NO ONE IS AVERAGE

Why averages can mislead in retirement plans—and how to move beyond them
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NO ONE IS AVERAGE

WHY AVERAGES CAN MISLEAD IN RETIREMENT PLANS—
AND HOW TO MOVE BEYOND THEM

In Brief

• Employers, financial advisors and individual investors often rely on averages—retirement age, life expectancy, investment returns—when evaluating retirement readiness. Yet averages can be distorting because, in fact, no one is average. The strongest retirement plan, whether it is for a single individual or a 401(k) plan for a large group of employees, will be designed for the edges as well as the middle, for every point along a wide continuum of life choices and experiences.

• Our analysis begins with an average financial plan for an average American preparing for retirement. We then show how varying assumptions can lead to very different retirement outcomes—which result in very different required savings rates. Finally, we demonstrate how changes in key variables (number of years in retirement, health care costs) can dramatically impact the relative success, or failure, of an individual’s retirement outcome.

• Financial advisors can play an important role in helping their clients understand the consequences of their choices and calibrate their tolerance for the spectrum of risks faced in retirement. Stress testing the impact of individual behavior and circumstance, along with market returns, can be especially useful.

• Employers, working with their providers, have an opportunity to consider the broadest possible range of employees’ saving and investing behavior, and not merely rely on averages, when they refine their retirement plan designs and investment options. Employers can help their workers make, in effect, “better than average” choices. Among the tools at their disposal: automatic enrollment, re-enrollment, automatic contribution escalation and target date funds (TDFs).
In much of what we do and think, the concept of averages is so deeply embedded that we barely notice it is there. We look at averages in sports, medicine, financial markets, economic forecasting and political polling. And no wonder. Facing a wide range of possible outcomes, and an essential uncertainty about what the future holds, we sensibly consider what average experience has prevailed in the past.

We all look at averages, but they can be misleading—and in ways that are not always well understood.

Look at EXHIBIT 1 below: two very different people, 24-year-old Mary and 60-year-old Phil, with disparate income levels, savings rates, educational backgrounds and retirement account balances. From these two very different individuals, an average can be deduced: a 42-year-old—we’ll call him Average Joe—with $57,000 a year in annual income and $43,000 in retirement assets. And yet there is not the slightest resemblance to either Mary or Phil. So how reliable are averages, anyway?

In this paper, we examine the use of averages from a retirement perspective. Policymakers and academics turn to statistical averages, including 401(k) balances, savings rates and retirement plan coverage ratios, to assess the strength of the U.S. retirement system. Financial advisors often rely on averages in lieu of a client’s individual variables in their retirement planning tools. Employers use averages in both designing defined contribution (DC) plans and measuring their success.

We all talk about averages, but how many people actually meet the definition? For example, we know that the average life expectancy for a 65-year-old American woman is 86.

The flaw of averages: Average Joe bears not the slightest resemblance to either Mary or Phil

**EXHIBIT 1: CHARACTERISTICS OF 24-YEAR-OLD MARY, 60-YEAR-OLD PHIL AND A COMPOSITE AVERAGE AMERICAN, AVERAGE JOE**

<table>
<thead>
<tr>
<th></th>
<th>AVERAGE</th>
<th>MARY</th>
<th>PHIL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>24</td>
<td>42</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>High school</td>
<td>Some college</td>
<td>Graduate</td>
<td></td>
</tr>
<tr>
<td>Annual income</td>
<td>$34K</td>
<td>$57K</td>
<td>$80K</td>
<td></td>
</tr>
<tr>
<td>Income growth potential</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Savings rate</td>
<td>2%</td>
<td>5%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Current 401(k) savings</td>
<td>$5K</td>
<td>$25K</td>
<td>$45K</td>
<td></td>
</tr>
<tr>
<td>Current IRA savings</td>
<td>$3K</td>
<td>$18K</td>
<td>$33K</td>
<td></td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management. For illustrative purposes only. For the full set of assumptions and model methodology, please see the appendix.
How many American women die at age 86? Only 8.5%. As we will demonstrate, averages have limited utility in both individual retirement planning and the design and management of defined contribution plans. The most effective retirement plan, for a single individual or a large group of employees, will be the most inclusive and comprehensive—encompassing a wide continuum of life choices and experiences.

