

EBRI Databook on Employee Benefits

Chapter 14: Retirement Income Adequacy

UPDATED July 2014

For more information, see [“Retirement Savings Shortfalls: Evidence from EBRI’s Retirement Security Projection Model,[®]”](#) *EBRI Issue Brief*, no. 410, February 2015.

1 The EBRI Retirement Security Projection Model[®]

One of the basic objectives of the EBRI Retirement Security Projection Model[®] (RSPM) is to simulate the percentage of the population at risk of not having income adequate to cover average expenses and uninsured health care costs (including long-term-care costs) at age 65 or older throughout retirement in specific income and age groupings. RSPM 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 preretirement compensation they would need as additional savings in order to have a 50, 75, or 90 percent probability of attaining retirement income adequacy.

VanDerhei and Copeland (2010) describe how households are tracked through retirement age and how their retirement income/wealth is simulated for the following components:

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

A household is considered to run short of money in this model if aggregate resources in retirement are not sufficient to meet average retirement expenditures, defined as a combination of deterministic expenses from the Consumer Expenditure Survey (as a function of age and income) and some health insurance and out-of-pocket, health-related expenses, plus stochastic expenses from nursing-home and home-health care (at least until the point such expenses are covered by Medicaid).

The baseline version of the model used for this analysis assumes all workers retire at age 65,¹ that they immediately begin drawing benefits from Social Security and defined benefit plans (if any), and, to the extent that the sum of their expenses and uninsured medical expenses exceed the projected, after-tax annual income from those sources, immediately begin to withdraw money from their individual accounts (defined contribution and cash balance plans, as well as individual retirement accounts, or IRAs). If there is sufficient money to pay expenses without tapping into the tax-qualified individual accounts, those balances are assumed to be invested in a non-tax-advantaged account where the investment income is taxed as ordinary income. Individual accounts are tracked until the point at which they are depleted. At that point, any net housing equity is assumed to be added to retirement savings in the form of a lump-sum distribution (not a reverse annuity mortgage (RAM)). If all the retirement savings are exhausted and if the

Social Security and defined benefit payments are not sufficient to pay expenses, the individual is designated as having run short of money at that point.

One of the primary outputs of RSPM is the production of retirement readiness ratings (RRRs) for various subgroups of the population. The RRR is defined as the percentage of simulated life-paths that do not run short of money in retirement.

2 Retirement Readiness Ratings

Figure 1 provides the 2014 Retirement Readiness Ratings™ by age cohort with a comparison to last year's numbers. The primary differences between the values this year and those from 2013 reflect the changes in the market value of defined contribution and IRA assets, as well as the increase in housing values during that period. The RRRs increase by 1.6 percentage points, from 55.1 percent to 56.7 percent, for the Early Boomers, 1.0 percentage points from 57.5 percent to 58.5 percent for Late Boomers, and by 0.5 percentage points from 57.2 percent to 57.7 percent for Gen Xers.² Given that the primary change in RRRs from 2013 to 2014 is the above-average return in the equity markets,³ it is not surprising that the older age cohorts with larger defined contribution and IRA account balances⁴ show larger improvements.

