

Notes

How Much Needs to be Saved for Retirement After Factoring In Post-Retirement Risks: Evidence from the EBRI Retirement Security Projection Model,[®] p. 2

A T A G L A N C E

How Much Needs to be Saved for Retirement After Factoring In Post-Retirement Risks: Evidence from the EBRI Retirement Security Projection Model,[®] *by Jack VanDerhei, Ph.D., Employee Benefit Research Institute*

- This analysis helps answer one of the most important questions that many defined contribution participants face before retirement: How much do I need to save each year for a “successful” retirement? It includes three of the major post-retirement risks (longevity, investment, and long-term care) while allowing the participant to also choose the probability of “success” that is best suited for their circumstances.
- Given the assumptions used in this *Notes* article, a single male age 25 earning \$40,000 with no previous savings would need a total contribution rate (employee and employer combined) of less than 3 percent per year until retirement (age 65) for a 50 percent chance of success. A 6.4 percent contribution rate would achieve a 75 percent success rate and a 14 percent contribution rate would achieve a 90 percent success rate. But if a male earning \$40,000 were to wait until age 40 to begin saving, he would need a 6.5 percent total contribution rate for just a 50 percent chance of success and a 16.5 percent total contribution rate for a 75 percent chance of success; a 90 percent probability of success would be impossible even with a 25 percent contribution rate.
- The analysis also shows how large a participant’s current account balance needs to be, by contribution rate, to be “on-track” for a particular level of retirement success.

How Much Needs To Be Saved For Retirement After Factoring In Post-Retirement Risks: Evidence from the EBRI Retirement Security Projection Model[®]

By Jack VanDerhei, Ph.D., Employee Benefit Research Institute

Introduction

As defined contribution plans continue to become more important to retirement income for private-sector workers in the United States,¹ there is renewed interest in providing them with information on appropriate contribution rates, as well as benchmarks on appropriate levels of account balances at various ages. These actions would help workers determine whether they are “on-track” for an affordable retirement or will need to increase their contributions, delay their expected retirement age, modify their expected standards of living in retirement, or (implicitly) accept a lower probability of a “successful” retirement. The Employee Benefit Research Institute (EBRI) and others have previously published several studies dealing with this topic, ranging anywhere from “a simple Excel spreadsheet example”² to a full stochastic decumulation model focusing simultaneously on post-retirement investment risk, longevity risk, and long-term care costs.³

One of the inherent problems with not explicitly modeling these post-retirement risks is that the alternative method is often just to meet some generalized “replacement rate” of savings, whereby a worker’s projected post-retirement income is compared to preretirement income to determine the ratio of needed salary replacement. Unfortunately, this standard leaves several questions unanswered:

- What is the proper measure of the numerator? For example, how should one convert 401(k) and individual retirement account (IRA) balances to retirement income?
- What is the proper measure of the denominator? Should it focus only on the last few years of income, should it be a career-average, or should it be similar to the AIME (average indexed monthly earnings) calculation used to compute Social Security benefits?
- What is the proper measure of the threshold? Often these thresholds are computed to adjust for differentials in taxes pre- and post-retirement, as well as age- and work-related expenses. However, it is extremely difficult, if not impossible, to have any meaningful modifications for risk aversion.

Since very few households annuitize all (or even most) of their individual accounts in retirement, a replacement-rate focus would overlook the potential longevity risk of outliving one’s savings.⁴ Also, one of the biggest obstacles to retirement income adequacy for households who might otherwise have sufficient financial resources at retirement age is the risk of long-term care costs for a prolonged period.⁵ In the real world, few retirees have long-term care insurance policies that would cover the potentially catastrophic financial impact of this exposure. Consequently, any attempt to incorporate this into a replacement rate threshold (and many don’t) needs to be carefully assessed against actual implications.

The EBRI Retirement Security Projection Model[®] (RSPM[®]), which is detailed in the next section, uses a full stochastic simulation procedure for both the preretirement and post-retirement periods to determine the percentage of times households are simulated to *not* run short of money in retirement (i.e., a “successful” retirement). While this is extremely useful (and realistic) for public policy modeling of the impact of preretirement leakages,⁶ considering the combined impacts of the recent crisis in the financial and real estate markets,⁷ the impact of participating in a defined benefit (DB) plan,⁸ the value of deferring retirement age,⁹ the impact of the current low-interest-rate environment,¹⁰

and the impact of future contributions to defined contribution (DC) plans,¹¹ makes it difficult to display the results of a large number of alternative paths to retirement in a meaningful fashion.

Instead, this *EBRI Notes* article uses a variety of stylized preretirement examples¹² with different contribution rates, salary levels, and ages for both genders and then simulates the results with the full stochastic post-retirement module of RSPM[®] to find the overall probability of success for each stylized example. To simplify the analysis, the simulations performed for this article do not account for any net housing equity or any possible defined benefit accruals.¹³

The results are used first to assist in determining the percentage of compensation that would need to be saved if starting out at age 25 under stylized salary levels and contribution rates for males and females. In addition to the age-25 results, the contribution analysis is also expanded to those first beginning to save at ages 40 and 55.

The results are next used to provide information for those who have already been saving and want feedback on whether their account balances are large enough to provide for a successful retirement with a range of probabilities. In essence, this allows one to pick which of the three contribution rates they are most likely to choose for the future and then see the minimum existing account balance they should already have accumulated at that age.

The article begins with a brief description of RSPM,[®] followed by the specific methodology utilized in this analysis. Results are provided first for the required contribution rates for those starting to save at ages 25, 40, or 55. This is followed by the analysis of the account balances required by ages 40 and 55 for those who have already been saving for retirement. The final section summarizes the results for both analyses.

EBRI Retirement Security Projection Model[®]

One of the basic objectives of RSPM[®] is to simulate the percentage of the population at risk of not having retirement 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.¹⁴ RSPM[®] also provides information on the distribution of the likely number of years before those at risk will run short of money, as well as the percentage of preretirement compensation they will need in terms of additional savings in order to have a 50, 75, or 90 percent probability of 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.
- DC balances.
- IRA balances.
- 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). It should be noted that the definition of retirement income adequacy used in RSPM[®] is not a simple replacement rate in which someone with twice the salary of another would require twice the resources in retirement (before factoring in Social Security benefits). While certain components of the decumulation of RSPM[®] are

income-related, several of them (especially those dealing with long-term care prior to qualification for Medicaid) will be income-invariant.¹⁵

The baseline version of the model used for this analysis assumes all workers retire at age 65, 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 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.