**PLANNING FOR RETIREMENT**

In planning for retirement, individuals should assess their particular circumstances and concerns and not assume that they can safely rely on the averages. Do they have a family history of longevity? Did they start saving for their retirement in their 20s, 30s or only in their 40s? Are they healthy? Are their savings in cash or do they diversify their investments? Only then can they understand what variables are under their control and how they might influence them. They might, for example, choose to participate in a 401(k) plan, escalate 401(k) contributions, spend less/save more, maintain a healthy lifestyle or modify their asset allocation.

Employers offering defined contribution plans to their workers also need to move beyond the average, taking into account a wide range of employee behavior and circumstances. The same principle applies for an individual with $100,000 in savings or a company 401(k) with $100 million in assets: The strongest retirement plan considers many variables, well above and below the average.

To make the case for an inclusive approach to retirement planning—designing for the edges as well as the middle—our analysis begins with a composite average American, our Average Joe. In developing Joe's financial plan for retirement, we use typical planning assumptions (which may be averages, or means, medians, or midpoints, or generally recommended conservative estimates). These typical assumptions define our base case scenario.

We then show how alternative planning assumptions (retiring at 70, say, instead of 65) can lead to very different retirement outcomes. These, in turn, result in very different required savings rates that would need to be sustained well before retirement. For instance—and not surprisingly—retiring at 62 instead of 65 requires a higher savings rate, but a much higher savings rate than many expect. Finally, we demonstrate how changes in a few key variables—number of years in retirement, investment returns and high health care costs driven by a need for long-term care—can dramatically impact the relative success, or failure, of an individual's retirement outcome.

**AVERAGE JOE**

Meet our Average Joe.

Our composite average American is a 42-year-old college-educated man who earns $57,000 a year and saves 5.1% of his gross income, including a consistent 1.7% employer 401(k) match, as a participant in his DC plan. Because Joe's profile is constructed using either averages or medians for each characteristic, the composite is derived from very different groups of people. Joe's age is the median of all American workers, his salary is the median individual income for 42-year-old Americans with a bachelor's degree, and his savings rate is the national average savings rate of all U.S. households. (Returning to our opening cast of characters, Joe is an average of many different Marys and Phils.)

How much has Joe saved for his retirement? To answer that question, we first note that averages can obscure what is an especially large dispersion, or range of values, in 401(k) and IRA balances. The average, or mean, 401(k) account of all participants totals $76,000, but the median, or midpoint, is just $18,000. That's because the average, calculated as all 401(k) account values divided by the number of participant accounts, can be distorted by a few large or many very small accounts, whereas the median, the midpoint in a continuum of all account values, is more representative of the typical participant.

In short, a mean may be quite different from a median (EXHIBITS 2A and 2B, on the next page).

Because the median is a more representative value for retirement account balances, we set Joe's IRA balance at $18,000, the median value for accounts owned by individuals age 40–44, and his 401(k) balance at $25,000, the median...

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balance for workers in their 40s who have access to a company 401(k) plan. That balance may seem low or high depending on which industry statistic is used in comparison. When the average 401(k) balance is based on a pool of retirement savings for all Americans, the average is $16,000. When it includes only employed private sector workers, the average increases to $33,000. When the universe is narrowed to those who consistently participate in their DC plans, the average jumps to $130,000.

Here are the assumptions that form the foundation of Joe’s retirement plan. (We use typical retirement planning assumptions in our analysis). We’ll refer to these as our base case.

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**AVERAGE JOE’S RETIREMENT PLANNING ASSUMPTIONS**

We assume that Joe retires—that is, he stops working full-time and begins claiming Social Security—at age 65. This is a commonly used default assumption by both financial advisors and employers when they provide retirement income estimates to their employees. The assumption reflects the fact that most Americans link their desired retirement age more to Medicare eligibility than to full Social Security benefits.

In our base case scenario, Joe lives to 90. (Many planning tools incorporate the life expectancy for an individual who lives past 65, which is age 86 for women and 83 for men, and conservatively add several years to that projection.)

