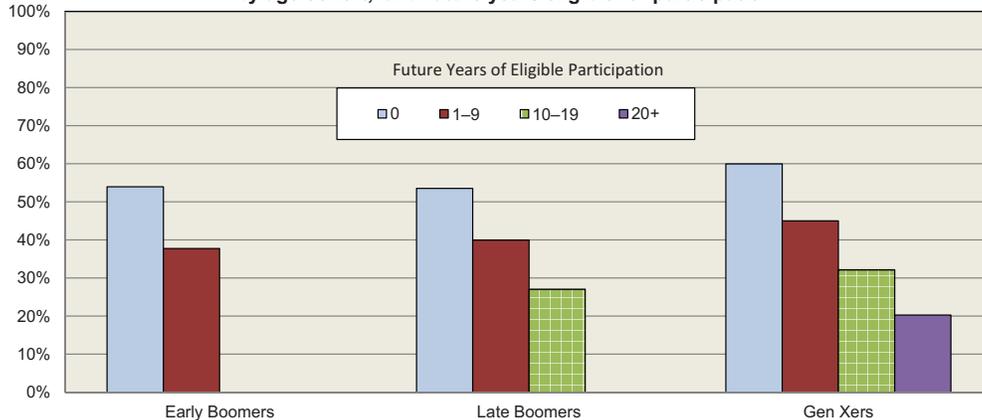


Source: EBRI Retirement Security Projection Model® versions 100504e and 100708e, and "The National Retirement Risk Index: After the Crash," Center for Retirement Research at Boston College, October 2009.

\* An individual or family is considered to be "at risk" in this version of the model if their aggregate resources in retirement are not sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen) and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

**Figure 6**  
**Impact of Age and Future Years Eligible for Participation in a Defined Contribution Plan on At-Risk\* Probabilities**

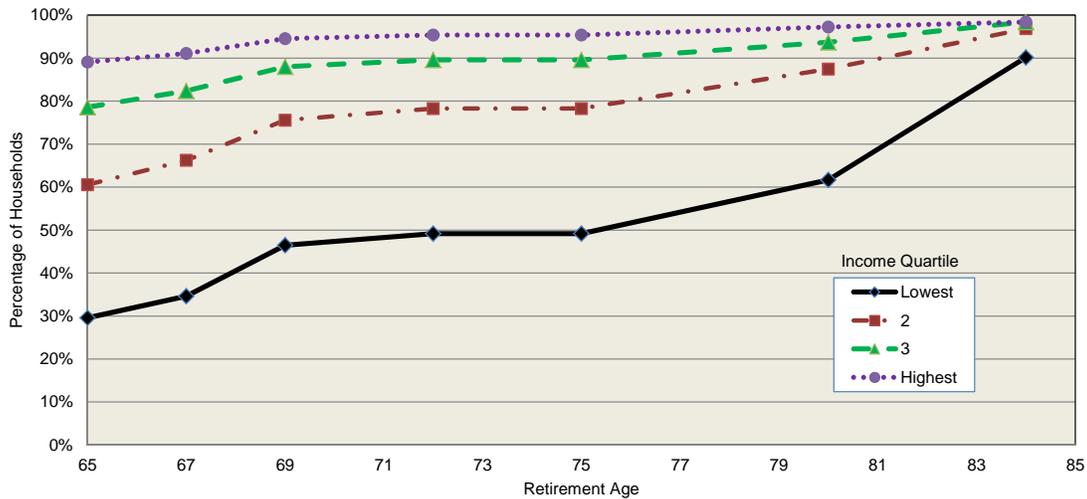
Percentage of population "at risk" for inadequate retirement income, by age cohort, and future years eligible for participation



Source: EBRI/ERF Retirement Security Projection Model® version 100504e.

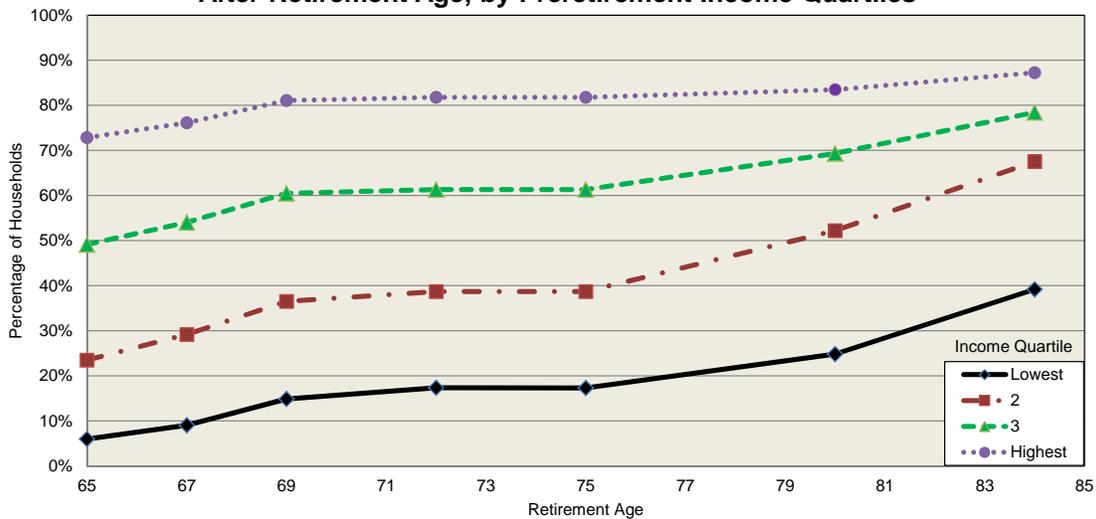
\* An individual or family is considered to be "at risk" in this version of the model if their aggregate resources in retirement are not sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living, and other ad hoc thresholds.

**Figure 7**  
**Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 50% of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles**



Source: EBRI Retirement Security Projection Model® version 110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

**Figure 8**  
**Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 70% of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles**



Source: EBRI Retirement Security Projection Model® version 110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

A total of 23.5 percent of the households in the second preretirement income quartile would be able to satisfy the 70 percent threshold if they retired at age 65. This value increases to 36.5 percent at age 69 (or an additional 17 percent of these households that had not met the threshold at age 65 would meet it by age 69).

A total of 49.1 percent of the households in the third preretirement income quartile would be able to satisfy the 70 percent threshold if they retired at age 65. This value increases to 60.5 percent at age 69 (or an additional 22 percent of these households that had not met the threshold at age 65 would meet it by age 69).

A total of 75.9 percent of the households in the highest preretirement income quartile would be able to satisfy the 70 percent threshold if they retired at age 65. This value increases to 81.1 percent at age 69 (or an additional 30 percent of these households that had not met the threshold at age 65 would meet it by age 69).

Figure 9 provides a similar analysis, although in this case the threshold for success increases to having adequate retirement income for at least 80 percent of the simulated life paths in retirement. Less than 1 percent of the households in the lowest preretirement income quartile will meet this threshold. By deferring retirement to age 69, 1.3 percent of these households would meet the 80 percent threshold (or less than 1 percent of these households that had not met the threshold at age 65 would meet it by age 69).

A total of 10.3 percent of the households in the second preretirement income quartile would be able to satisfy the 80 percent threshold if they retired at age 65. This value increases to 15.3 percent at age 69 (or an additional 6 percent of these households that had not met the threshold at age 65 would meet it by age 69).

A total of 33.2 percent of the households in the third preretirement income quartile would be able to satisfy the 80 percent threshold if they retired at age 65. This value increases to 40.6 percent at age 69 (or an additional 11 percent of these households that had not met the threshold at age 65 would meet it by age 69).

A total of 61.2 percent of the households in the highest preretirement income quartile would be able to satisfy the 80 percent threshold if they retired at age 65. This value increases to 68.7 percent at age 69 (or an additional 19 percent of these households that had not met the threshold at age 65 would meet it by age 69).