Methodology

The primary objectives of this *Notes* article are to:

1. Determine the probability of a “successful” retirement under various future total contribution rates for stylized individuals with no previous savings at ages 25, 40, and 55; and
2. Determine the minimum account balances that would need to be accumulated for a 50, 75, and 90 percent chance of a “successful” retirement for stylized individuals at ages 40 and 55 under different assumptions with respect to future contribution rates.

The analysis is undertaken for single males and females separately, given their differential longevity. Given the stylized examples used during the accumulation period, a simple 4 percent (nominal) wage growth was assumed for all ages and no preretirement cashouts, hardship withdrawals or loan defaults were included. The rates of return used in the analysis are generated from stochastic annual returns with a log-normal distribution and a geometric mean of 6.5 percent real return for stocks and 2.3 percent real return for bonds.¹⁶ Net returns are computed by subtracting 78 basis points from the gross returns.¹⁷ Asset allocation is assumed to be a function of age and is drawn from the average allocations for more than 24 million 401(k) participants at year-end 2013.¹⁸

Unlike the full accumulation module used in RSPM,[®] these stylized examples assume no defined benefit accruals, no individual-account savings other than that provided by the simulated defined contribution plan (e.g., no non-rollover IRAs), and no use of any net housing equity to finance retirement expenditures.

For purposes of the first objective (determining the probability of success associated with various contribution rates for those with no previous savings at ages 25, 40 and 55), six different total contribution rates are simulated ranging from 3 percent to 25 percent.

For purposes of the second objective (determining minimum account balances at ages 40 and 55), three different total contribution rates are simulated: 4.5 percent, 9 percent, and 15 percent. For each of the 48 combinations of salary, gender, age and contribution levels mentioned, 25 different initial account balances are simulated ranging from zero to \$1.5 million. For each of the resulting 1,200 scenarios, the accumulated balance at age 65 is simulated 100 times to reflect the pre-retirement investment risk. At that point, 100 alternative life-paths are simulated using the full stochastic decumulation portion of RSPM.[®] This provides 10,000 different simulations for each of the 1,200 combinations. In each case, the percentage of simulations where the stylized individual does *not* run short of money in retirement is computed and interpolation methods are used to determine the initial account balance that would be required such that a “successful” retirement would result 50, 75, and 90 percent of the time.

Minimum Contribution Rate Results

Age 25

Males: Figure 1 provides the probabilities of *not* running short of money in retirement for a male age 25, as a function of current salary and future total contribution rates (employee and employer combined) for three different current salary levels: \$20,000, \$40,000, and \$65,000. It is assumed that the 25-year-old has no previous savings. A stylized male employee at this age currently earning \$20,000 would need to have a total contribution rate of approximately 6.8 percent of salary each year until retirement (age 65) for a 50 percent probability of success (defined as *not* running short of money in retirement) and a 16.5 percent contribution rate for a 75 percent success rate. At this salary level, even if this individual would contribute at a rate of 25 percent of salary each year until retirement, he would reach only an 86 percent probability of success.

Under the same set of assumptions, a 25-year-old male currently earning \$40,000 would have a 58 percent probability of success with just a 3 percent future total contribution rate, but would need to increase it to approximately 6.4 percent of salary for a 75 percent probability of success. The rate would need to be increased even further (to approximately 14 percent) for a 90 percent probability of success.

For a 25-year-old male earning as much as \$65,000, a 3 percent contribution rate would provide a 69 percent probability of success while a contribution rate of 4.2 percent would provide a 75 percent probability of success and an 8.2 percent contribution rate would increase it to 90 percent.

It is worth noting how much the curves in Figure 1 flatten out beyond a 10 percent total contribution rate, especially for the higher salary levels. For example, a 25-year-old male earning \$40,000 would increase his probability of success by approximately 14 percentage points (from 70 percent to 84 percent) by increasing the total contribution rate from 5 to 10 percent. However, increasing the total contribution rate by another 5 percentage points (from 10 to 15 percent) will increase the success rate by about only 7 percentage points (from 84 percent to 91 percent).¹⁹

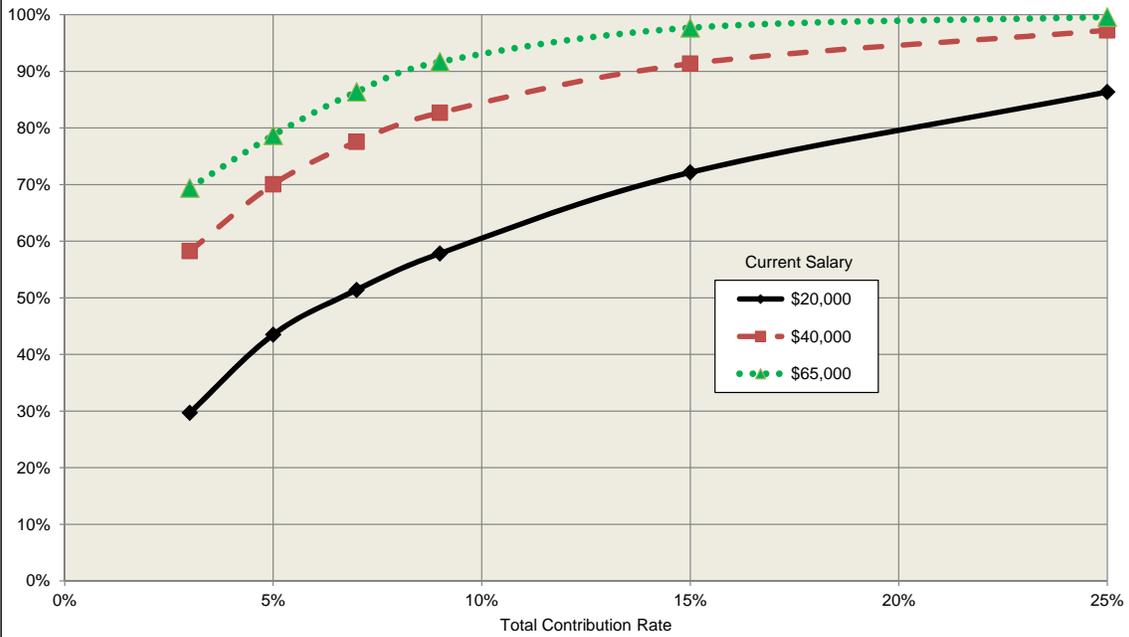
Females: Figure 2 provides the probabilities of *not* running short of money in retirement for a female age 25 as a function of current salary and future total contribution rates for the same three salary levels. A stylized female employee at this age currently earning \$20,000 would need to have a total contribution rate of approximately 9.6 percent of salary each year until retirement (age 65) for a 50 percent probability of success. At this salary level, even if this individual would contribute at a rate of 20.5 percent of salary each year until retirement, she would reach only a 75 percent probability of success.