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8 Employee Benefit Research Institute (EBRI), March 2017.
11 EBRI Issue Brief No. 426, September 2016.
What will Joe want or need to spend in retirement? We begin by looking at his pre-retirement income, after taxes and after his own savings. Our assumption is that Joe will look to replace 100% of his disposable income, the equivalent of his pre-retirement lifestyle, in retirement.

For health care costs, we project expenses based on estimated annual spending of $5,140 per person per year in 2017 for a 65-year-old traditional Medicare enrollee. This assumes a comprehensive supplemental Medicare plan and average out-of-pocket costs for prescription drugs.

At 42, Joe has accumulated retirement savings of $43,000, having saved steadily since he started working. We assume he saves 5.1% a year from age 42 until he retires at 65—as we’ve said, the rate already includes a consistent 1.7% 401(k) match. His retirement portfolio generates an average annual return between 5% and 6% over that period (see box on the right).

In Joe’s plan, we make no provision for long-term care, as most retirement income forecasts do not initially assume such a need. This can be a major shortcoming: Most Americans will need some level of long-term care for some period of time, and if they don’t grasp the potential financial impact, they may not be adequately prepared.

That is our base case scenario. Where does our retirement plan leave Joe? The answer is bleak (EXHIBITS 4A and 4B).

Joe’s assets are wiped out by the time he turns 72—just seven years into retirement and well before he dies at 90. To stave off that scenario, starting at age 42 Joe would have to either more than triple his total savings rate (his own savings plus his employer match) to 16% or reduce his spending in retirement by 31%.

Research shows that many people make improbable assumptions about their future portfolio returns. An effective retirement plan must be grounded in reality.

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**EXHIBIT 4A: FINANCIAL ASSETS FROM AGE 42 THROUGH RETIREMENT**

- **Retirement at 65**
- **Joe’s assets are depleted by the time he turns 72**

**EXHIBIT 4B: ANNUAL CASH FLOW NEEDS IN RETIREMENT**

- **Distributions**
  - Withdrawals (including tax needs)
  - Social Security benefit
  - Spending needs

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Source: J.P. Morgan Asset Management. For illustrative purposes only. For the full set of assumptions and model methodology, please see the appendix.
He must more than triple his savings rate. It is difficult to over-emphasize how much an individual’s savings rate can tip the odds of a successful retirement outcome. To an extent that might surprise many financial advisors and employers, a higher savings rate makes it more probable that a pre-retirement lifestyle can be replaced in retirement. That is partly because someone who saves more before retirement becomes used to a more modest lifestyle.

In our revised base case scenario, Joe takes our advice. He saves 13% a year and receives an employer match of 3%, bringing his total savings rate to 16%. (Note that many financial experts recommend that investors save 15% of income throughout their working years to secure a comfortable retirement.) If all our other base case assumptions hold—he retires at 65, his portfolio returns between 5% and 6% a year, he has no long-term care event, etc.—Joe will be able to sustain his pre-retirement lifestyle until he dies at 90.

Testing resilience: A wide range of outcomes, different savings requirements

How resilient is Joe’s plan if one or more of those base case assumptions falls apart? What happens if Joe retires early, or his portfolio generates returns well below 5%, or he suddenly faces an extended stay in a nursing home? What would he need to save from age 42 on in order to sustain his assets until he dies? In the following section, we tackle these questions.

To address these issues, we look at a range of outcomes. More specifically, we consider what factors produce the greatest dispersion of outcomes as measured by the level of savings required to reach a successful retirement outcome (Exhibit 5, on the next page). For example, retiring at 70 instead of 65 lowers the required savings rate from 16% to 3%. But retiring at 62 kicks up the required savings rate to a much higher level of 25%.

Years in retirement: Retirement age and life expectancy

Our first question is foundational: How long will retirement last—when does it begin (retirement timing), and when does it end (longevity)?

In our revised base case scenario, we assume, as most financial plans do, that Joe retires at 65. But let’s imagine that he is laid off at 62 and, unable to find new work, has no choice but to retire earlier than he hoped. For Joe to have sufficient funds to last until he is 90, we calculate that he would have needed to save 25% a year from age 42.