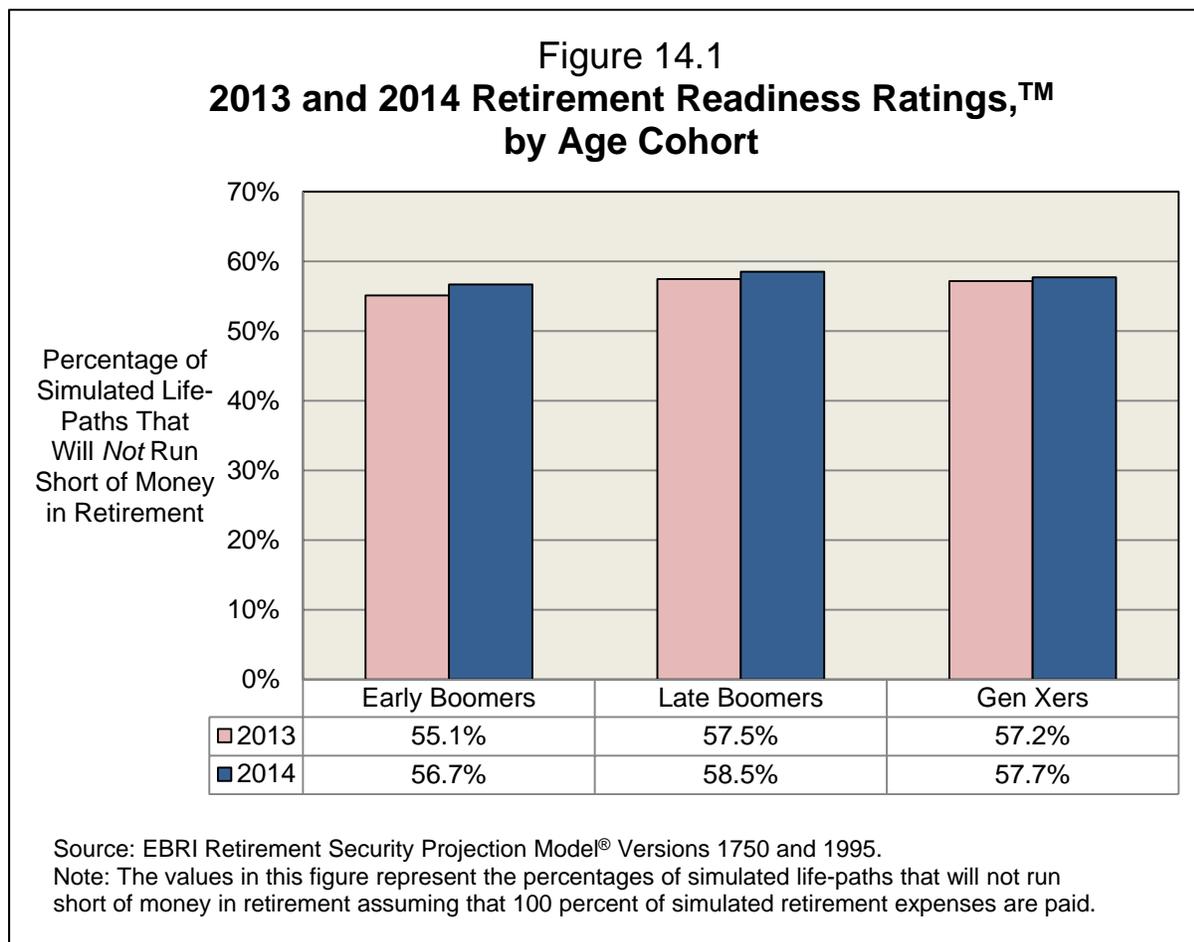
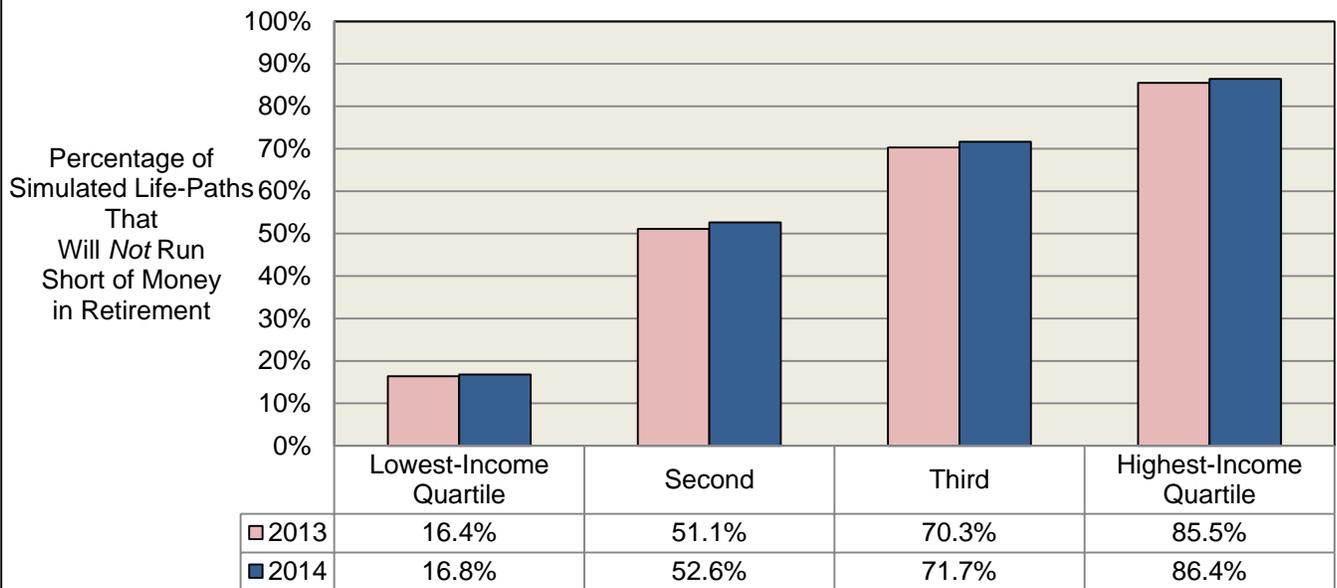