Under the same set of assumptions, a 25-year-old female currently earning \$40,000 would have a 50 percent probability of success with just a 3 percent future total contribution rate, but would need to increase it to approximately 7.5 percent of salary for a 75 percent probability of success. The rate would need to be increased to 15 percent for a 90 percent probability of success.

For a 25-year-old female earning as much as \$65,000, a 3 percent contribution rate would provide a 66 percent probability of success while a contribution rate of 5 percent would provide a 75 percent probability of success and a 9 percent contribution rate would increase it to 90 percent.

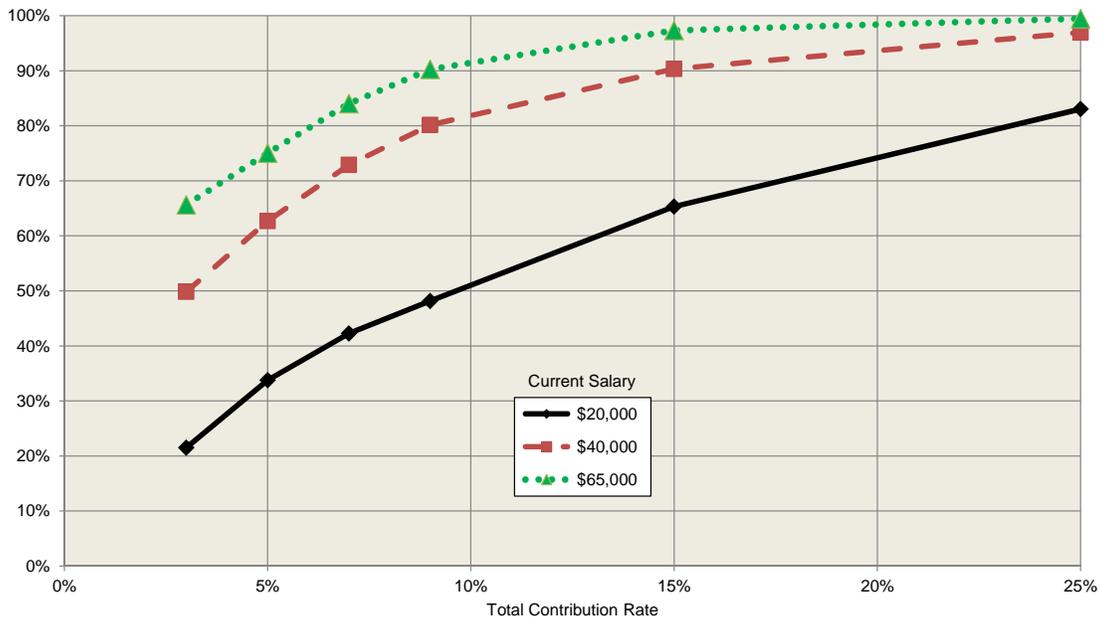
Overall, the probabilities of success for a female currently earning \$20,000 under these assumptions is 8 percentage points lower (given their increased life expectancies) than a male at a 3 percent contribution rate, and 7 percentage points lower at a 15 percent contribution rate. The gender-related difference at a \$40,000 salary is still 8 percentage points at the 3 percent contribution level but decreases to 1 percentage point at the 15-percent contribution rate.

Figure 1
Probability of Not Running Short of Money in Retirement for a Male Age 25,
as a Function of Current Salary and Future Total Contribution Rates
 (see text for assumptions)



Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 2
Probability of Not Running Short of Money in Retirement for a Female age 25,
as a Function of Current Salary and Future Total Contribution Rates
 (see text for assumptions)



Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Age 40

Males: Figure 3 provides the probabilities of *not* running short of money in retirement for a male age 40, as a function of current salary and future total contribution rates for three different current salary levels: \$20,000, \$40,000, and \$65,000. Again, it is assumed that the 40-year-old has no previous savings. Even with a total contribution rate of 16 percent each year until retirement age, a stylized employee currently earning \$20,000 would have only a 50 percent probability of success.

Under the same set of assumptions, a 40-year-old male currently earning \$40,000 and just starting to save would have a 50 percent probability of success with approximately a 6.5 percent future total contribution rate. But even if the contribution rate were increased to 16.5 percent, the probability of success would be only 75 percent.

For a 40-year-old male earning \$65,000, a 3 percent contribution rate would provide a 67 percent probability of success, while a contribution rate of 4.8 percent would provide a 75 percent probability of success and a 9.6 percent contribution rate would increase it to 90 percent.

Females: Figure 4 provides the probabilities of *not* running short of money in retirement for a female age 40, as a function of current salary and future total contribution rates assuming that she just started saving at age 40. Even with a total contribution rate of 23 percent each year until retirement age, a stylized employee currently earning \$20,000 would have only a 50 percent probability of success.

Under the same set of assumptions, a 40-year-old female currently earning \$40,000 and just starting to save would have a 50 percent probability of success with approximately a 9.5 percent future total contribution rate. But even if the contribution rate were increased to 19.5 percent, the probability of success would be only 75 percent.

For a 40-year-old female earning \$65,000, a 3 percent contribution rate would provide a 61 percent probability of success, while a contribution rate of 5.5 percent would provide a 75 percent probability of success and an 11.4 percent contribution rate would increase it to 90 percent.

Overall, the probabilities of success for a female currently earning \$20,000 under these assumptions is 4 percentage points lower (given a woman's increased life expectancy) than a male at a 3 percent contribution rate and 11 percentage points lower at a 15 percent contribution rate. The gender-related difference at a \$65,000 salary is 6 percentage points at the 3 percent contribution level but decreases to 1 percentage point at the 15 percent contribution rate.