## **The Value of Participating in a Defined Contribution Plan After Age 64**

Given the current baseline assumptions of no job change after age 64, the importance of participating in a defined contribution plan after age 64 could be substantial. This is investigated in Figures 10, 11, and 12 by bifurcating several combinations of retirement age and preretirement income quartiles into those participating in a defined contribution plan after age 64 and those that are not and computing the differences in the percentages. Figure 10 provides the analysis for the 50 percent probability of success threshold. In this case, the numbers are largest for age 65 and decline to differences of 6 percentage points or less for age 84. However, two points must be considered when interpreting these results. First, the differences at age 65 are not due to additional accumulations after age 65, but to the fact that to have participated in a defined contribution plan at 65 means that the household must have been a participant at age 64 (and likely for several years prior to that time, depending on the simulated tenure for the last job). Second, the absolute differences for values at age 84 would be expected to be quite small given that the aggregated results at that age in Figure 7 are all over 90 percent.

Figures 13, 14 and 15 are used to deal with the second point above. Instead of taking the simple difference (for each combination of retirement age and preretirement income quartile) of percentage of households satisfying the threshold success probability assuming a defined contribution plan minus of percentage of households satisfying the threshold success probability assuming no defined contribution plan, a ratio was computed where this difference is the numerator and the denominator is the value (1- percentage of households satisfying the threshold success probability assuming no defined contribution plan). In essence, this value can be conceptualized as the ratio of those households NOT satisfying the threshold probability of success without a defined contribution plan that are able to satisfy it with a defined contribution plan.

For example, when the 29.6 percent aggregate value for the lowest preretirement income quartile at retirement age 65 is bifurcated for a 50 percent success rate, the corresponding values are 35.2 percent for those participating in a defined contribution plan and 21.4 percent for those not participating in a defined contribution plan. This difference of 13.8 percent is the value of the first bar in Figure 10. When the 13.8 percent is divided by the percentage of these households without a defined contribution plan who have NOT satisfied the 50 percent success threshold (100 percent – 21.4 percent = 78.6 percent) the resulting ratio is 13.8 percent/78.6 percent, or 17.6 percent (the first bar in Figure 13). This relative value for the lowest preretirement income quartile increases for each retirement age modeled in Figure 13 (22.6 percent at age 69, 27.6 percent age 75, and 44.3 percent at age 84). Given that larger percentages of higher preretirement income quartile households satisfy the 50 percent threshold, the same absolute increase in percentage of households satisfying the threshold as a result of defined contribution participation after age 64 will result in a larger relative increase. This is exactly what is found in Figures 13 through 15 as the relative values for each retirement age are monotonically increasing with an increase in preretirement income quartile.

Figure 14 provides results from a similar analysis to Figure 13; however, the threshold in this case is set at 70 percent. The relative increase in each case is smaller than it was for the 50 percent threshold but the overall trends are similar. Figure 15 repeats this analysis with an 80 percent threshold. Again, the relative increases are smaller than in the previous analyses but with similar overall trends.

## The Impact of Nursing Home and Home Health Care Costs on the Results

Previous EBRI research has demonstrated the extreme importance of nursing home and home health care costs on retirement income adequacy. VanDerhei (March 2005) evaluated the impact of purchasing long-term care insurance on retirement income adequacy and VanDerhei (September 2006) enhanced the EBRI interactive Ballpark E\$timate<sup>®</sup> worksheet by providing Monte Carlo simulations of the necessary replacement rates needed for specific probabilities of retirement income adequacy under alternative risk management treatments using a series of “building blocks” to isolate the impact of nursing home and home health care costs. More recently, VanDerhei (October 2010) analyzed the average individual retirement income deficit with and without these stochastic health components.

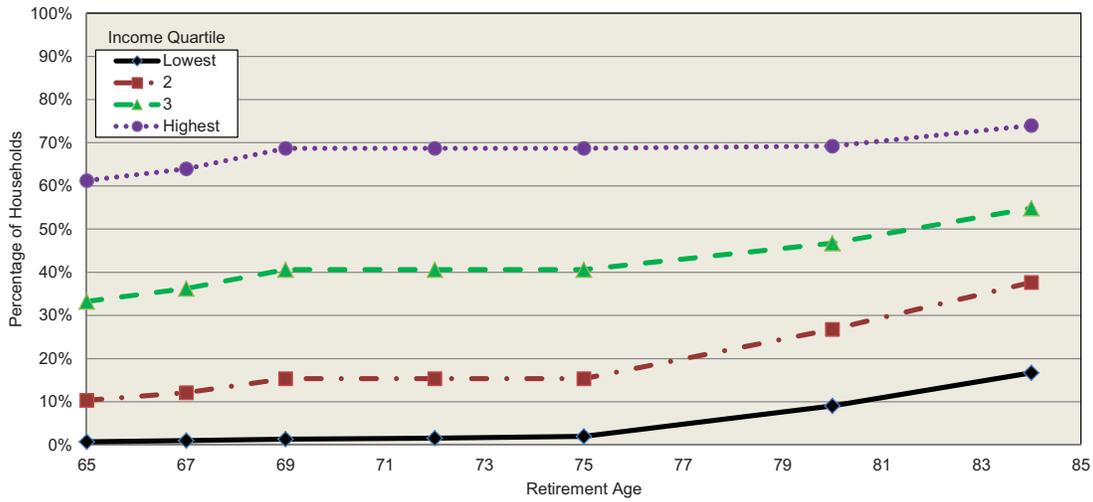
Figure 16 examines the impact of excluding nursing home and home health care costs at retirement ages 65 and 84, by preretirement income quartile for a 50 percent probability of success. Although the percentage of households meeting the 50 percent success threshold is slightly larger in each of the four preretirement income quartiles at retirement age 65, the differences become minimal by retirement age 84.

Figure 17 repeats the analysis with a threshold success probability of 70 percent. The percentage of households with sufficient retirement income at least 70 percent of the time is now significantly larger when nursing home and home health care costs are excluded in each case but especially for the earlier retirement age and the lower preretirement income quartiles. Similar findings for an 80 percent success probability are displayed in Figure 18.

The impact of these stochastic health care costs on the value of deferring retirement age can be seen by performing a pairwise comparison of the differences in the percentage of households with adequate retirement income at retirement age 65 vs. retirement age 84. For example, in Figure 16, the percentage point difference between the households with adequate retirement income at least 50 percent of the time at a retirement age of 84 vs. 65 is a relatively small improvement of 60.6 percent (with nursing home costs) vs. 56.3 percent (without them) for the lowest preretirement income quartile. However, the relative percentage point difference is much more important for the highest preretirement income quartile, as the value decreases from 9.4 percent difference between age 84 and age 65 retirement ages with these costs to 4.1 percent without them.

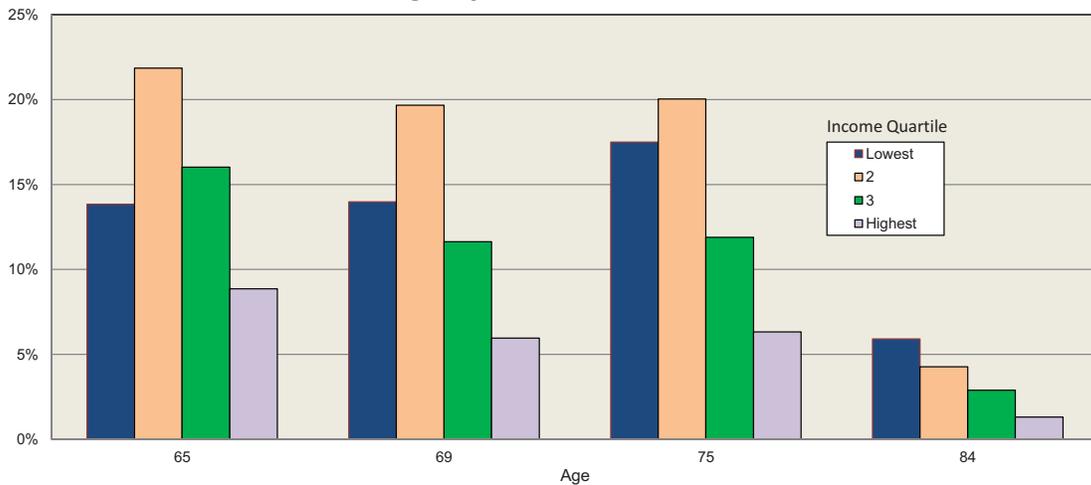
Moving to the 70 percent probability thresholds in Figure 17 produces significant differences even for the lowest preretirement income quartile, as the value decreases from 33.2 percent difference between age 84 and age 65 retirement ages with these costs to 18.7 percent without them. Again, the relative differences are even more extreme for the highest preretirement income quartile, as the value decreases from 14.4 percent difference between age 84 and age 65 retirement ages with these costs to only 3.1 percent without them.