On the other hand, let’s assume that he is able to keep working, and consequently postpone claiming Social Security, until he is 70. Now the savings demand is quite different. Because Joe has fewer years in retirement to fund and, critically, has maximized his Social Security payments, he can save 3% a year from age 42 to age 70 and not run out of money before he dies at 90.

Of course, life expectancy is a critical variable. If Joe were to retire at 65 and die at 83, he would need to save 13% a year from age 42. But if he were to live to 100, he would need to save 19% a year.

Investment returns

To recap, in our revised base case scenario, Joe saves 16% a year, inclusive of an employer match of 3%, and his retirement savings generate an average annual return of 5%-6%. We assume his portfolio is well diversified and becomes more conservative over time; we also assume he stays invested and does not jump in and out of the market to chase returns or run from volatility.

Not surprisingly, a change in investment returns over the course of a working life can make a significant difference in required savings rates. If Joe’s portfolio were to return an average annual 11% until he retires at 65—studies show that many individuals expect average annual portfolio returns as high as 11%—Joe would need to save just 1% a year. On the other hand, if his portfolio returns were to fall to 2%, he would need to boost his savings rate to 26%. A long stretch of market returns well below their historical average, coupled with poor investing behavior, can wreak havoc with a financial plan for retirement.
Different scenarios result in very different savings rate requirements

EXHIBIT 5: BASE CASE SCENARIO, ALTERNATIVE ASSUMPTIONS, NEEDED SAVINGS RATES

Source: J.P. Morgan Asset Management. For illustrative purposes only. For the full set of assumptions and model methodology, please see the appendix.

Long-term care and health care costs

While many plans take specific health care costs into account, most individual plans and retirement forecasts in DC plans do not consider the risk of long-term care needs. And yet 72% of women and 55% of men who reach 75 require some sort of long-term care during their retirement.15

If Joe has no long-term care need, his 16% savings rate will be adequate. If he requires a two-year stay in a nursing home, he would need to save 21% a year to have sufficient funds to last until 90. Reliable statistics about long-term care are hard to come by, but among individuals who make long-term care claims to insurers, one in 10 require paid care in their home, a stay in a nursing home or other assistance for five years or more.15 For Joe, that would demand a 28% savings rate from age 42. We note, however, that Joe’s plan assumes he has no long-term care insurance, which could mitigate the costs of a nursing home stay.

Even without long-term care, health care costs can have a major impact on a retiree’s lifestyle and required savings rate. Our revised base case scenario assumes a 6.5% average annual increase in health care costs in retirement.

15 American Association for Long-Term Care Insurance.
If Joe has more modest health care costs, he need save only 11% a year. Higher costs, on the other hand, would require a savings rate of 17%.

Stress testing a plan

Before we leave our Average Joe, we’ll conduct a series of stress tests on his plan (EXHIBIT 6).

As we’ve noted, in our revised base case scenario Joe saves 16% a year from age 42 and his assets carry him to age 90. But if he retires at 62 instead of 65, his money runs out at 74. If he faces increased health care expenses and a two-year stay in a nursing home, his assets are depleted at 79, and if his retirement portfolio generates average annual returns of 4%-5% instead of 5%-6%, his assets are gone at 83.

PLANNING FOR THE EDGES AS WELL AS THE AVERAGE: AN INDIVIDUAL PERSPECTIVE

As Joe’s story makes clear, changing life choices and circumstances can dramatically affect the odds of a successful retirement outcome. It’s not always easy to see. This is one of many reasons individuals planning for retirement may want to work with a financial advisor who can help them understand these causal connections and appreciate the potential consequences of their decisions. Merely looking at averages will not suffice. We believe everyone contemplating retirement should think about how choices made at 40 or 50 could impact their retirement lifestyle, how they might balance competing objectives and, finally, how resilient they might be to unexpected adversity. Put another way, they need to answer one critical question: How much uncertainty—and what kind of risk—can I tolerate?
Financial advisors, in turn, can play an important role in helping their clients craft financial plans that do not simply rely on average inputs but instead take into account an individual’s specific goals, needs, risks and risk tolerances.