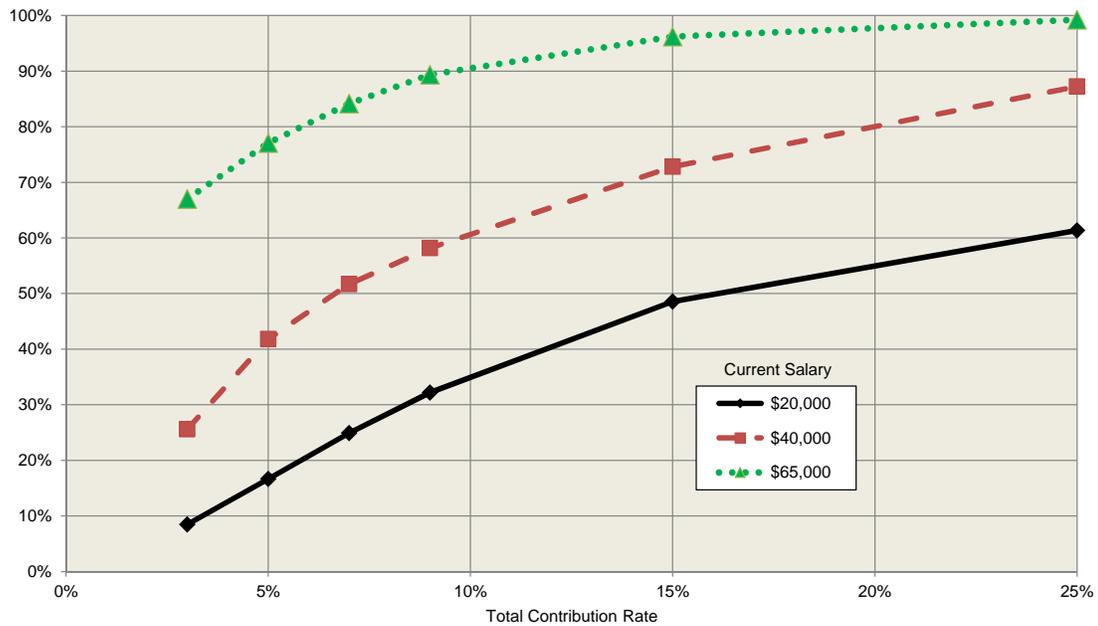
Age 55

Males: Figure 5 provides the probabilities of *not* running short of money in retirement for a male age 55, as a function of current salary and future total contribution rates for three different current salary levels: \$20,000, \$40,000 and \$65,000. Again, it is assumed that the 55-year-old has no previous savings. Even with a total contribution rate of 25 percent each year until retirement age, a stylized employee currently earning \$20,000 would have only a 16 percent probability of success.

Under the same set of assumptions, a 55-year-old male currently earning \$40,000 and just starting to save would have only a 50 percent probability of success even if the contribution rate were 24.5 percent. For a 55-year-old male earning \$65,000, a 12.9 percent contribution rate would provide a 50 percent probability of success.

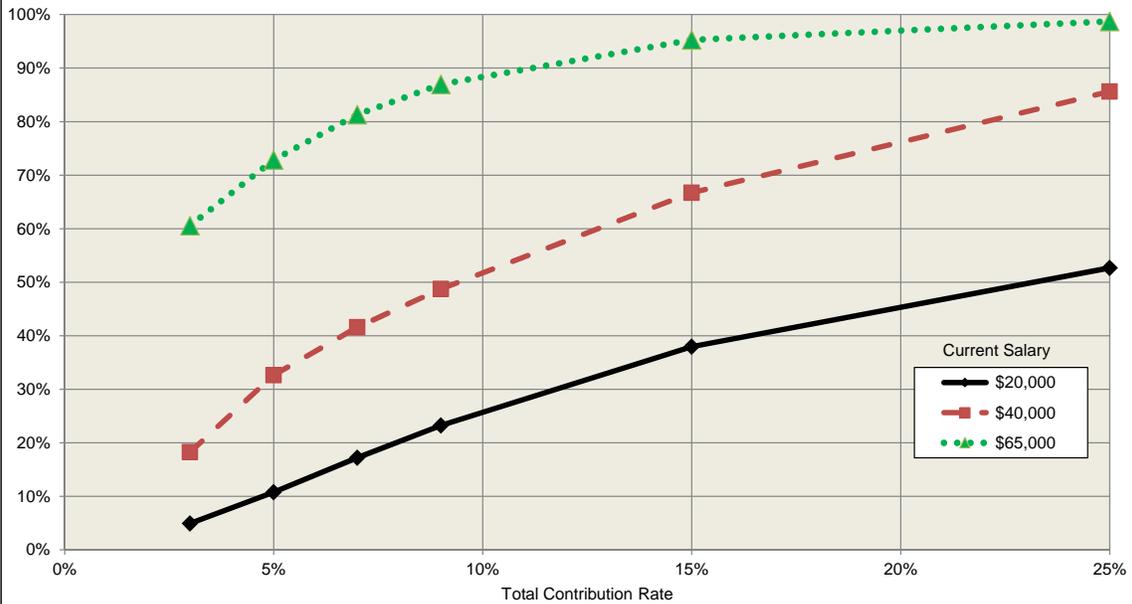
Females: Figure 6 provides the probabilities of *not* running short of money in retirement for a female age 55, as a function of current salary and future total contribution rates for the same three salary levels assuming there are no previous savings. Even with a total contribution rate of 25 percent each year until retirement age, a stylized employee currently earning \$20,000 would have only a 10 percent probability of success.

Figure 3
Probability of Not Running Short of Money in Retirement for a Male Age 40,
as a Function of Current Salary and Future Total Contribution Rates
 (see text for assumptions)



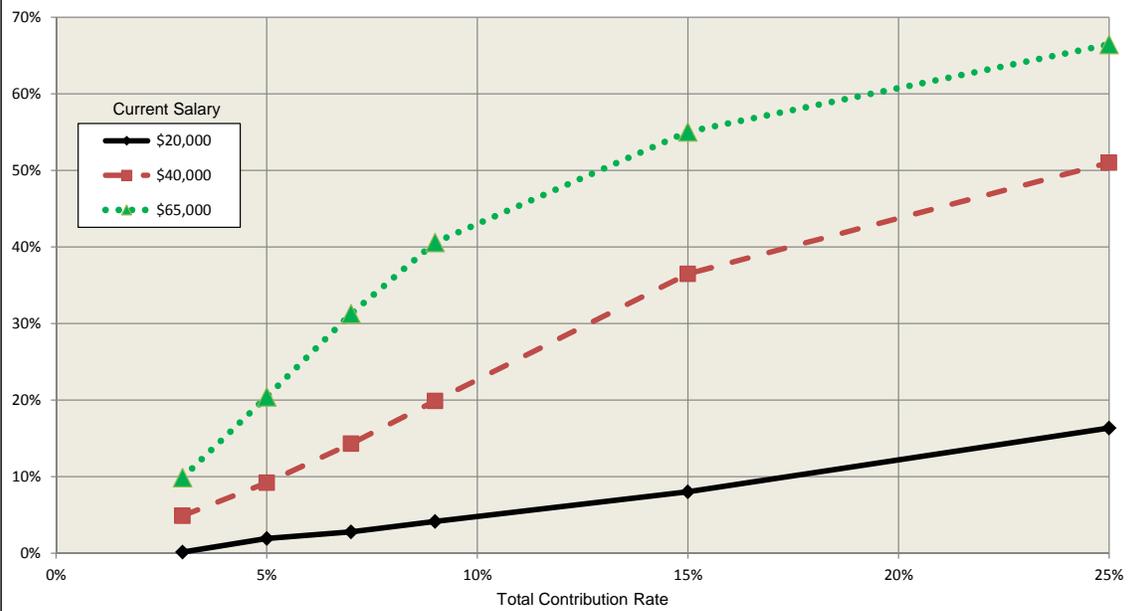
Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 4
Probability of Not Running Short of Money in Retirement for a Female Age 40,
as a Function of Current Salary and Future Total Contribution Rates
 (see text for assumptions)