Figure 9  
**Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 80% of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles**



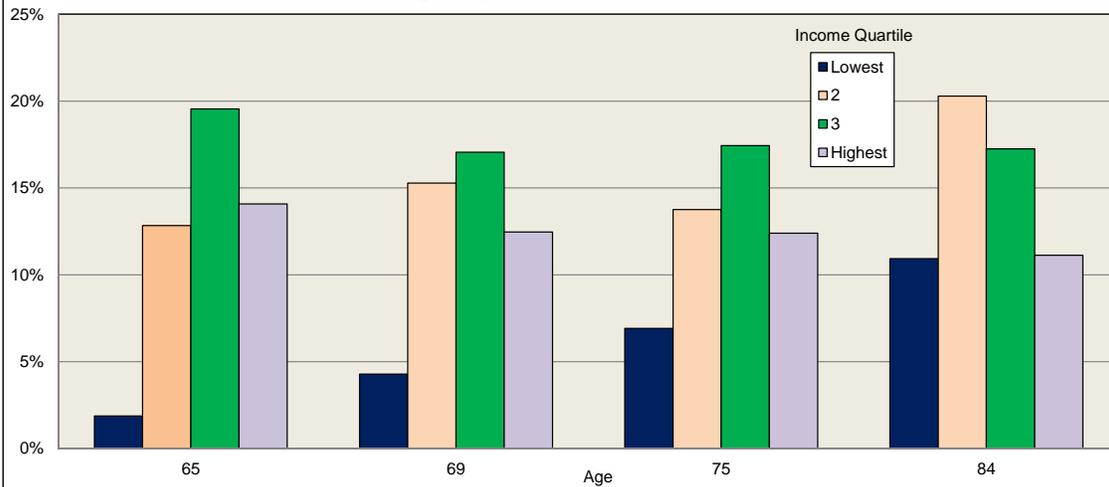
Source: EBRI Retirement Security Projection Model® version 110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

Figure 10  
**Value of DC Participation After Age 64: Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 50% of Simulated Life Paths After Retirement Age, by Preretirement Income Quartiles**



Source: EBRI Retirement Security Projection Model® version 110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

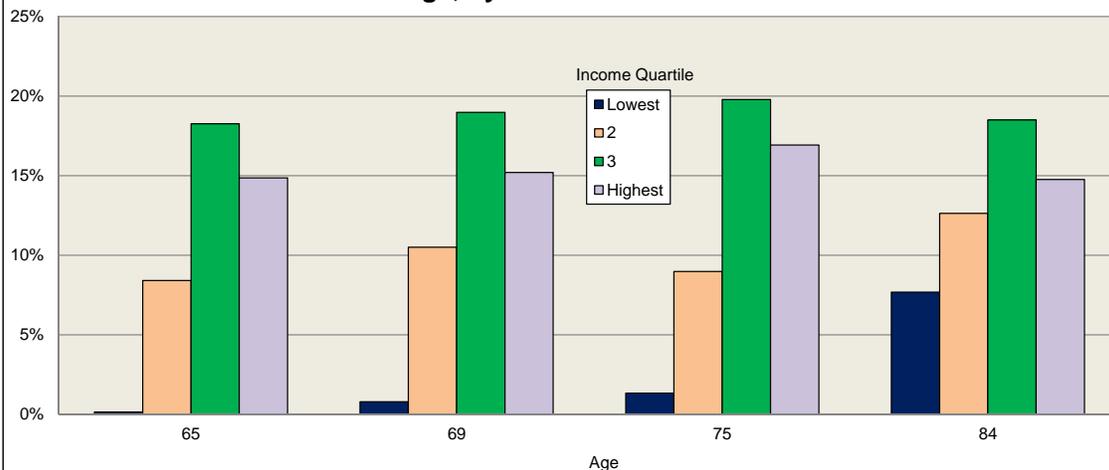
**Figure 11**  
**Value of DC Participation After Age 64: Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 70% of Simulated Life Paths After Retirement Age, by Preretirement Income Quartile**



Source: EBRI Retirement Security Projection Model® version110410i.

\* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

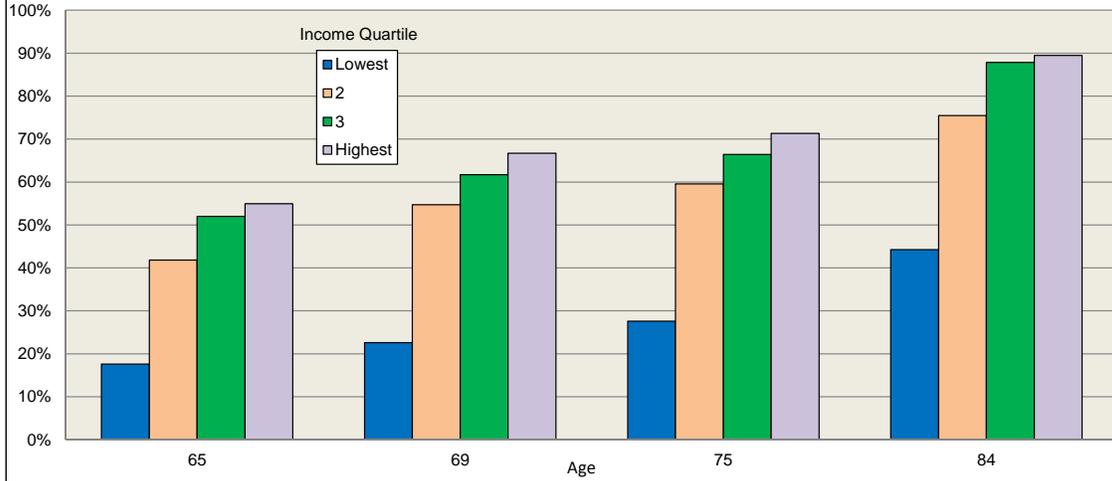
**Figure 12**  
**Value of DC Participation After Age 64: Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 80% of Simulated Life Paths After Retirement Age, by Preretirement Income Quartile**



Source: EBRI Retirement Security Projection Model® version110410i.

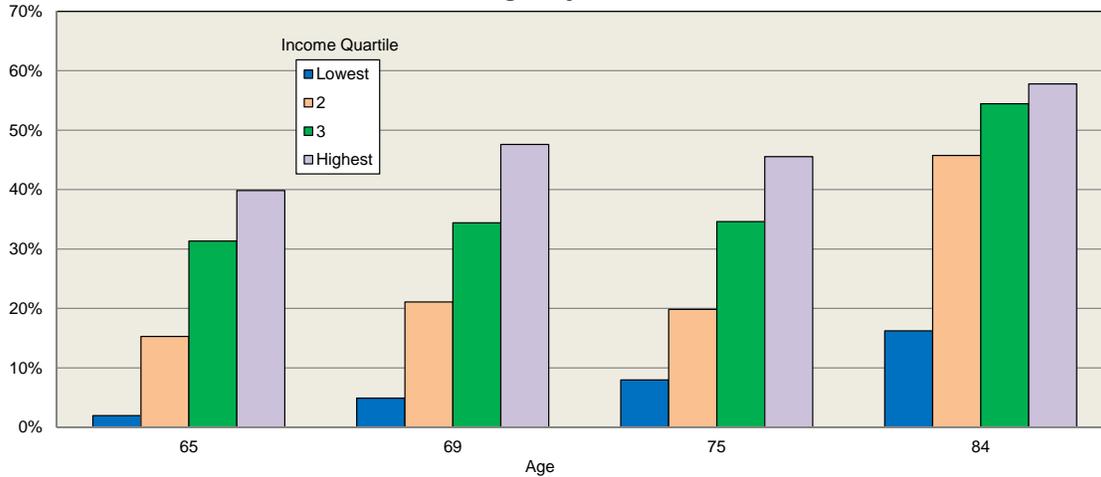
\* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