Stress testing an individual’s plan can often bring into bold relief the need for using a range of variables and not merely relying on averages. Stress testing in this context can involve an analysis of the impact of early retirement, longer lives and long-term care, as well as market shocks. Although financial advisors often use simulations to stress test market returns, simulation testing of individual behavior and circumstances is much less common, despite the fact that those factors can have a greater impact on experienced returns.

Understanding the range of potential outcomes helps clarify which challenging scenarios can be successfully met and which would require a course correction. Financial advisors can also help their clients decide if a course correction would be best addressed well before the scenario occurs. (In other words, save more now because later may be too late.)

PLANNING FOR THE EDGES AS WELL AS THE AVERAGE: A DEFINED CONTRIBUTION PERSPECTIVE

From a very different vantage point from that of financial advisors, employers look at the same terrain—a wide range of individual employees who often fail to understand how the choices they make long before they stop working can affect the lifestyle they experience in retirement.

In establishing and refining their defined contribution plan designs and investment options, employers—with help from their providers—have an opportunity to consider the broadest possible range of participants’ saving and investing behavior, and not merely rely on averages. The variables may include contribution levels, salary levels, investing choices and loan and withdrawal activity. Employers may find it particularly useful to move beyond averages when they measure plan success. For example, when observing an increase in the plan’s average contribution rate, employers can determine if relatively few participants are driving that increase by looking at the median as well as the mean. They can see if plan features are working as well as they could.

Many employers look at the overall asset allocation of their plan and conclude that it is well diversified, as most plans offer a core lineup of eight to 12 funds in addition to the qualified default investment alternative (QDIA) and plan assets are often well diversified across those funds. But a focus on individual participant allocations may reveal a surprising number of plan participants with inappropriate asset allocation for their age and risk tolerance. According to J.P. Morgan retirement research, the average number of funds held by a 401(k) plan participant, excluding target date funds, is only 3.3. Moreover, the vast majority—88%—of plan participants fall outside the range of equity exposure generally considered appropriate for their age.

Recognizing the inadequacy of average assumptions in DC plan design, employers can help their participants make, in effect, “better than average” choices.

Two plan design features, automatic enrollment and automatic contribution escalation, encourage the “good” behavior in retirement planning that makes all others possible—saving.

Automatic contribution escalation makes automatic annual increases in participant savings rates. (Here, too, notification must be given and participants may opt out.) The two programs, automatic enrollment and automatic contribution escalation, should go together, but often they do not. That can be a problem because automatic enrollment on its own may have the effect of freezing plan participants at too-low contribution rates.

Diversification, target date funds and re-enrollment

While saving is a critical determinant of a retirement outcome, investing, and in particular asset allocation, are also very important. Employers can do a lot to help their employees in this arena. While many approaches can work well, we are long-time believers in target date funds. These are professionally managed, well-diversified multi-asset solutions whose asset allocation changes as a participant’s age approaches the target date. Another benefit: TDF investors are less inclined than other fund investors to move their assets at inopportune times.16

16 “Mind the Gap 2016,” Morningstar, Inc.
Target date funds can go hand in hand with another strategy that employers may adopt to help their employees improve their asset allocation—an investing reset known as re-enrollment. In a re-enrollment, participants are notified that their existing assets and future contributions will be invested in the plan’s qualified default investment alternative unless the participant makes a new investment election during a specified time period. Many employers choose target date funds as their plan’s QDIA. Before conducting a re-enrollment, a plan sponsor must engage in a prudent process to determine whether the strategy is appropriate for the plan and its participants. As with automatic enrollment and automatic contribution escalation, plan participants must be given the opportunity to opt out of the re-enrollment.

Simulations for participant behavior as well as market returns

In designing DC plans, it can be very useful to move beyond average inputs. What does this mean in practice? Plan design, in all its components, can take into account a range of scenarios related to both participant spending and saving behavior as well as market returns. This can be especially effective in setting a target date fund’s “glide path,” the mix of assets, which changes as a participant’s age gets closer to the target date.

To be sure, average inputs may be more appropriate than common industry assumptions in designing a DC plan. For example, it is often assumed that participants receive raises every year, when the reality is that they get raises every two or three years, on average. But designing for the edges as well as the average is by far the better approach.