Figure 2 provides the 2014 RRRs by preretirement wage quartiles⁵ compared with results from 2013. Similar to the age-cohort analysis in Figure 1, each of the categories in Figure 2 displays a slight increase in RRR values: 0.4 percentage points for the lowest-income quartile, 1.5 percentage points for the second-income quartile, 1.4 percentage points for the third-income quartile, and 0.9 percentage points for the

highest-income quartile. Again, these results are expected given the larger defined contribution and IRA account balances for the higher-income quartiles.

However, unlike Figure 1, Figure 2 shows a tremendous disparity between the various categories analyzed. Only 16.8 percent of the simulated life-paths for entities in the lowest-income quartile have sufficient retirement resources to prevent them from running short of money in retirement. This value more than triples to 52.6 percent for those in the second-income quartile and continues to increase to 71.7 percent for those in the third-income quartile before reaching a maximum value for 86.4 percent for those in the highest-income quartile.

Figure 14.2
2013 and 2014 Retirement Readiness Ratings,TM
by Preretirement Wage Quartile



Source: EBRI Retirement Security Projection Model[®] Versions 1750 and 1995.

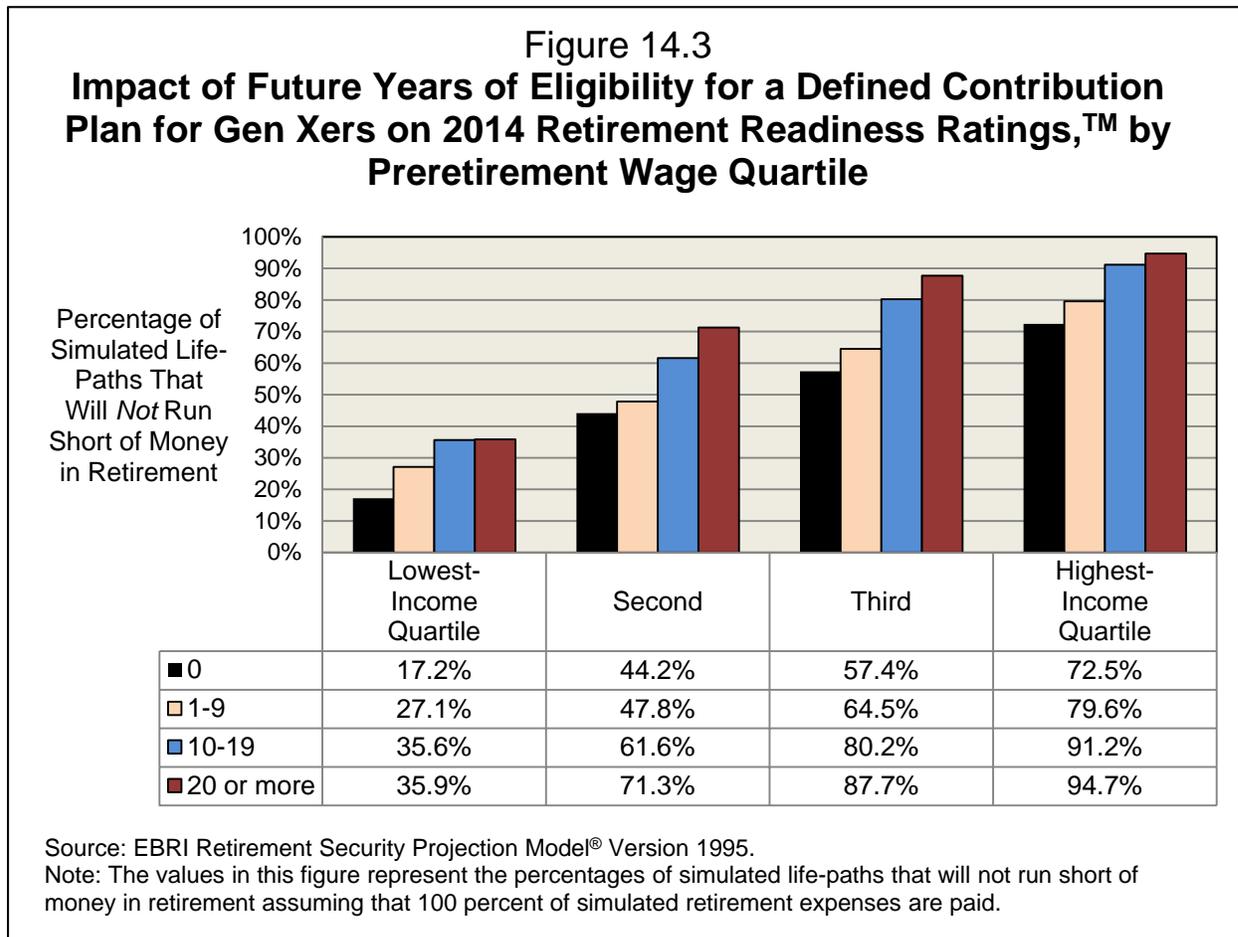
Note: The values in this figure represent the percentages of simulated life-paths that will not run short of money in retirement assuming that 100 percent of simulated retirement expenses are paid.