**Figure 13**  
**Value of DC Participation After Age 64: Relative Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 50% of Simulated Life Paths After Retirement Age, by Preretirement Income**



Source: EBRI Retirement Security Projection Model® version 110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

**Figure 14**  
**Value of DC Participation After Age 64: Relative Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 70% of Simulated Life Paths After Retirement Age, by Preretirement Income**



Source: EBRI Retirement Security Projection Model® version 110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

For those desiring at least an 80 percent probability of success, Figure 18 shows that the value of deferring retirement age (even as much as 20 years) for those with at least an 80 percent probability of success decreases considerably when the impact of stochastic health care costs are excluded. For the lowest preretirement income quartile, the value of deferral (in terms of percentage of additional households that will meet the threshold by deferring retirement age from 65 to 84) decreases from 16.0 percent to 3.8 percent by excluding these costs. The highest preretirement income quartile experiences a similar decrease, from 12.8 percent to 2.6 percent.<sup>22</sup>

## Summary and Conclusion

The EBRI Retirement Security Projection Model<sup>®</sup> (RSPM) was developed in 2003 to provide an assessment of national retirement income prospects. The model was updated in 2010 using more recent data and incorporating retirement plan changes (e.g., auto-enrollment, auto-escalation of contributions, and diversified default investments resulting from the Pension Protection Act of 2006) as well as updates for financial market performance and employee behavior (based on a database of 20 million 401(k) participants). The model produced Retirement Readiness Ratings for age and income cohorts to determine what percentage of households would likely be “at risk” of having inadequate retirement income.

Since the genesis of this project in the late 1990s, the model had always assumed a retirement age of 65. While there was abundant evidence of many individuals retiring earlier (e.g., as soon as they became eligible for Social Security retirement benefits at age 62), the model was constructed to measure the households probability of retirement income adequacy if this temptation were avoided and retirement deferred to age 65. However, even with this admittedly optimistic assumption, the results in both 2003 and 2010 showed that the median additional percentage of compensation that would be required for retirement income adequacy at more than a 50 percent probability would exceed 25 percent of compensation annually (until age 65) for many age/income combinations.

As a result, the 2011 version of RSPM added a new feature that would allow households to defer retirement age past age 65<sup>23</sup> in an attempt to determine whether retirement age deferral is indeed sufficiently valuable to mitigate retirement income adequacy problems for most households (assuming the worker is physically able to continue working and that there continues to be a suitable demand for his or her skills). The answer, unfortunately, is not always “yes,” even if retirement age is deferred into the 80s.

Using the threshold of retirement income adequacy described above (essentially sufficient retirement income to pay for basic retirement expenses and uninsured medical costs for the entire retirement period), RSPM baseline results indicate that the lowest preretirement income quartile would need to defer retirement age to 84 before 90 percent of the households would have a 50 percent probability of success. Although a significant portion of the improvement takes place in the first four years after age 65, the improvement tends to level off in the early 70s before picking up in the late 70s and early 80s. Households in higher preretirement income quartiles start at a much higher level, and therefore have less improvement in terms of additional households reaching a 50 percent success rate as retirement age is deferred for these households.

The problem with using a 50 percent probability of success, of course, is that the household is in a position where they will “run short of money” in retirement one chance out of two. While most households (at least those that are cognizant of these risks) are likely to have a risk aversion level that would make this untenable, switching to a higher probability of success will significantly reduce the percentage of households capable of satisfying the threshold at any given retirement age. For example, if the success rate is moved to a threshold of 70 percent, only 2 out of 5 households in the lowest-income quartile will attain retirement income adequacy even if they defer retirement age to 84. Increasing the threshold to 80 percent reduces the number of lowest preretirement income quartile households that can satisfy this standard at a retirement age of 84 to approximately 1 out of 7.

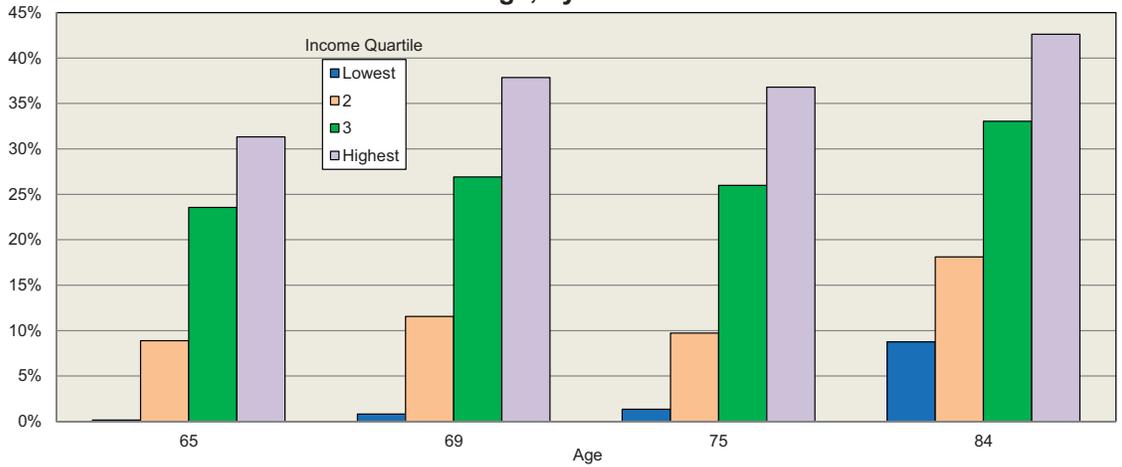
One of the factors that makes a major difference in the percentage of households satisfying the retirement income adequacy thresholds at any retirement age is whether the worker is still participating in a defined contribution plan after age 65. The increase in the percentage of households that are predicted to have adequate retirement income as a

result of defined contribution participation varies by retirement age, preretirement income quartile and probability of retirement income adequacy, but this factor results in at least a 10 percentage point difference in the majority of the retirement age/income combinations investigated. The results are even more striking when the value of defined contribution participation after age 64 is viewed as the relative increase in the percentage of households simulated to have adequate retirement income (see Figures 13–15).

Another factor that has a tremendous impact on the value of deferring retirement age is whether stochastic post-retirement health care costs are excluded (or the stochastic nature is ignored). In essence, the true value of deferring retirement age is substantially muted if the full stochastic nature of nursing home and home health care costs is not appropriately modeled. This is especially true for those desiring a high probability of a successful retirement. Figure 18 shows that the value of deferring retirement age (even as much as 20 years), as those with at least an 80 percent probability of success decreases considerably when the impact of stochastic health care costs are excluded. For the lowest preretirement income quartile, the value of deferral (in terms of percentage of additional households that will meet the threshold by deferring retirement age from 65 to 84) decreases from 16.0 percent to 3.8 percent by excluding these costs. The highest preretirement income quartile experiences a similar decrease, from 12.8 percent to 2.6 percent.