Typically this will involve Monte Carlo simulations. Plan sponsors and investment managers may use simulations, based on forward-looking capital market assumptions, to illustrate market return scenarios. Rarely are simulations used to incorporate the variability of participant behavior. The behavioral variables might include: participant contribution rates and changes to those rates over time; pace of salary growth; frequency and size of loans; and frequency and size of withdrawals. But simulations can be most effective when they simultaneously incorporate both market returns and participant behavior.

The full distribution of those behavioral variables can be quite extensive, as illustrated in representative data from 400 DC plans with 2.2 million participants, compiled by J.P. Morgan (EXHIBIT 7). For example, salary growth among participants getting a raise is on average 3% every two to three years, but those gains range between 1% and 36%. Contribution rates have almost as wide a span, from 2% to 8% for 25-year-olds and 2% to 15% for 50-year-olds.

The full distribution of behavioral variables can be quite extensive—underscoring the inherent limitations of average inputs

![EXHIBIT 7: REPRESENTATIVE BEHAVIORAL DATA FROM 400 DC PLANS WITH 2.2 MILLION PARTICIPANTS](source)

Salary growth (among participants getting a raise)

<table>
<thead>
<tr>
<th>Lower range (10th percentile)</th>
<th>Median (50th percentile)</th>
<th>Higher range (90th percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>3%</td>
<td>36%</td>
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Contributions at age 25

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<td>2%</td>
<td>4%</td>
<td>8%</td>
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</table>

Contributions by age 50

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<th>Median (50th percentile)</th>
<th>Higher range (90th percentile)</th>
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<tbody>
<tr>
<td>2%</td>
<td>6%</td>
<td>15%</td>
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Loan as a % of account balance

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<th>Median (50th percentile)</th>
<th>Higher range (90th percentile)</th>
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<tr>
<td>2%</td>
<td>15%</td>
<td>40%</td>
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Pre-retirement distributions

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<th>Median (50th percentile)</th>
<th>Higher range (90th percentile)</th>
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<tbody>
<tr>
<td>6%</td>
<td>43%</td>
<td>98%</td>
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Post-retirement distributions

<table>
<thead>
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<th>Lower range (10th percentile)</th>
<th>Median (50th percentile)</th>
<th>Higher range (90th percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7%</td>
<td>95%</td>
<td>100%</td>
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</tbody>
</table>

Source: J.P. Morgan retirement research, 2014. Salary raises are calculated based on participants getting a raise. Pre-retirement distributions are for active participants aged 59 ½ - 65. Post-retirement distributions are for retired participants aged 65-plus.

Simulations can incorporate the variability of participant behavior to best account for all possible portfolio outcomes. If the pace of salary growth slows by 1 percentage point, for example, what impact would it have on the participant’s portfolio? If contribution rates increase by 2 percentage points, what impact would that have? Monte Carlo simulations can help answer those questions and in that way move beyond the inherent limitations of average inputs. At J.P. Morgan we have been using this type of analysis for more than 10 years to build our own target date glide paths.
Moving beyond averages: Implications for stakeholders in the U.S. retirement system

The need to move beyond averages cuts across the entire U.S. retirement system. Employers, plan providers/recordkeepers, financial advisors, individuals, policymakers—all can benefit when they take into account a wide range of variables and do not merely rely on an average. Here are some key takeaways for each stakeholder group:

**INDIVIDUALS/EMPLOYEES:** Work with a financial advisor, or use a retirement planning tool or advisory service. Contemplate how changing circumstances might impact your retirement portfolio. Consider if you need to save more now (because later may be too late).

**POLICYMAKERS:** Review an extensive collection of data, not merely statistical averages. Don’t ignore the messy continuum of human behavior.

**FINANCIAL ADVISORS TO INDIVIDUALS:** Help clients understand the consequences of their choices. Stress test an individual’s retirement plan, using simulations to model client behavior and circumstance.

**EMPLOYERS:** Evaluate a deep set of data to inform decisions about plan design and investments and to evaluate plan success. Help employees make “better than average” choices.

**FINANCIAL ADVISORS TO EMPLOYERS:** Be a proactive partner. Offer innovative ideas that move beyond the average. Stress test an employer’s DC plan to determine how participants are interacting with the plan. Use simulations to incorporate a wide range of behavioral variables.