Figure 3 shows the positive impact of *future* years of eligibility (regardless of whether the employee chooses to participate, although there is a high likelihood of participating if eligible) in a defined contribution plan on the 2014 RRR values for Gen Xers by preretirement wage quartile.⁶ For those in the lowest-income quartile with no future years of eligibility in a defined contribution plan, the RRR value is only 17.2 percent, indicating that more than 8 in 10 of this cohort are projected to run short of money in retirement. This value increases almost 10 percentage points to 27.1 percent for those in the lowest-income quartile with one–nine future years of eligibility in a defined contribution plan. The RRR value increases to 35.6 percent for those in this category with 10–19 future years of eligibility in a defined contribution plan, and reaches a maximum value of 35.9 percent for those with 20 or more future years of eligibility in a defined contribution plan.

3 Other EBRI Retirement Security Projection Model® Results

Previously, RSPM has been used to analyze the impact of retirement plans on prospects for retirement income adequacy under several scenarios, including:

- **Annuitizing defined contribution and IRA balances at retirement age:** A 2004 EBRI



publication⁷ analyzed the impact of annuitizing defined contribution and IRA balances at retirement age and therefore needed to simulate a significant number of future life-paths to capture the longevity risk experienced by retirees. The output metric used was the median percentage of additional compensation that must be saved annually until retirement for a 75 percent chance of covering simulated expenses. If one assumes that all defined benefit participants take lump-sum distributions at retirement, the average annual increase in needed savings is 14.9 percent, whereas assuming that all individual accounts are annuitized at retirement has an impact twice as large—but in the opposite direction (a 30.0 percent decrease in needed annual savings).

- **Impact of the financial crisis:** In a 2011 EBRI publication,⁸ the model was used to analyze the impact of the 2008–2009 crisis in the financial and real estate markets on retirement income adequacy. The analysis in this paper was designed to answer two questions: (1) What percentage of U.S. households became “at risk” of insufficient retirement income as a result of the financial market and real estate crisis in 2008 and 2009 and (2) Of those who are at risk, what additional savings do they need to make each year until retirement age to make up for their losses from the crisis? The percentage of households that would not have been “at risk” without the 2008–2009