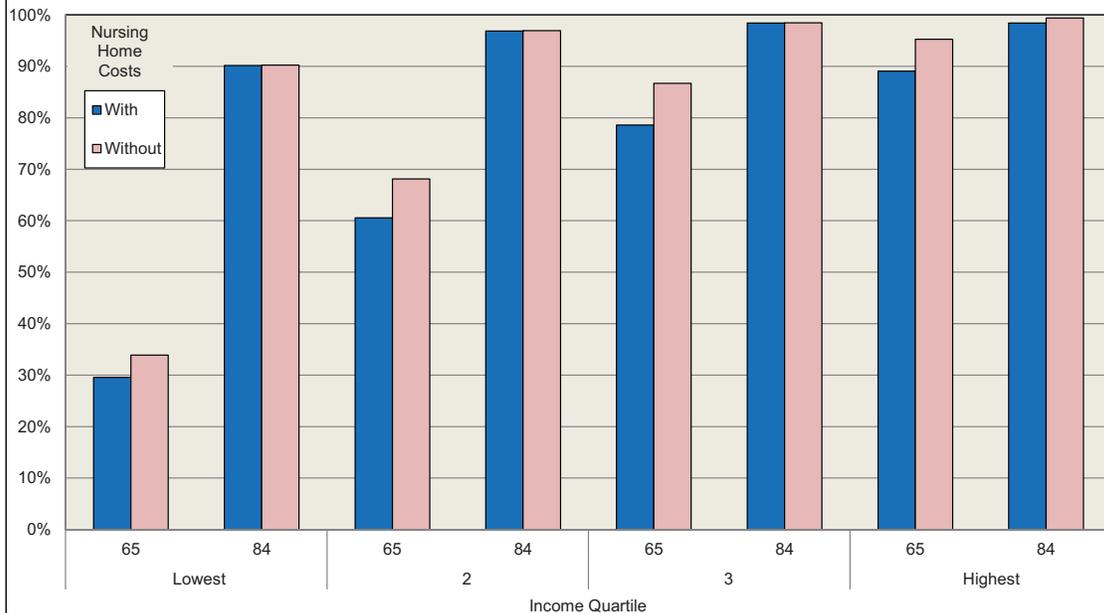
In conclusion, this *Issue Brief* used the RSPM to provide an initial estimate of just how valuable deferring retirement age might be in terms of retirement income adequacy for Baby Boomers and Gen Xers. Given the paucity of data with respect to many wage and benefit conditions for workers beyond age 65, several assumptions with little empirical verification were needed to produce the initial results. In most cases,<sup>24</sup> the assumptions made were optimistic in terms of their impact on the value of deferring retirement age. Therefore, the percentages of households with adequate retirement income in Figures 7–9 should be seen as a best-case estimate, especially at the more advanced retirement ages.

**Figure 15**  
**Value of DC Participation After Age 64: Relative Increase in the Percentage of Baby Boom and Gen X Households Simulated to Have Adequate\* Retirement Income for at Least 80% of Simulated Life Paths After Retirement Age, by Preretirement Income**



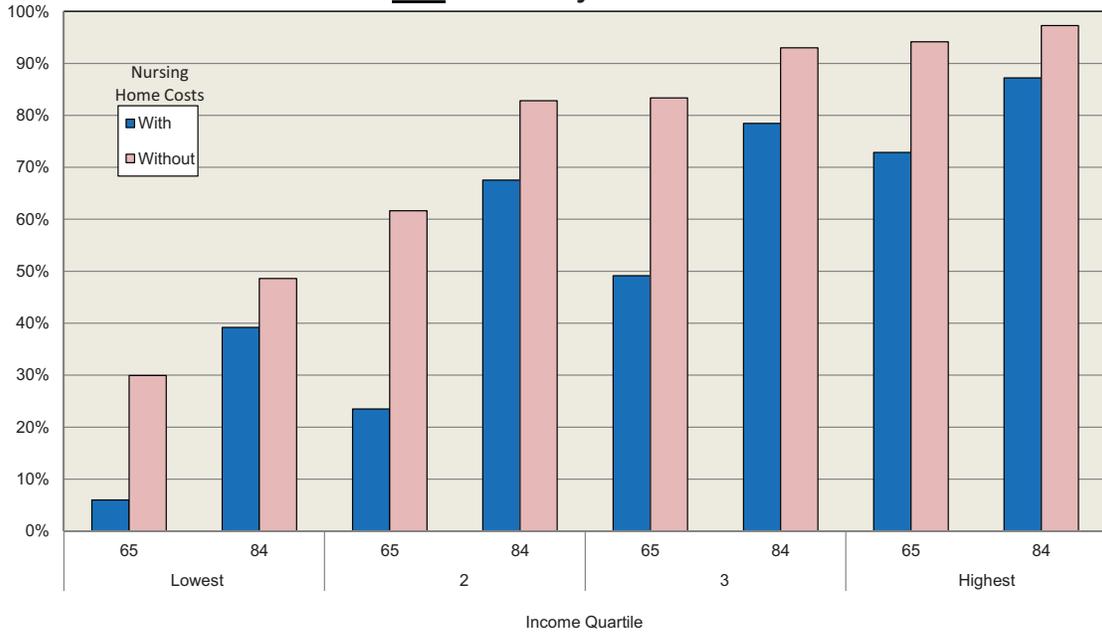
Source: EBRI Retirement Security Projection Model® version110410i.  
 \* An individual or family is considered have "adequate" retirement income in this version of the model if their aggregate resources in retirement are sufficient to meet aggregate minimum retirement expenditures defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of income) and some health insurance and out-of-pocket health-related expenses, plus stochastic expenses from nursing home and home health care expenses (at least until the point they are picked up by Medicaid). The resources in retirement will consist of Social Security (either status quo or one of the specified reform alternatives), account balances from defined contribution plans, IRAs and/or cash balance plans, annuities from defined benefit plans (unless the lump-sum distribution scenario is chosen), and (in some cases) net housing equity (either in the form of an annuity or as a lump-sum distribution). This version of the model is constructed to simulate "basic" retirement income adequacy; however, alternative versions of the model allow similar analysis for replacement rates, standard-of-living and other ad hoc thresholds.

**Figure 16**  
**Impact of Excluding Nursing Home Costs at Retirement**  
**Ages 65 and 84, by Preretirement Income Quartile:**  
**50% Probability of Success**



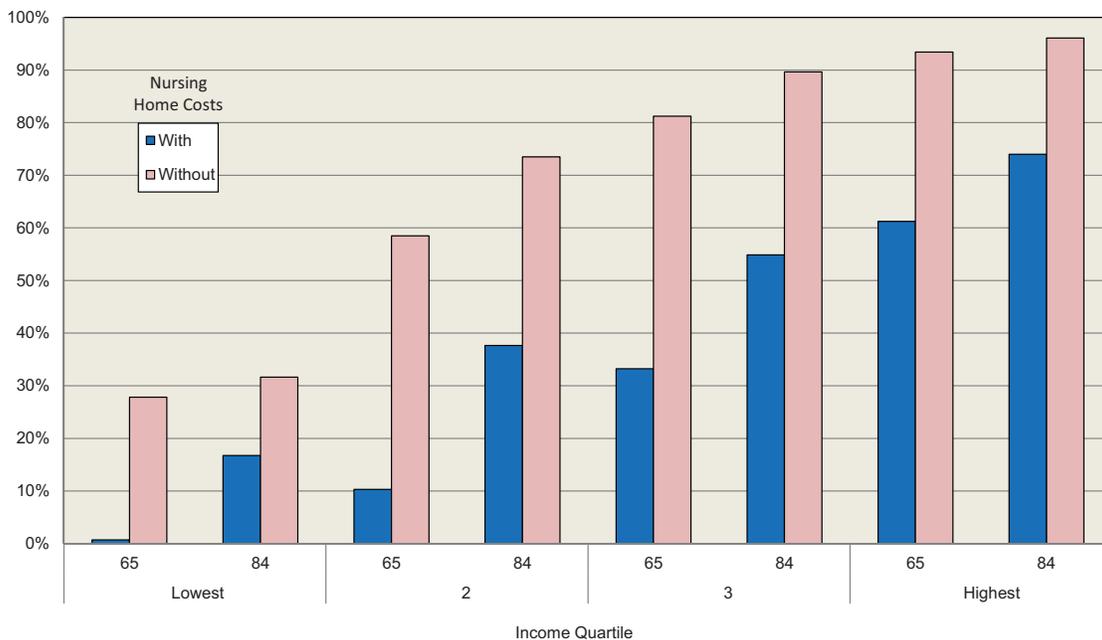
Source: EBRI Retirement Security Projection Model® version 110410i.