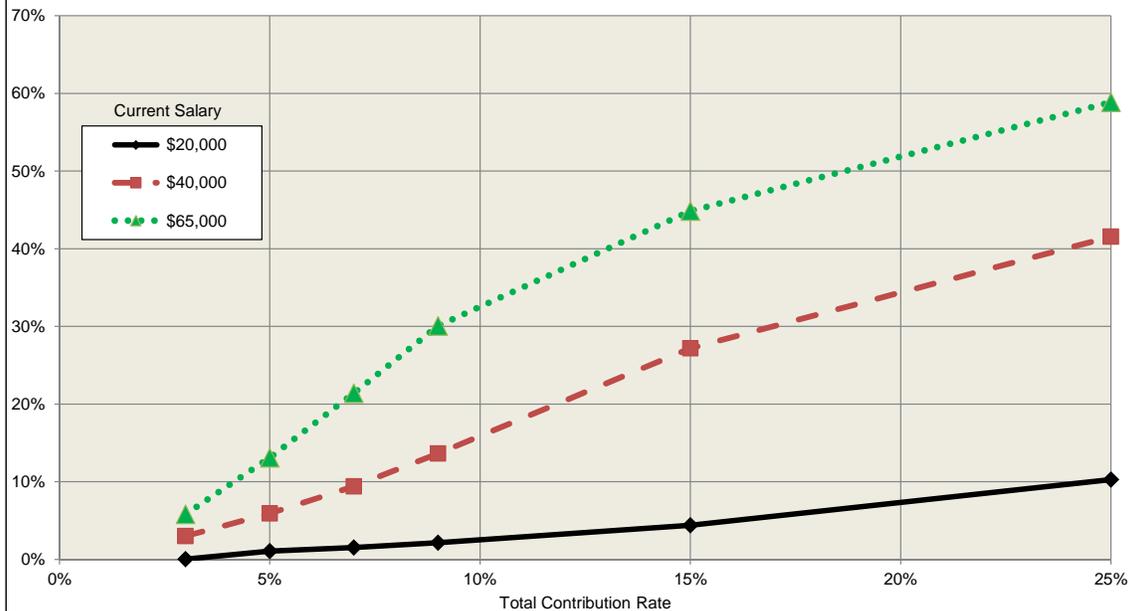
Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 5
Probability of Not Running Short of Money in Retirement for a Male Age 55,
as a Function of Current Salary and Future Total Contribution Rates
 (see text for assumptions)



Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 6
Probability of Not Running Short of Money in Retirement for a Female Age 55,
as a Function of Current Salary and Future Total Contribution Rates
 (see text for assumptions)



Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Under the same set of assumptions, a 55-year-old female currently earning \$40,000 and just starting to save would have only a 41 percent probability of success even if the contribution rate were 25 percent. For a 55-year-old female earning \$65,000, an 18.5 percent contribution rate would provide a 50 percent probability of success.

Minimum Account Balance Results

Age 40

Males: Figure 7 provides the minimum account balances required for adequate retirement income at 50, 75, and 90 percent probability levels by total contribution rates and salary for a male age 40. The numbers in the first column of the grid show that, under these assumptions, a 40-year-old male earning \$65,000 would not need any existing balances at that age to achieve a 50 percent probability of success, even if his future total contribution rate is only 4.5 percent of salary per year. The \$12,956 value in the first column for the \$40,000 salary could be used as a guideline for the minimum balance that should already be accumulated if all other assumptions remain constant (e.g., future total contribution rate of 4.5 percent, retirement age of 65, and a desired 50 percent probability of success).

The \$35,326 value in the first column for the \$20,000 salary level suggests that this stylized individual would need to have accumulated an account balance of at least this size by age 40 to have a 50 percent probability of attaining adequate retirement income by age 65, if the future total contribution rate is 4.5 percent. It may seem counterintuitive to have a larger minimum threshold for a 40-year-old male currently earning \$20,000 than one earning \$40,000; however, the latter will have future contributions equal to twice the value of the former. Moreover, the definition of retirement income adequacy used in RSPM[®] is not a simple replacement rate in which someone with twice the salary of another would require twice the resources in retirement (before factoring in Social Security benefits). While certain components of the decumulation of RSPM[®] are income-related, several of them (especially those dealing with long-term care prior to qualification for Medicaid) will be income-invariant.

The second and third columns of the grid show the same results if the future contribution rates are increased to 9 and 15 percent respectively. In both of these cases, all of the stylized individuals are simulated to have sufficient funds for a successful retirement age at least 50 percent of the time even if they are just starting their contributions at age 40, except for those in the lowest-salary category. For males age 40 currently earning \$20,000, the minimum account balances required would be \$14,619 if future total contributions are equal to 9 percent of salary but only \$3,384 if they are equal to 15 percent of compensation.

If a 40-year-old male desires a 75 percent success rate instead, the results in columns 4 through 6 of Figure 7 provide the relevant results. In this case, with a 4.5 percent contribution rate, someone earning \$65,000 would need to have already accumulated \$1,387, whereas a 40-year-old male earning \$40,000 would need a minimum balance of \$60,937 and one earning only \$20,000 would need to have already accumulated slightly more than five times their current salary (\$107,118). Increasing the future contribution rate to 9 percent reduces the minimum account balances needed to zero at the \$65,000 salary level, \$47,493 at the \$40,000 salary level, and \$83,298 at the \$20,000 salary level. Further increasing the future contribution rate to 15 percent reduces the minimum account balances needed even more to \$2,003 at the \$40,000 salary level and \$72,793 at the \$20,000 salary level.

For a 40-year-old male desiring a 90 percent chance of success, columns 7 through 9 of the grid in Figure 7 show that even a 9 percent future contribution rate would require current balances for all three salary levels, whereas a 15 percent contribution rate would be sufficient for those earning \$65,000 even if they first begin saving at age 40.

Females: Figure 8 provides the minimum account balances required for adequate retirement income at 50, 75 and 90 percent probability levels by total contribution rates and salary for a female age 40. The relative results are quite similar to those for a male age 40 in Figure 7, with the exception that each non-zero minimum account balance is somewhat larger due to a woman's longer life expectancy.