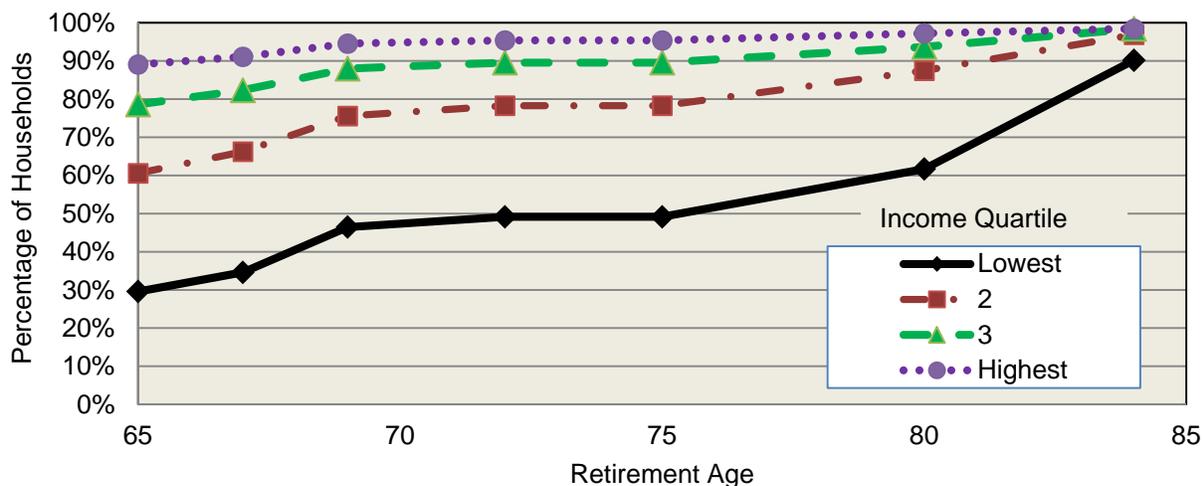
crisis but that ended up “at risk” varies from a low of 3.8 percent to a high of 14.3 percent. Looking at all Early Boomer households that would need to save an additional amount (over and above the savings already factored into the baseline model), the median percentage of additional compensation for these households desiring a 50 percent probability of retirement income adequacy would be 3.0 percent of compensation each year until retirement age to account for the financial and housing market crisis in 2008 and 2009. Looking at all Early Boomer households that would need to save an additional amount (over and above the savings already factored into the baseline model), the median percentage of additional compensation for these households desiring a 90 percent probability of retirement income adequacy would be 4.3 percent of compensation. Looking only at Early Boomer households that would need to save an additional amount (over and above the savings already factored into the baseline model), that had account balances in defined contribution plans and IRAs as well as exposure to the real estate crisis in 2008 and 2009 shows a median percentage for of 5.6 percent for a 50 percent probability and 6.7 percent for a 90 percent probability of retirement income adequacy

- **Impact of defined benefit plans:** Another 2011 EBRI publication⁹ used RSPM to analyze the impact of defined benefit plans in achieving retirement income adequacy for Baby Boomers and Gen Xers. This article shows the tremendous importance of defined benefit plans in achieving retirement income adequacy for Baby Boomers and Gen Xers. Overall, the presence of a defined benefit accrual at age 65 reduces the “at-risk” percentage by 11.6 percentage points. The defined benefit plan advantage (as measured by the gap between the two at-risk percentages) is particularly valuable for the lowest-income quartile but also has a strong impact on the middle class (the reduction in the at-risk percentage for the second- and third-income quartiles combined is 9.7 percentage points).
- **Impact of deferring retirement age:** As explored in another 2011 EBRI publication¹⁰ RSPM added 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. 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 (Figure 4). 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. If the success rate is moved to a threshold of 70 percent, only 2 in 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 in 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. This factor results in at least a 10 percentage point difference in the majority of the retirement age/income combinations investigated. A 2012 EBRI publication¹¹ provided additional evidence on whether deferring retirement to age 70 would provide retirement income adequacy for the vast majority of Baby Boomers and Gen Xers.

- **Impact of the low interest-rate environment:** A 2013 EBRI publication¹² used RSPM to show that 25–27 percent of Baby Boomers and Gen Xers who would have had adequate retirement income under return assumptions based on historical averages were simulated to end up running short of money in retirement if the historically low interest rates at the time were assumed to be a permanent condition. In certain circumstances, only the accumulation portion of RSPM is used to focus on the impact of retirement plans (including IRA rollovers) and Social Security on retirement income (without running the decumulation portion of the model).
- **Freezing of defined benefit plan accruals:** The model was used 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 in a 2006 EBRI publication.¹³ The median annual contribution rate needed to financially indemnify a participant in a career-average defined benefit pension plan whose plan was frozen in 2006 would be about 7 percent, assuming an 8 percent rate of return. A contribution rate of about 15 percent would cover three-quarters of the employees in this type of plan. The median contribution rate for a final-average plan is slightly larger: 8 percent (assuming an 8 percent return); a contribution rate of 16 percent would cover three-quarters of the workers in this type of plan. For workers in hybrid pension (cash balance) plans, the median contribution rate would be about 3 percent; a contribution rate of 4.5 percent would cover three-quarters of the workers, based on current interest credits. In all of these scenarios, the rate of return on investments has a major impact on the contribution rate; lower rates would require higher contributions to offset the benefit loss from a pension freeze.