**Figure 17**  
**Impact of Excluding Nursing Home Costs at Retirement**  
**Ages 65 and 84, by Preretirement Income Quartile:**  
**70% Probability of Success**



Source: EBRI Retirement Security Projection Model® version 110410i.

**Figure 18**  
**Impact of Excluding Nursing Home Costs at Retirement**  
**Ages 65 and 84, by Preretirement Income Quartile:**  
**80% Probability of Success**



Source: EBRI Retirement Security Projection Model® version 110410i.

## Appendix

### ***Brief Chronology of RSPM***

The original version of Retirement Security Projection Model<sup>®</sup> (RSPM) was used to analyze the future economic well-being of the retired population at the state level. The Employee Benefit Research Institute and the Milbank Memorial Fund, working with the governor of Oregon, set out to see if this situation could be addressed for Oregon. The analysis<sup>25</sup> focused primarily on simulated retirement wealth with a comparison to ad hoc thresholds for retirement expenditures, but the results made it clear that major decisions lie ahead if the state's population is to have adequate resources in retirement.

Subsequent to the release of the Oregon study, it was decided that the approach could be carried to other states as well. Kansas and Massachusetts were chosen as the next states for analysis. Results of the Kansas study were presented to the state's Long-Term Care Services Task Force on July 11, 2002,<sup>26</sup> and the results of the Massachusetts study were presented on Dec. 1, 2002.<sup>27</sup> With the assistance of the Kansas Insurance Department, EBRI was able to create Retirement Readiness Ratings based on a full stochastic decumulation model that took into account the household's longevity risk, post-retirement investment risk, and exposure to potentially catastrophic nursing home and home health care risks. This was followed by the expansion of RSPM, as well as the Retirement Readiness Ratings produced by it, to a national model and the presentation of the first micro-simulation retirement income adequacy model built in part from administrative 401(k) data at the EBRI December 2003 policy forum.<sup>28</sup> The basic model was then modified for Senate Aging testimony in 2004 to quantify the beneficial impact of a mandatory contribution of 5 percent of compensation.<sup>29</sup>

The first major modification of the model occurred for the EBRI May 2004 policy forum. In an analysis to determine the impact of annuitizing defined contribution and IRA balances at retirement age, VanDerhei and Copeland (2004) were able to demonstrate that for a household seeking a 75 percent probability of retirement income adequacy, the additional savings that would otherwise need to be set aside each year until retirement to achieve this objective would decrease by a median amount of 30 percent. Additional refinements were introduced in 2005 to evaluate the impact of purchasing long-term care insurance on retirement income adequacy.<sup>30</sup>

The model was next used in March of 2006 to evaluate the impact of defined benefit freezes on participants by simulating the minimum employer contribution rate that would be needed to financially indemnify the employees for the reduction in their expected retirement income under various rate-of-return assumptions.<sup>31</sup> Later that year, an updated version of the model was developed to enhance the EBRI interactive Ballpark E\$timate<sup>®</sup> worksheet by providing Monte Carlo simulations of the necessary replacement rates needed for specific probabilities of retirement income adequacy under alternative risk management treatments.<sup>32</sup>

RSPM was significantly enhanced for the May 2008 EBRI policy forum by allowing automatic enrollment of 401(k) participants with the potential for automatic escalation of contributions to be included.<sup>33</sup> Additional modifications were added in 2009 for a Pension Research Council presentation that involved a winners/losers analysis of defined benefit freezes and the enhanced defined contribution employer contributions provided as a quid pro quo.<sup>34</sup>

A new subroutine was added to the model to allow simulations of various styles of target-date funds for a comparison with participant-directed investments in 2009.<sup>35</sup> In April 2010, the model was completely reparameterized with 401(k) plan design parameters for sponsors that have adopted automatic enrollment provisions.<sup>36</sup> A completely updated version of the national model was produced for the May 2010 EBRI policy forum and used in the July 2010 *Issue Brief*.<sup>37</sup>

The new model was used to analyze how eligibility for participation in a defined contribution plan impacts retirement income adequacy in September 2010.<sup>38</sup> It was also used to compute Retirement Savings Shortfalls for Boomers and Gen Xers in October 2010.<sup>39</sup>

In October 2010 testimony before the Senate Health, Education, Labor and Pensions Committee, on “The Wobbly Stool: Retirement (In)security in America,” the model was used to analyze the relative importance of employer-provided retirement benefits and Social Security.<sup>40</sup>

In February 2011, the model was used to analyze the impact of the 2008/9 crisis in the financial and real estate markets on retirement income adequacy.<sup>41</sup>

Finally, an April 2011 article introduced a new method of analyzing the results from the RSPM.<sup>42</sup> Instead of simply computing an overall percentage of the simulated life paths in a particular cohort that will not have sufficient retirement income to pay for the simulated expenses, the new method computes what percentage of the households will meet that requirement more than a specified percentage of times in the simulation.

### ***Retirement Income and Wealth Assumptions***

RSPM is based in part on a 13-year time series of administrative data from several million 401(k) participants and tens of thousands of 401(k) plans,<sup>43</sup> as well as a time series of several hundred plan descriptions used to provide a sample of the various defined benefit and defined contribution plan provisions applicable to plan participants. In addition, several public surveys based on participants’ self-reported answers (the Survey of Consumer Finances [SCF], the Current Population Survey [CPS], and the Survey of Income and Program Participation [SIPP]) were used to model participation, wages, and initial account balance information.

This information is combined to model participation and initial account balance information for all defined contribution participants, as well as contribution behavior for non-401(k) defined contribution plans. Asset allocation information is based on previously published results of the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project, and employee contribution behavior to 401(k) plans is provided by an expansion of a method developed in VanDerhei and Copeland (2008) and further refined in VanDerhei (2010).

A combination of Form 5500 data and self-reported results was also used to estimate defined benefit participation models; however, it appears information in the latter is rather unreliable with respect to estimating current and/or future accrued benefits. Therefore, a database of defined benefit plan provisions for salary-related plans was constructed to estimate benefit accruals.

Combinations of self-reported results were used to initialize IRA accounts. Future IRA contributions were modeled from SIPP data, while future rollover activity was assumed to flow from future separation from employment in those cases in which the employee was participating in a defined contribution plan sponsored by the previous employer. Industry data are used to estimate the relative likelihood that the balances are rolled over to an IRA, left with the previous employer, transferred to a new employer, or used for other purposes.

### ***Defined Benefit Plans***

A stochastic job duration algorithm was estimated and applied to each individual in RSPM to predict the number of jobs held and age at each job change. Each time the individual starts a new job, RSPM simulates whether or not it will result in coverage in a defined benefit plan, a defined contribution plan, both, or neither. If coverage in a defined benefit plan is predicted, time series information from the Bureau of Labor Statistics (BLS) is used to predict what type of plan it will be.<sup>44</sup>

While the BLS information provides significant detail on the generosity parameters for defined benefit plans, preliminary analysis indicated that several of these provisions were likely to be highly correlated (especially for integrated plans). Therefore, a time series of several hundred defined benefit plans per year was coded to allow for assignment to the individuals in RSPM.<sup>45</sup>

Although the Tax Reform Act of 1986 at least partially modified the constraints on integrated pension plans by adding Sec. 401(l) to the Internal Revenue Code, it would appear that a significant percentage of defined benefit sponsors have retained Primary Insurance Amount (PIA)-offset plans. In order to estimate the offset provided under the plan

formulas, RSPM computes the employee's Average Indexed Monthly Earnings, Primary Insurance Amount, and covered compensation values for the birth cohort.

### ***Defined Contribution Plans***

Previous studies on the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project have analyzed the average account balances for 401(k) participants by age and tenure. Recently published results (VanDerhei, Holden and Alonso, 2009) show that the year-end 2008 average balance ranged from \$3,237 for participants in their 20s with less than three years of tenure with their current employer to \$172,555 for participants in their 60s who have been with the current employer for at least 30 years (thereby effectively eliminating any capability for IRA rollovers).