**PLAN PROVIDERS/RECORDKEEPERS:** Provide detailed data about the variety of participant saving and investing behavior. Make sure that employers understand how individual participants are actually allocating their money.

Considering a range of behavior can also be helpful in establishing target income replacement ratios for plan participants. In our view, there is no one-size-fits-all—no average—income replacement rate. These will vary with wage levels, savings rates and spending needs, among other factors. An employee who earns less may also spend/need less in retirement, and an employee who earns more may also spend/need more in retirement. These are the sorts of offsetting combinations—the plan edges—that cannot be captured by average inputs.

**CONCLUSION**

We conclude where we began, acknowledging that all of us, faced with an existential uncertainty about what the future holds, naturally look to see what average experience has occurred in the past. We don’t know when we’ll retire, how long we’ll live, what our retirement health care costs might be or what markets will return in the coming decades. Quite reasonably, we look at average savings rates, average 401(k) asset levels and so on. And yet averages can be distorting because no one is average. (To return to our opening graphic, Mary and Phil together do not make an Average Joe.)

We aim to identify and explain the trade-offs and compromises that employers, individuals and financial advisors face as they create and monitor retirement plans. Defining and calibrating risks—and risk tolerance—can be a delicate balancing act. It can be very helpful to frame decisions in ways that allow people to better understand the consequences of their choices and to course correct as needed.

Yes, we look at averages, but we look beyond them, too. In our view, an effective retirement plan, for a single individual or thousands, should incorporate the sometimes messy continuum of human choice and experience. That is why we firmly believe in designing for the edges as well as the average.
APPENDIX
## SUMMARY OF CONTRIBUTION RATES AND INPUTS

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>Base total contribution assumed¹</th>
<th>At base contribution rate, assets run out at age ...</th>
<th>Break-even contribution² + Employer match³ = Total break-even contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base case</td>
<td>5.1% 72</td>
<td>12.8% 3.0%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Retire at age 62</td>
<td>5.1% 65</td>
<td>21.7% 3.0%</td>
<td>24.7%</td>
</tr>
<tr>
<td>Retire at age 70</td>
<td>5.1% &gt;100</td>
<td>2.0% 1.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Live to age 83</td>
<td>5.1% 72</td>
<td>9.8% 3.0%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Live to age 100</td>
<td>5.1% 72</td>
<td>15.8% 3.0%</td>
<td>18.8%</td>
</tr>
<tr>
<td>Lower health care expenses</td>
<td>5.1% 73</td>
<td>8.0% 3.0%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Higher health care expenses</td>
<td>5.1% 71</td>
<td>13.5% 3.0%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Two years of long-term care (age 79-80)</td>
<td>5.1% 72¹</td>
<td>17.6% 3.0%</td>
<td>20.6%</td>
</tr>
<tr>
<td>Five years of long-term care (age 79-83)</td>
<td>5.1% 72¹</td>
<td>24.7% 3.0%</td>
<td>27.7%</td>
</tr>
<tr>
<td>Lower investment returns</td>
<td>5.1% 68</td>
<td>23.0% 3.0%</td>
<td>26.0%</td>
</tr>
<tr>
<td>Higher investment returns</td>
<td>5.1% &gt;100</td>
<td>0.9% 0.5%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Revised base case</td>
<td>15.8% 90</td>
<td>12.8% 3.0%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Revised base case and retire at 62</td>
<td>15.8% 74</td>
<td>21.7% 3.0%</td>
<td>24.7%</td>
</tr>
<tr>
<td>Revised base case and 1% lower return</td>
<td>15.8% 83</td>
<td>16.0% 3.0%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Revised base case and higher health care and two years of long-term care</td>
<td>15.8% 79</td>
<td>18.3% 3.0%</td>
<td>21.3%</td>
</tr>
</tbody>
</table>

¹ Contributions are assumed to be made pre-tax.
² Break-even contribution rate is the rate required for assets to last through the retirement life span given the assumed ages at retirement and end of life (65 and 90, respectively, unless otherwise noted).
³ Employer match formula is 50% of the employee's contribution up to a 3% match.
⁴ Assets run out before long-term care event occurs at age 79.
MODEL METHODOLOGY AND ASSUMPTIONS

RETIREMENT SPENDING NEED

Post-retirement spending is based upon (a) an initial income replacement goal; (b) the changes in spending as one ages, which reflect data provided by JPMorgan Chase’s Consumer and Community Bank; and (c) assumed inflation. The initial income replacement goal is set at 100% of terminal pre-retirement after-tax, after-savings cash flow. The spending is computed in real terms, adjusted for inflation based on category-specific inflation rates provided by the Bureau of Labor Statistics.