Age 55

Males: Figure 9 provides the minimum account balances required for adequate retirement income at 50, 75 and 90 percent probability levels by total contribution rates and salary for a male age 55. The numbers in the first column of the grid show that, under these assumptions, a 55-year-old male at a \$65,000 salary level would need to have accumulated at least \$30,286 by this age to have a 50 percent probability of success with a 4.5 percent future contribution rate, but only \$7,172 at a 9 percent future contribution rate (and no current balance would be required for this stylized individual to achieve a 50 percent probability of success at a 15 percent future contribution rate).

If the stylized 55-year-old male at a \$65,000 salary level would prefer a 75 percent probability of success instead, he would need a minimum account balance at that age of \$145,061 with a 4.5 percent future contribution rate. This decreases to \$122,095 at a 9 percent future contribution rate and only \$81,912 at a 15 percent contribution rate. If a 90 percent probability of success is desired instead, the minimum account balances needed would increase correspondingly: a minimum of \$272,769 would be required with a 4.5 percent future contribution rate, \$243,291 if the future contribution rate is 9 percent, and \$196,662 if the future contribution rate is 15 percent.

Females: Figure 10 provides the minimum account balances required for adequate retirement income at 50, 75 and 90 percent probability levels by total contribution rates and salary for a female age 55. The relative results are quite similar to those for a male age 55 in Figure 9, with the exception that each non-zero minimum account balance is somewhat larger due to a woman's longer life expectancy.

Summary

This *Notes* article attempts to help answer two of the most important questions that many defined contribution participants deal with before retirement:

1. How much do I need to save each year for a "successful" retirement?
2. How large do I need my account balance to be after saving for several years to be "on-track" for a successful retirement given my future contribution rate?

The answers to the first question obviously will depend on what probability of success is desired at any particular combination of age, gender, and salary, as illustrated in the following table summarizing Figures 1 through 6:

Summary Data from Figures 1–6

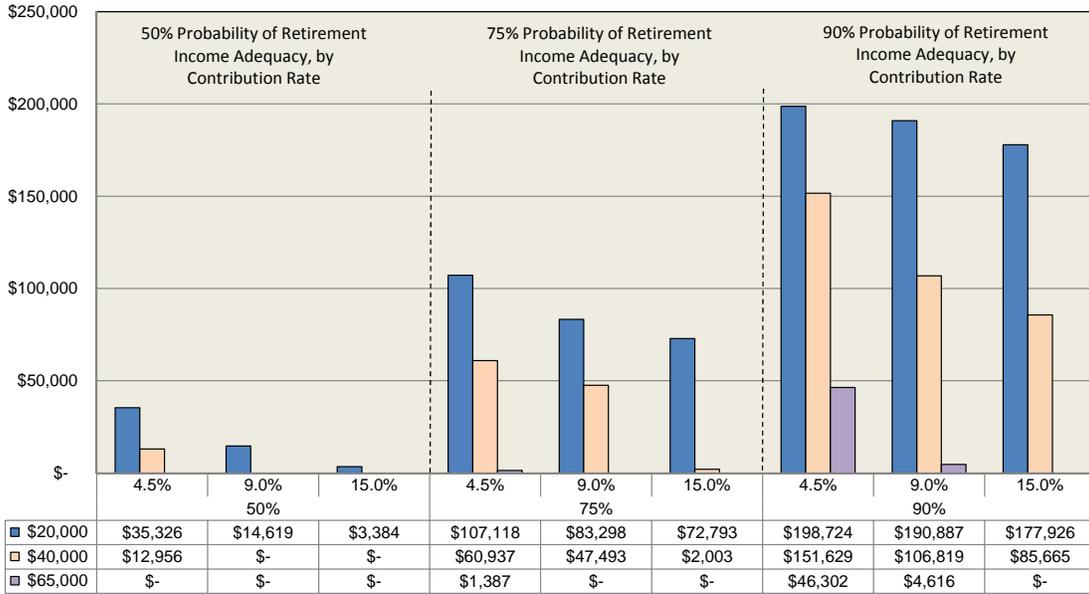
Gender	Age	Salary	Contribution Rate Required for a "Success" Rate of:		
			50.0%	75%	90%
Male	25	\$20,000	6.8%	16.5%	>25%
Male	25	\$40,000	<3%	6.4%	14.0%
Male	25	\$65,000	<3%	4.2%	8.2%
Female	25	\$20,000	9.6%	20.5%	>25%
Female	25	\$40,000	3.0%	7.5%	15.0%
Female	25	\$65,000	<3%	5.0%	9.0%
Male	40	\$20,000	16.0%	>25%	>25%
Male	40	\$40,000	6.5%	16.5%	>25%
Male	40	\$65,000	<3%	4.8%	9.6%
Female	40	\$20,000	23.0%	>25%	>25%
Female	40	\$40,000	9.5%	19.5%	>25%
Female	40	\$65,000	<3%	5.5%	11.4%
Male	55	\$20,000	>25%	>25%	>25%
Male	55	\$40,000	24.5%	>25%	>25%
Male	55	\$65,000	12.9%	>25%	>25%
Female	55	\$20,000	>25%	>25%	>25%
Female	55	\$40,000	>25%	>25%	>25%
Female	55	\$65,000	18.5%	>25%	>25%

For example, given the assumptions used in this *Notes* article, a male age 25 earning \$40,000 with no previous savings would need to have a total contribution rate (employee and employer combined) of less than 3 percent per year for a 50 percent chance of success. He could achieve a 75 percent success rate with a contribution rate of 6.4 percent and a 90 percent success rate with a contribution rate of 14 percent. However if a male earning \$40,000 were to wait until age 40 to begin saving for retirement, the situation becomes far more difficult: In this case, he would need a 6.5 percent total contribution rate each year until retirement (age 65) for just a 50 percent probability of success and a 16.5 percent total contribution rate to achieve a 75 percent probability of success. He would be unable to achieve a 90 percent probability of success even with a 25 percent contribution rate. If he were to defer his initial savings until age 55, he would be unable to achieve a 50 percent success rate unless he made a total contribution rate of 24.5 percent of salary each year.