Unfortunately, the EBRI/ICI database does not currently provide detailed information on other types of defined contribution plans, nor does it allow analysis of defined contribution balances that may have been left with previous employers. RSPM uses self-reported responses for whether an individual has a defined contribution balance to estimate a participation model and the reported value is modeled as a function of age and tenure.

The procedure for modeling participation and contribution behavior and asset allocation for defined contribution plans that have not adopted automatic enrollment is described in VanDerhei and Copeland (2008). The procedure for modeling contribution behavior (with and without automatic escalation of contributions) for 401(k) plans is described in VanDerhei (2010). Asset allocation for automatic enrollment plans is assumed to follow average age-appropriate target-date funds as described in VanDerhei (2009). Investment returns are based on those used in Park (2009).

### ***Social Security Benefits***

Social Security's current-law benefits are assumed to be paid and received by those qualifying for the benefits under the baseline scenario. This funding could either be from an increase in the payroll tax or from a general revenue transfer. The benefits are projected for each cohort assuming the intermediate assumptions within the 2009 OASDI Trustee's Report. A second alternative is used where all recipients' benefits are cut 24 percent on the date that the OASDI Trust Fund is depleted (2037).

### ***Expenditure Assumptions***

The expenditures used in the model for the elderly consist of two components—deterministic and stochastic expenses. The deterministic expenses include those expenses that the elderly incur in their basic daily life, while the stochastic expenses in this model are exclusively health-event related—such as an admission to a nursing home or the commencement of an episode of home health care—that occur only for a portion of retirement (if ever), not on an annual or certain basis.

### ***Deterministic Expenses***

The deterministic expenses are broken down into seven categories—food, apparel and services (dry cleaning, haircuts), transportation, entertainment, reading and education, housing, and basic health expenditures. Each of these expenses is estimated for the elderly (65 or older) by family size (single or couple) and family income (less than \$20,000, \$20,000–\$39,999, and \$40,000 or more in 2008 dollars) of the family/individual.

The estimates are derived from the 2008 Consumer Expenditure Survey (CES) conducted by the Bureau of Labor Statistics of the U.S. Department of Labor. The survey targets the total noninstitutionalized population (urban and rural) of the United States and is the basic source of data for revising the items and weights in the market basket of consumer purchases to be priced for the Consumer Price Index. Therefore, an expense value is calculated using actual experience of the elderly for each family size and income level by averaging the observed expenses for the elderly within each category meeting the above criteria. The basic health expenditure category has additional data needs besides just the CES.

## **Health**

The basic health expenditures are estimated using a somewhat different technique and are comprised of two parts. The first part uses the CES as above to estimate the elderly's annual health expenditures that are paid out-of-pocket or are not fully reimbursed (or not covered) by Medicare and/or private Medigap health insurance.

The second part contains insurance premium estimates, including Medicare Part B and Part D premiums. All of the elderly are assumed to participate in Part B and Part D, and the premium is determined annually by the Medicare program and is the same nationally with an increasing contribution from the individual/family on the basis of their income. For the Medigap insurance premium, it is assumed all of the elderly purchase a Medigap policy. A national estimate is derived from a 2005 survey done by Thestreet.com that received average quotes for Plan F in 47 states and the District. The estimates are calculated based on a 65-year-old female. The 2005 premium level is the average of the 47 state average quotes. The 2010 premium level was estimated by applying the annual growth rates in the Part B premiums from 2006 through 2010 to the average 2005 premium.

This approach is taken for two reasons. First, sufficient quality data do not exist for the matching of retiree medical care (as well as the generosity of and cost of the coverage) and Medigap policy use to various characteristics of the elderly. Second, the health status of the elderly at the age of 65 is not known, let alone over the entire course of their remaining life. Thus, by assuming everyone one has a standard level of coverage eliminates trying to differentiate among all possible coverage types as well as determining whether the sick or healthy have the coverage. Therefore, averaging of the expenses over the entire population should have offsetting effects in the aggregate.

The total deterministic expenses for the elderly individual or family are then the sum of the values in all the expense categories for family size and family income level of the individual or family. These expenses make up the basic annual (recurring) expenses for the individual or family. However, if the individual or family meet the income and asset tests for Medicaid, Medicaid is assumed to cover the basic health care expenses (both parts), not the individual or family. Furthermore, Part D and Part B premium relief for the low-income elderly (not qualifying for Medicaid) is also incorporated.

## **Stochastic Expenses**

The second component of health expenditures is the result of simulated health events that would require long-term care in a nursing home or home-based setting for the elderly. Neither of these simulated types of care would be reimbursed by Medicare because they would be for custodial (not rehabilitative) care. The incidence of the nursing home and home health care and the resulting expenditures on the care are estimated from the 1999 and 2004 National Nursing Home Survey (NNHS) and the 2000 and 2007 National Home and Hospice Care Survey (NHHCS). NNHS is a nationwide sample survey of nursing homes, their current residents and discharges that was conducted by the National Center for Health Statistics from July through December 1999 and 2004. The NHHCS is a nationwide sample survey of home health and hospice care agencies, their current and discharge patients that was conducted by the National Center for Health Statistics from August 2000 through December 2000 and from August 2007 through February 2008.

For determining whether an individual has these expenses, the following process is undertaken. An individual reaching the Social Security normal retirement age has a probability of being in one of four possible assumed "health" statuses:

- Not receiving either home health or nursing home care,
- Home health care patient,
- Nursing home care patient,
- Death,

based upon the estimates of the use of each type of care from the surveys above and mortality. The individual is randomly assigned to each of these four categories with the likelihood of falling into one of the four categories based

upon the estimated probabilities of each event. If the individual does not need long-term care, no stochastic expenses are incurred. Each year, the individual will again face these probabilities (the probabilities of being in the different statuses will change as the individual becomes older after reaching age 75 then again at age 85) of being in each of the four statuses. This continues until death or the need for long-term care.

For those who have a resulting status of home health care or nursing home care, their duration of care is simulated based upon the distribution of the durations of care found in the NNHS and NHHCS. After the duration of care for a nursing home stay or episode of home health care, the individual will have a probability of being discharged to one of the other three statuses based upon the discharge estimates from NNHS and NHHCS, respectively. The stochastic expenses incurred are then determined by the length of the stay/number of days of care times the per diem charge estimated for the nursing home care and home health care, respectively.

For any person without the need for long-term care, this process repeats annually. The process repeats for individuals receiving home health care or nursing home care at the end of their duration of stay/care and subsequently if not receiving the specialized care again at their next birthday. Those who are simulated to die, of course, are not further simulated.

As with the basic health care expenses, the qualification of Medicaid by income and asset levels is considered to see how much of the stochastic expenses must be covered by the individual to determine the individual's final expenditures for the care. Only those expenditures attributable to the individual—not the Medicaid program—are considered as expenses to the individual and as a result in any of the "deficit" calculations.

### ***Total Expenditures***

The elderly individuals' or families' expenses are then the sum of their assumed deterministic expenses based upon their retirement income plus any simulated stochastic expenses that they may have incurred. In each subsequent year of life, the total expenditures are again calculated in this manner. The base year's expenditure value estimates excluding the health care expenses, are adjusted annually using the assumed general inflation rate of 2.8 percent from the 2009 OASDI Trustees Report, while the health care expenses are adjusted annually using the 4.0 percent medical consumer price index that corresponds to the average annual level from 2004–2009.<sup>46</sup>

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## Endnotes

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<sup>1</sup> The nominal cost of these expenditures increases with component-specific inflation assumptions. See the appendix for more details.

<sup>2</sup> Net housing equity is introduced into the model in three different mechanisms (explained below).

<sup>3</sup> IRS tax tables from 2010 are used to compute the tax owed on the amounts received from defined benefit plans and Social Security (with the percentage of Social Security benefits subject to federal income tax proxied as a function of the various retirement income components) as well as the individual account withdrawals.