At retirement, our Average Joe begins to draw on his accumulated savings and Social Security to finance his spending. He is assumed to first use Social Security benefits and mandatory payments from retirement accounts to meet spending needs. If those payments exceed the spending requirement, any excess is invested in the taxable account for consumption in future years. If those payments are insufficient, discretionary withdrawals from retirement plans would be required. When such withdrawals result in taxation—i.e., taxable withdrawals from 401(k) plans—additional withdrawals take place to pay taxes such that retirement spending cash flow needs are met in full.

INCOME TAX

The model incorporates all aspects of the tax code as it applies and assumes a continuation of current statutory rates; income brackets are adjusted upwards over time for inflation. Earned income is subject to federal ordinary income tax, payroll taxes, applicable Medicare surtaxes and state/local taxes. (Our model assumes a state/local tax rate of 2.7%.) Unearned income is subject to corresponding ordinary income and capital gains taxes, applicable Medicare surtaxes and state/local taxes. Both types of income are also subject to alternative minimum tax adjustments where necessary. Deductions and exemptions are adjusted based on income per existing legislation.

INVESTMENT RETURN

Equity return: 6.25%
Fixed income: 3.00%

These are the equity and fixed income returns that are assumed to be earned on pre-tax and after-tax savings.

Each investment scenario is assumed to decrease (glide) its equity allocations annually as Joe ages. The glide is equal to the average observed equity allocation. This starts at 74% at age 42 and steadily decreases to 55% at age 65. 1

Stress testing the low and high investment returns is based on historical and survey-based information. DALBAR conducted a study to measure the effects of investors’ decisions to buy, sell and shift investments, and found the effective 20-year average asset allocation fund investor return was 2.3%. Natixis, conversely, found end investors expect to receive 8.5% above inflation. 3

HEALTH CARE AND LONG-TERM CARE

Health care expenses are derived from three hypothetical scenarios of low, median and high health care situations. The low scenarios assume the lowest third of cost distribution for Medicare Advantage plans. The median and high scenarios assume Medicare Part B; Part D; comprehensive Medigap; and vision, dental and hearing. The median scenario, our base case, assumes 50th percentile of prescription drug costs, and the high scenario assumes the 90th percentile of prescription drug costs. 4

Long-term care is equal to the national median costs for nursing care: $82,000 annually (real dollars). 5 Among individuals who make long-term care claims to insurers, about 50% require paid care in their home, a stay in a nursing home or other assistance for approximately two years and 10% for five years or longer. 6 Our model inflates costs by 2.25%. Inflation rates for nursing home, assisted living and home health aides vary considerably. Over the past five years, U.S. inflation rates for the three categories were 3.5%, 2.2% and 1.3%, respectively. 5

OTHER

Tax-deferred 401(k) assets at age 42: $25,372
Tax-deferred IRA assets at age 42: $17,864

Social Security: Benefits are calculated under current rules (adjusted for inflation), accounting for historical indexing factors, Joe’s actual wage history and claim age (tied to his retirement age in each scenario).

Wage inflation: 2.75%. The rate at which real incomes, adjusted for age cohort, grow over time.

CPI inflation: 2.25%. General inflation assumption used to compute real returns on stocks and bonds, adjust expenditures from 2017$ and adjust tax brackets and deductions.

1 J.P. Morgan retirement research. Data as of 2014.
4 Employee Benefit Research Institute, SelectQuote, Centers for Medicare and Medicaid Services, 2016 Medicare Trustees Report, J.P. Morgan analysis.
6 American Association for Long-Term Care Insurance.
7 Employee Benefit Research Institute (EBRI), March 2017
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