The answer to the question of how large account balances need to be after saving for several years to be "on-track" for a successful retirement are provided in Figures 7 through 10 for a variety of future contribution rates. Figure 7 provides the minimum account balances that a 40-year-old male would need to have a successful retirement under various combinations of salary and future total contribution rates. As expected, for any given level of salary, any non-zero minimum account balances required will decrease as the future total contribution rate increases, but will increase as the

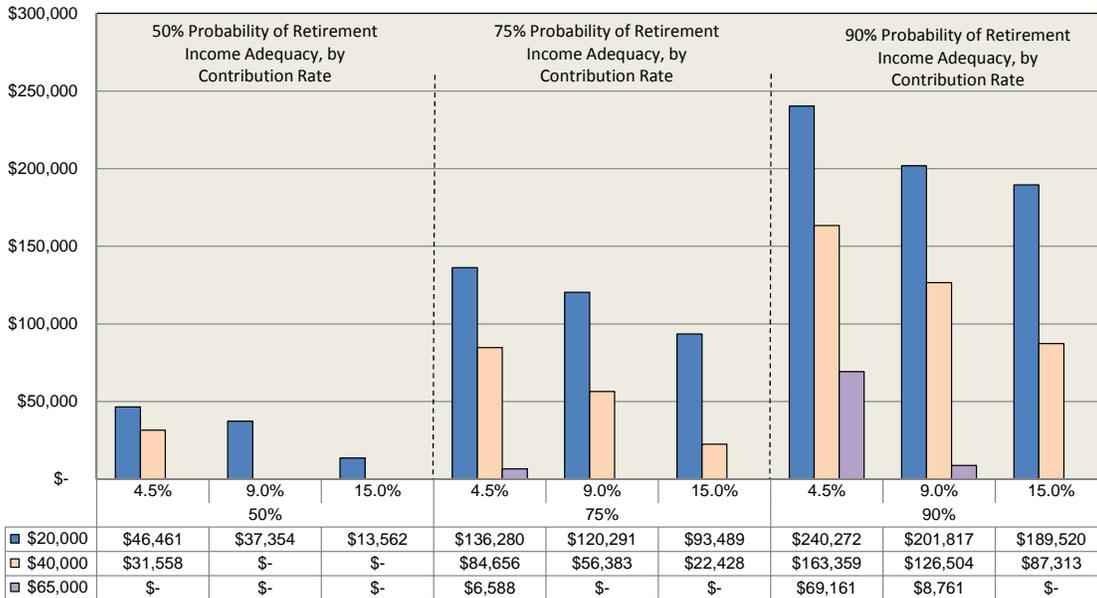
desired probability of success increases. Figure 8 provides similar analysis for a 40-year-old female. Figure 9 provides the minimum account balances that a 55-year-old male would need to have a successful retirement under various combinations of salary and future total contribution rates. Figure 10 provides similar analysis for a 55-year-old female.

Figure 7
Minimum Account Balance Required for Adequate Retirement Income at 50, 75, and 90% Probability, by Total Contribution Rates and Salary: Male Age 40



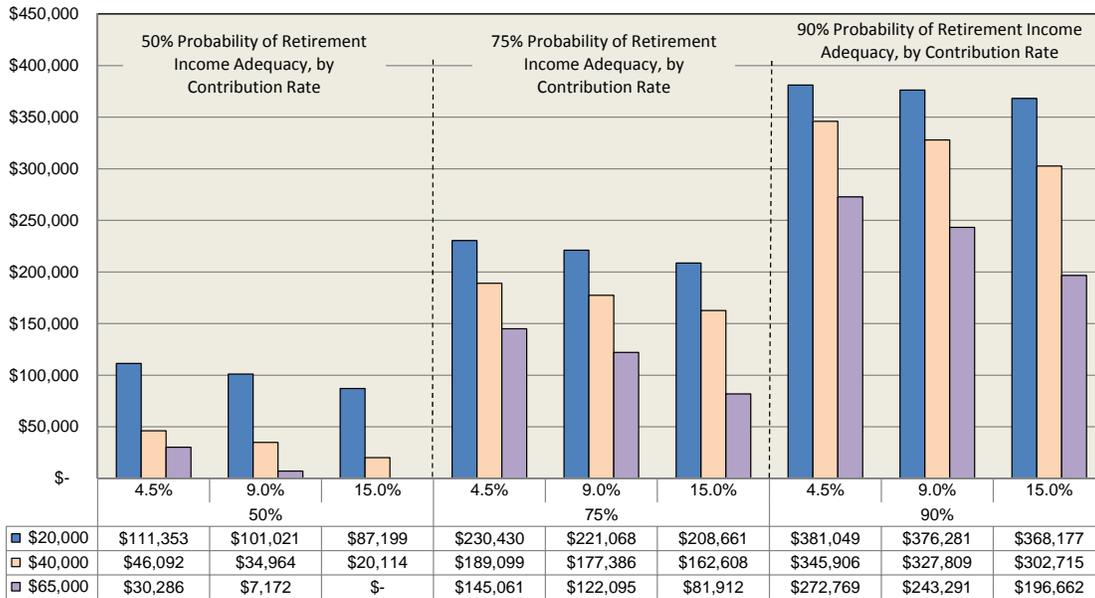
Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 8
Minimum Account Balance Required for Adequate Retirement Income at 50, 75, and 90% Probability, by Total Contribution Rates and Salary: Female Age 40



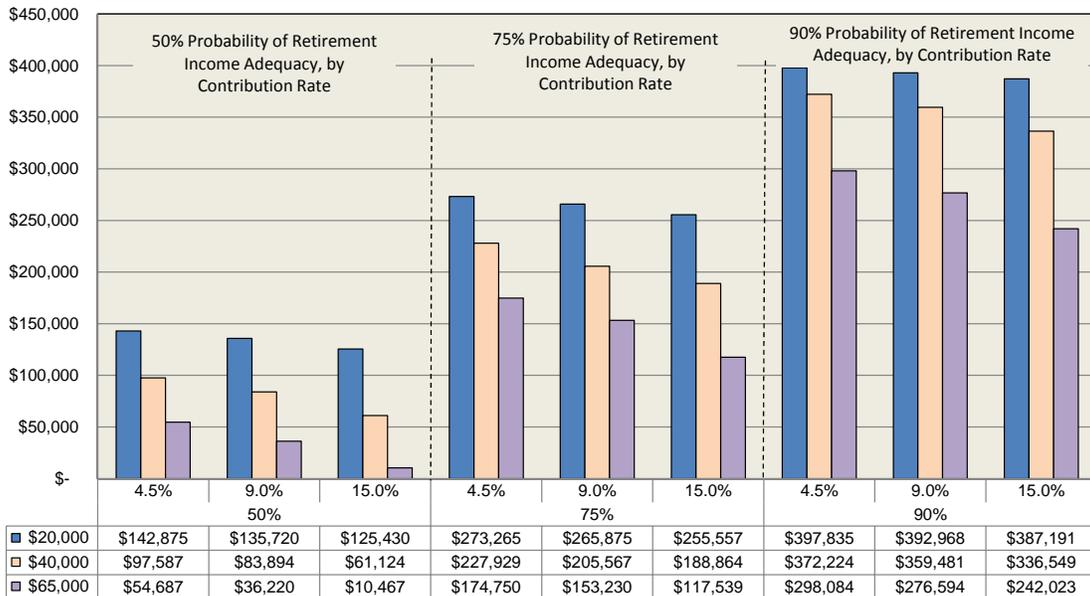
Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 9
Minimum Account Balance Required for Adequate Retirement Income at 50, 75, and 90% Probability, by Total Contribution Rates and Salary: Male Age 55



Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

Figure 10
Minimum Account Balance Required for Adequate Retirement Income at 50, 75, and 90% Probability, by Total Contribution Rates and Salary: Female Age 55



Source: Employee Benefit Research Institute Retirement Security Projection Model® Version 2207.
 See text for assumptions and caveats.