<sup>4</sup> Roth IRA and 401(k) accounts are not used in this version of the model but will be incorporated into a forthcoming EBRI publication.

<sup>5</sup> Capital gains treatment is not used in this version of the model.

<sup>6</sup> See VanDerhei (September 2004) for a description of the various approaches to benchmarking retirement income needs.

<sup>7</sup> For a description of the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project, see the November 2010 *EBRI Issue Brief* and *ICI Perspective*, at [www.ebri.org/publications/ib](http://www.ebri.org/publications/ib) and [www.ici.org/research/perspective](http://www.ici.org/research/perspective)

<sup>8</sup> This allows simulations for those ages 36–62 in 2010. In previous work with this model (VanDerhei and Copeland, 2003), workers between the ages of 38 and 67 in 2003 were simulated.

<sup>9</sup> The nominal cost of these expenditures increase with component-specific inflation assumptions. See the appendix for more details.

<sup>10</sup> The NRRI projects replacement rates for each member of the SCF sample of households and compares the projection with a target replacement rate that would allow the household to “maintain its preretirement standard of living in retirement.” Households whose projected replacement rates fall more than 10 percent below the target are denoted as being “at risk” of having insufficient income to meet this standard.

<sup>11</sup> One likely difference deals with the asset allocation of investments in defined contribution plans. VanDerhei (June 2009) conducts simulations using RSPM showing the improvement in terms of risk and return for large cohorts of 401(k) participants when TDF asset allocations (simulations are run for average, conservative, and aggressive TDF asset allocations) are substituted for participant-directed investments. In contrast, the NRRI methodology is based on historical data over a time period that largely excludes any potential beneficial impact from this trend. Another difference that remains to be quantified is the assessment of defined benefit accruals. Whereas NRRI is based on SCF data that have the survey respondents assess what their eventual defined benefit payouts will be, RSPM bases the defined benefit accruals on a time series of defined benefit plan type and generosity parameters coded from, inter alia, summary plan description-type information on more than 1,000 large salaried defined benefit plans per year.

<sup>12</sup> Munnell, Webb, and Golub-Sass (2009).

<sup>13</sup> Until empirical information is available to track individual employees from one job to the next and track their 401(k) eligibility status, one needs to rely on some type of assumption with respect to this variable. Since there appears to be a well-documented body of evidence (Ippolito, 1997) that individuals with a propensity to save would seek out 401(k) sponsors (or vice versa), an admittedly ad-hoc approach was developed to compute eligibility probabilities conditional upon the eligibility status on the previous job, as shown below:

- Let  $z$  = unconditional probability of being covered (empirical value as a function of age and wage).
- Let  $x$  = probability of being covered given that your last job was covered.
- Let  $y$  = probability of being covered given that your last job was NOT covered.

There are two cases for  $x$  in VanDerhei and Copeland (2008):

- Complete independence (e.g.,  $x=z=y$ ).
- An ad-hoc assumption that the value of  $x$  will be half-way between the unconditional value and 100 percent. In other words,  $x = (1+z)/2$  and  $y = (z-.5*(z)(1+z))/(1-z)$ .

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There is no way to tell at this point which of these assumptions is likely to be more realistic. However, all simulations were conducted using both sets of assumptions to check the sensitivity of the results.

<sup>14</sup> See VanDerhei (July 2007) for detail on the EBRI/Mercer survey of defined benefit sponsors to gauge their recent activity as well as planned modifications with respect to both defined benefit and defined contribution plan design.

<sup>15</sup> EBRI has modeled the likely cost/benefit impact of purchasing long-term care insurance on retirement income adequacy. VanDerhei (2005) demonstrated that this purchase appears to be quite favorable for those in the second- and third-income quartile who desire more than a 50 percent chance of adequacy, whereas those in the lowest-income quartile often have the ability to satisfy the financial thresholds necessary to be covered by Medicaid and those in the fourth quartile will sometimes find self-insurance a more efficient method of dealing with this risk.

<sup>16</sup> Preretirement income in RSPM is determined in a manner similar to the average indexed monthly earnings computation for Social Security with the following modifications:

- All earned income is included up to the age of retirement (i.e., there is no maximum taxable wage base constraint and the calculation terminates at retirement age).
- Instead of indexing for changes in average national wages, the model indexes based on assumed after-tax rate of return based on asset allocations that are a function of the individual's age in each year.
- Percentile distributions are then established based on population statistics for each five-year age cohort. Whereas households are split into three income groups in Figure 5 to allow a direct comparison with the NRRI results, the remainder of this *Issue Brief* presents these results as quartiles to provide more useful results.

<sup>17</sup> VanDerhei and Copeland (2003) and VanDerhei and Copeland (2010).

<sup>18</sup> Helman, Copeland, and VanDerhei (2011)

<sup>19</sup> Many of these assumptions will be relaxed in future work.

<sup>20</sup> Social Security benefits are increased by a certain percentage (depending on date of birth) if retirement is deferred beyond Social Security Normal Retirement Age. The benefit increase no longer applies after the worker reaches age 70.

<sup>21</sup> Similar calculations for the other two preretirement income quartiles are: 24 percent for the lowest quartile and 50 percent for the highest quartile.

<sup>22</sup> The percentage of households in the second preretirement income quartile decreases from 27.3 percent to 15.0 percent and the percentage of households in the third preretirement income quartile decreases from 21.7 percent to 8.4 percent.

<sup>23</sup> A future version of the model will include the ability to model retirement ages prior to Medicare eligibility.

<sup>24</sup> The obvious exception is that housing equity was not included in the baseline runs for this *Issue Brief*. A future EBRI publication will focus on the importance of this component of potential retirement income.

<sup>25</sup> VanDerhei and Copeland (2001).

<sup>26</sup> VanDerhei and Copeland (July 2002).

<sup>27</sup> VanDerhei and Copeland (December 2002).

<sup>28</sup> VanDerhei and Copeland (2003)

<sup>29</sup> VanDerhei (January 2004).

<sup>30</sup> VanDerhei (2005).

<sup>31</sup> VanDerhei (March 2006).

<sup>32</sup> VanDerhei (September 2006)

<sup>33</sup> VanDerhei and Copeland (2008).

<sup>34</sup> Copeland and VanDerhei (2010).

<sup>35</sup> VanDerhei (2009).

<sup>36</sup> VanDerhei (2010).

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<sup>37</sup> VanDerhei and Copeland (2010).

<sup>38</sup> VanDerhei (September 2010).

<sup>39</sup> VanDerhei (October 2010a).

<sup>40</sup> VanDerhei (October 2010b).

<sup>41</sup> VanDerhei (February 2011).

<sup>42</sup> VanDerhei (April 2011).

<sup>43</sup> The EBRI/ICI Participant-Directed Retirement Plan Data Collection Project is the largest, most representative repository of information about individual 401(k) plan participant accounts. As of December 31, 2009, the database included statistical information about:

- 20.7 million 401(k) plan participants, in
- 51,852 employer-sponsored 401(k) plans, holding
- \$1.21 trillion in assets.

The EBRI/ICI project is unique because it includes data provided by a wide variety of plan recordkeepers and, therefore, portrays the activity of participants in 401(k) plans of varying sizes—from very large corporations to small businesses—with a variety of investment options.

<sup>44</sup> The model is currently programmed to allow the employee to participate in a nonintegrated career average plan; an integrated career average plan; a five-year final average plan without integration; a three-year final average plan without integration; a five-year final average plan with covered compensation as the integration level; a three-year final average plan with covered compensation as the integration level; a five-year final average plan with a PIA offset; a three-year final average plan with a PIA offset; a cash balance plan, or a flat benefit plan.

<sup>45</sup> BLS information was utilized to code the distribution of generosity parameters for flat benefit plans.

<sup>46</sup> While the medical consumer price index only accounts for the increases in prices of the health care services, it does not account for the changes in the number and/or intensity of services obtained. Thus, with increased longevity, the rate of health care expenditure growth will be significantly higher than the 4.0 percent medical inflation rate, as has been the case in recent years.

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