Figure 14.4

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.

- This analysis was expanded for a 2010 Pension Research Council publication¹⁴ that involved a “winners/losers” analysis of defined benefit freezes and the enhanced employer contributions provided to defined contribution plans at the time the defined benefit plans were frozen. The analysis focused on the percentage of those with DB wealth foregone due to the freeze who are expected to have a larger total nominal replacement rate from DC enhanced contributions (if any). As expected, young employees have the highest percentage, with nearly 40 percent of those between 20 and 24 ending up with more retirement wealth from the annuitized account balances from the enhanced contributions than they would have had under the additional DB accruals. This percentage drops to 6 percent for those ages 55–59.
- **Impact of a transition from defined benefit to defined contribution plans:** A 2013 EBRI publication¹⁵ used RSPM to provide a direct comparison of the likely benefits under specific types of defined contribution and defined benefit retirement plans. The results presented show that if historical rates of return are assumed as well as annuity purchase prices reflecting average bond rates over the last 27 years, the median pairwise comparisons result in a strong outcome advantage for voluntary (VE) 401(k) plans over both the stylized, final-average DB plan and the stylized cash balance plan. When the robustness of these findings are subjected to various “stress tests” by reducing the rate of return assumptions by 200 basis points and increasing the annuity purchase price to reflect today’s bond rates, results show that in many cases the VE 401(k) plans lose their comparative advantage to the stylized, final-average DB plans (at least at the median) for lower-paid employees; however, VE 401(k) plans’ median advantages over the stylized cash balance plans remain in force. When the simulation results are subjected to both stresses simultaneously, virtually all of the median differences between the VE 401(k) plans and the stylized, final-average DB plan are reversed, regardless of income quartile. However, even in this scenario, based on the median differences, virtually all of the participants will do better in the VE 401(k) plans than the stylized cash balance plan.
- Another 2013 EBRI publication¹⁶ used RSPM to expand the previous analysis. Rather than trying to reflect the real-world variation in defined benefit accruals, the baseline analysis in the previous analysis used the median accrual rate in the sample (1.5 percent of final compensation per year of participation) as the stylized value for the baseline counterfactual simulations. The new research computed the actual final-average defined benefit accrual that would be required to provide an equal amount of retirement income at age 65 as would be produced by the annuitized value of the projected sum of the 401(k) and IRA rollover balances and found the median DB accrual that males with 31–40 years of plan eligibility would need to generate the same retirement income that they are projected to have with a 401(k) is 2.0 percent of final compensation, if they are in the lowest-income quartile. This increases to 2.2 percent for the next income quartile and 2.5 percent for the third income quartile. Those in the highest-income quartile would need a 3.0 percent accrual for equivalency. When the model analyzed the impact of simultaneously reducing the assumed rates of return by 200 basis points and assuming future annuity purchase prices are equivalent to today’s historically high rates, the median DB accrual that males with 31–40 years of plan eligibility would need to have the same retirement income that they are projected to have with a 401(k) plan is 1.1 percent of final compensation, if they are in the lowest income quartile. This represents a 45 percent reduction from the 2.0 percent value under the baseline assumptions.
- **Assessment of automatic enrollment (AE) 401(k) plans relative to voluntary enrollment (VE) plans:** RSPM was significantly enhanced for a 2008 EBRI publication¹⁷ by allowing automatic enrollment of 401(k) participants with the potential for automatic escalation of contributions to be included. The results showed that the median 401(k) accumulations for the lowest-income quartile

of these workers (assuming all 401(k) plans were voluntary enrollment) would only be 0.1 times final earnings at age 65 (this is largely due to the fact that 41 percent of workers—as opposed to participants—were assumed to have zero balances at age 65). However, if all 401(k) plans are assumed to be using the auto-enrollment provisions under PPA, the median 401(k) accumulations for the lowest-income quartile jumps to 2.5 times final earnings under the most conservative assumptions and 4.5 times final earnings under the most beneficial assumptions. Even for the top 25 percent of these workers (when ranked by 401(k) accumulations as a multiple of final earnings), there are large increases: the multiple under a voluntary enrollment scenario is 1.8 times final earnings, whereas auto-enrollment provides multiples ranging from 6.5 to 10.4, depending on auto-escalation of contributions.