References

- Bajtelsmit, Vickie, and Anna Rappaport "The Impact of Long-Term Care Costs on Retirement Wealth Needs," in Society of Actuaries Monograph *Managing the Impact of Long-Term Care Needs and Expense on Retirement Security*. (2014). <https://www.soa.org/Library/Monographs/Retirement-Systems/managing-impact-ltc/2014/mono-2014-managing-ltc.aspx>
- Deloitte Consulting and Investment Company Institute, *Defined Contribution/401(k) Fee Study: Inside the Structure of Defined Contribution/ 401(k) Plan Fees: A Study Assessing the Mechanics of the 'All-In' Fee*. November 2011.
- Finke, Michael, Wade D. Pfau, and David M. Blanchett. 2013. "The 4 Percent Rule Is Not Safe in a Low-Yield World." *Journal of Financial Planning* 26 (6): 46–55.
- Munnell, Alicia, Anthony Webb and Wenliang Hou, "How Much Should People Save?" Center for Retirement Research, July 2014 Number 14-11.
- U.S. Department of Labor Employee Benefits Security Administration, Private Pension Plan Bulletin Historical Tables and Graphs, December 2014.
- VanDerhei, Jack. "Retirement Savings Shortfalls: Evidence from EBRI's Retirement Security Projection Model,®" EBRI Issue Brief, no. 410 (Employee Benefit Research Institute, February 2015).
- _____. "Contributory 'Negligence?'" The Impact of Future Contributions to Defined Contribution Plans on Retirement Income Adequacy for Gen Xers," *EBRI Notes*, no. 8 (Employee Benefit Research Institute, August 2014): 10–26.
- _____. "The Impact of Leakages on 401(k) Accumulations at Retirement Age," ERISA Advisory Council, U.S. Department of Labor. Hearing on: Lifetime Participation In Plans, June 17, 2014.
- _____. "What Causes EBRI Retirement Readiness Ratings™ to Vary: Results from the 2014 Retirement Security Projection Model,®" *EBRI Issue Brief*, no. 396 (Employee Benefit Research Institute, February 2014).
- _____. "What a Sustained Low-yield Rate Environment Means for Retirement Income Adequacy: Results From the 2013 EBRI Retirement Security Projection Model.®" *EBRI Notes*, no. 6 (Employee Benefit Research Institute, June 2013): 2–12.
- _____. "Is Working to Age 70 Really the Answer for Retirement Income Adequacy?" *EBRI Notes*, no. 8 (Employee Benefit Research Institute, August 2012): 10–21.
- _____. "The Importance of Defined Benefit Plans for Retirement Income Adequacy." *EBRI Notes*, no. 8 (Employee Benefit Research Institute, August 2011): 7–20.
- _____. "A Post-Crisis Assessment of Retirement Income Adequacy for Baby Boomers and Gen Xers." *EBRI Issue Brief*, no. 354 (Employee Benefit Research Institute, February 2011).
- _____. "Measuring Retirement Income Adequacy: Calculating Realistic Income Replacement Rates." *EBRI Issue Brief*, no. 297 (Employee Benefit Research Institute, September 2006).
- VanDerhei, Jack, and Craig Copeland. "The Impact of Deferring Retirement Age on Retirement Income Adequacy." *EBRI Issue Brief*, no. 358 (Employee Benefit Research Institute, June 2011).
- _____. "The EBRI Retirement Readiness Rating:™ Retirement Income Preparation and Future Prospects." EBRI Issue Brief, no. 344 (Employee Benefit Research Institute, July 2010).
- VanDerhei, Jack, Sarah Holden, Luis Alonso, Steven Bass and AnnMarie Pino. "401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2013." *EBRI Issue Brief*, no. 408, (Employee Benefit Research Institute, December 2014); and *ICI Research Perspective*, Vol. 20, no. 10 (December 2014).

Endnotes

- ¹ The number of active participants in private defined benefit plans dropped from 27.2 million in 1975 to 15.7 million in 2012. During that same time, the number of active participants in private defined contribution plans increased from 11.2 million to 75.4 million. The active-participant definitions were changed beginning with the *2005 Private Pension Plan Bulletin* and added approximately 9.2 million active defined contribution participants but only approximately 200,000 active defined benefit participants. U.S. Department of Labor (2014).
- ² Munnell, Webb and Hou (2014).
- ³ VanDerhei (September 2006).
- ⁴ See Figures 11 and 12 of VanDerhei (February 2014) for more detail.
- ⁵ VanDerhei (February 2014) and Bajtelsmit and Rappaport (2014).
- ⁶ VanDerhei (June 2014).
- ⁷ VanDerhei (February 2011).
- ⁸ VanDerhei (August 2011).
- ⁹ VanDerhei and Copeland (2011) and VanDerhei (August 2012).
- ¹⁰ VanDerhei (June 2013).
- ¹¹ VanDerhei (August 2014).
- ¹² A similar approach was used by the author for the March 2013 *Money* Magazine cover feature, “Dream Big, Act Now: Six Secrets of Retirement.”
- ¹³ A future publication will provide sensitivity analysis around both of these factors.
- ¹⁴ For a brief chronology of the EBRI Retirement Security Projection Model,[®] see the appendix of VanDerhei (February 2015).
- ¹⁵ This version of the model is constructed to simulate retirement income adequacy, as noted above. Alternative versions of the model allow similar analysis for replacement rates, standard-of-living calculations, and other ad hoc thresholds.
- ¹⁶ See Finke, Pfau and Blanchett (2013).
- ¹⁷ A 2011 study by Deloitte Consulting and the Investment Company Institute found that the median participant-weighted fee for 401(k) plans—including administrative, record-keeping, investment, and other expenses—was 78 basis points.
- ¹⁸ See VanDerhei, Holden, Alonso, Bass and Pino (2014).
- ¹⁹ This may have implications for the debate over whether a 10 percent or a 15 percent total contribution rate is the “correct” level for specific situations. In this stylized example, a 50 percent increase in the total contributing rate from 10 to 15 percent would provide only an 8.3 percent increase in the success rate. Obviously, these results and any similar cost/benefit analysis would vary for each stylized example.



Notes

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