- **Analysis of employer contributions when converting from VE to AE and its implications for retirement income:** The model was completely re-parameterized with 401(k)-plan design parameters for sponsors that had adopted automatic-enrollment provisions for a 2010 EBRI publication¹⁸ and found under baseline assumptions, the median 401(k) accumulations for the lowest-income quartile of workers currently age 25–29 (assuming all 401(k) plans were voluntary enrollment plans as typified by the 225 large plan sponsors analyzed in the study) would only be 0.08 times final earnings at age 65. However, if all 401(k) plans are assumed to be using the large plan sponsor AE provisions, the median 401(k) accumulations for the lowest-income quartile jumps to 4.96 times final earnings (if 401(k) participants revert back to the default contribution when they change jobs) and 5.33 times final earnings (if they retain their previous contribution level when they change jobs). There are also large increases even for high-income workers: The multiple under a VE scenario is 2.41 times final earnings compared with 9.15 or 9.81 under auto-enrollment, depending on the assumptions for employee reversion to default contribution rates upon job change.
- **The impact of plan design and employee behavior for automatic escalation provisions in AE plans:** Another 2010 EBRI publication¹⁹ expanded upon earlier work to provide the first results of a new simulation model that estimated the impact of changing 401(k) plan design variables and assumptions on retirement income adequacy. The results in this paper demonstrate the profound influence of plan design variables, as well as assumptions of employee behavior in AE 401(k) plans. Even with a relatively simple definition of “success,” large differences in success rates can be seen, depending on which plan design factors and employee behavior assumptions are used. The probability of success for the lowest-income quartile increases from the baseline probability of 45.7 percent to 79.2 percent when all four factors are applied. The impact on the highest-income quartile is even more impressive, with an increase in the probability of success from 27.0 percent to 64.0 percent.
- **The impact of increasing default contributions for AE plans:** A 2012 EBRI publication²⁰ analyzed the impact of increasing the default-contribution rate for AE 401(k) plans with automatic escalation of contributions. Under a set of specified behavioral assumptions, more than a quarter of those in the lowest-income quartile who had previously NOT been successful under actual default contribution rates were found to be successful as a result of the change in deferral percentage. When employees in the highest-income quartile were analyzed under the same set of assumptions, the percentage of those who had NOT previously been successful (under the actual default contribution rates) that now ARE successful as a result of the change in deferral rate was 18.4 percent.

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5 Endnotes

¹ See VanDerhei and Copeland (2011) and VanDerhei (August 2012) for an analysis of the impact of increasing retirement ages beyond 65.

² In this analysis, Early Boomers are defined as those born between 1948 and 1954; Late Boomers as born between 1955 and 1964; and Gen Xers as born between 1965 and 1974.

³ Standard & Poor’s 500 index increased 31.3 percent in 2013.

⁴ VanDerhei, Holden, Alonso and Bass (December 2013) show that for participants in the EBRI/ICI 401(k) database with 20–30 years of tenure with the current employer, the average account balance at the end of 2012 increased from \$136,761 for participants in their 40s to \$187,425 for participants in their 50s. Copeland (May 2013) shows that for individuals in the EBRI IRA Database, average balances for year-end 2011 were \$38,354 for those ages 40–44 and \$86,572 for those ages 55–59.

⁵ 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.

⁶ Only Gen Xers are shown in this portion of the analysis given their longer future working careers until age 65.

⁷ VanDerhei and Copeland (2004).

⁸ VanDerhei (February 2011).

⁹ VanDerhei (August 2011).

¹⁰ VanDerhei and Copeland (2011).

¹¹ VanDerhei (August 2012).

¹² VanDerhei (June 2013b).

¹³ VanDerhei (March 2006).

¹⁴ Copeland and VanDerhei (2010).

¹⁵ VanDerhei (June 2013a).

¹⁶ VanDerhei (December 2013).

¹⁷ VanDerhei and Copeland (2008).

¹⁸ VanDerhei (April 2010).

¹⁹ VanDerhei and Lucas (2010).

²⁰ VanDerhei (September 2012).