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How Spending Evolves in Retirement: A Smile, a Smirk, or Something Else?

David Blanchett

Head of Retirement Research, Prudential Financial, Lexington, Kentucky, USA

Correspondence: David Blanchett (david.blanchett@pgim.com)

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ABSTRACT

Research indicates that inflation-adjusted (real) retiree spending tends to decrease over time, challenging the common assumption that expenses rise in line with inflation throughout retirement. This piece examines actual changes in retiree spending leveraging data from the Health and Retirement Study. The analysis suggests that even retirees who are relatively well off typically reduce real spending, especially those who are older and spending at higher levels, indicating that choice is a key driver in the decision to spend less. Additionally, evidence supports both "smile" and "smirk" spending trajectories, depending on modeling assumptions (e.g., whether focused on the median or average retiree). Overall, reduced real spending needs to be better integrated in our models given the varied implications of the assumption on optimal retirement decision-making.

1 | Introduction

Retirement income research and financial planning models predominately assume that spending increases relatively lockstep with inflation throughout retirement. This is in contrast to a growing body of research demonstrating that retirees tend to reduce inflation-adjusted (real) spending over time. Questions remain, though, to what extent reductions in spending are driven by circumstances or by choice (or some combination of both), since the modeling implications of drivers of the change are quite different.

Additionally, there are conflicting perspectives about how spending changes at advanced ages (80+). For example, Blanchett (2014) documents the "retirement spending smile" which notes that changes in retiree spending follow a U-shape over time, where spending in retirement wanes and then begins to drift back up at older ages. In contrast, Hurd and Rohwedder (2022) document declines in real spending that persist even at older ages, an effect evident when reviewing total average expenditures by age (e.g., from the Consumer Expenditure Survey), suggesting changes in spending resemble more of a "smirk," without the upward curl.

This piece explores retiree spending decisions leveraging data from the Health and Retirement Study (HRS), more specifically the 2021 RAND HRS Consumption and Activities Mail Survey (CAMS) v1 and the 2022 RAND HRS Longitudinal Files v1. The analysis demonstrates that while both circumstances and choices likely play important roles in spending changes, choice is likely a key driver since even relatively well-funded retirees tend to reduce real spending, on average, especially those who are older and spending more.

With respect to the trajectory of the change in spending over time, the analysis supports *both* "smile" and "smirk" patterns. For the average retiree (i.e., the median person), real spending changes continue to decline, that is, exhibits a "smirk;" however, when changes are averaged across all retirees, there does appear to be an increase at older ages, that is, exhibits a "smile." Idiosyncratic healthcare risks likely contribute to the differences, since healthcare shocks would affect the average change in spending across all retirees but not necessarily the median retiree.

Incorporating reduced real spending models in a retirement income forecast can result in initial spending rates that are approximately 20% higher compared to a constant real spending model. Therefore, regardless of the specific spending pattern modeled, whether a smirk, smile, or some other shape, incorporating a real decline in retiree spending needs to be more widely considered in financial planning tools and retirement research today given the significant implications for optimal decision-making.

2 | Keeping it Real in Retirement

The belief that retirees desire to maintain a constant real (i.e., inflation-adjusted) spending level throughout retirement seems like a relatively intuitive assumption. As the costs of goods and services change, it would seem obvious that retirees would adjust spending accordingly (i.e., spend in constant real terms).

Constant real spending is an incredibly common assumption in both financial planning tools and retirement research. For example, Bengen (1994) assumed that portfolio withdrawal amounts are increased by inflation in his widely cited research noting the "4% Rule." Additionally, most retirement research conducted by this author assumes spending increases in response to inflation, despite publishing research documenting otherwise (change is hard!).

There are a variety of reasons, though, why retiree spending levels might not evolve the same as aggregate inflation. For example, the basket of goods and services consumed by retirees differs from the "average" person. This effect is captured when comparing the weights of the Consumer Price Index for Urban Consumers, or CPI-U, which is perhaps the most widely used definition of inflation in the US, to the CPI-E,[1] a price index for the elderly (i.e., retirees), which includes only Americans 62 years and older. As of December 2024, medical expenditures represent 11.3% of total expenditures in the CPI-E versus 8.3% for the CPI-U.[2]

Differences in expenditures are further documented in Exhibit 1, which includes both total spending amounts (Exhibit 1A) and the distribution of expenditures (Exhibit 1B), leveraging data from the 2024 Consumer Expenditure Survey.[3]

Exhibit 1A illustrates the sizable differences in total spending across ages. For example, households with a reference person who is between the ages of 45 and 54 tend to have the highest level of total expenditures, totaling $97,319. This is considerably higher than households with the reference person who is age 75 or over, who spend $53,031 in total. The decline in real expenditures at older ages is to some extent contrary to the common assumption that people desire to maintain constant real lifetime spending. In theory, the reduction could be driven by lack of resources, though which is explored later in this piece.

Exhibit 1B illustrates how the share of expenditures evolves over time. Older Americans tend to devote an increasing share of spending to items such as healthcare, housing, and cash contributions, and lower shares to things such as transportation, insurance, and pensions. These effects are also evident when contrasting the expenditure weights of the CPI-U and CPI-E.

Healthcare is an expenditure of special note. For example, while households with the reference person under the age of 35 devote less than 5% of total expenditures to healthcare, those with a reference person 75 or older devote roughly 15%. Even as total expenditures decline at older ages, the absolute amount spent on healthcare rises almost monotonically with age.

Healthcare expenses have historically increased at a faster rate than base inflation. For example, from January 1957 to May 2025, medical care inflation[4] has averaged 5.10% per year, while

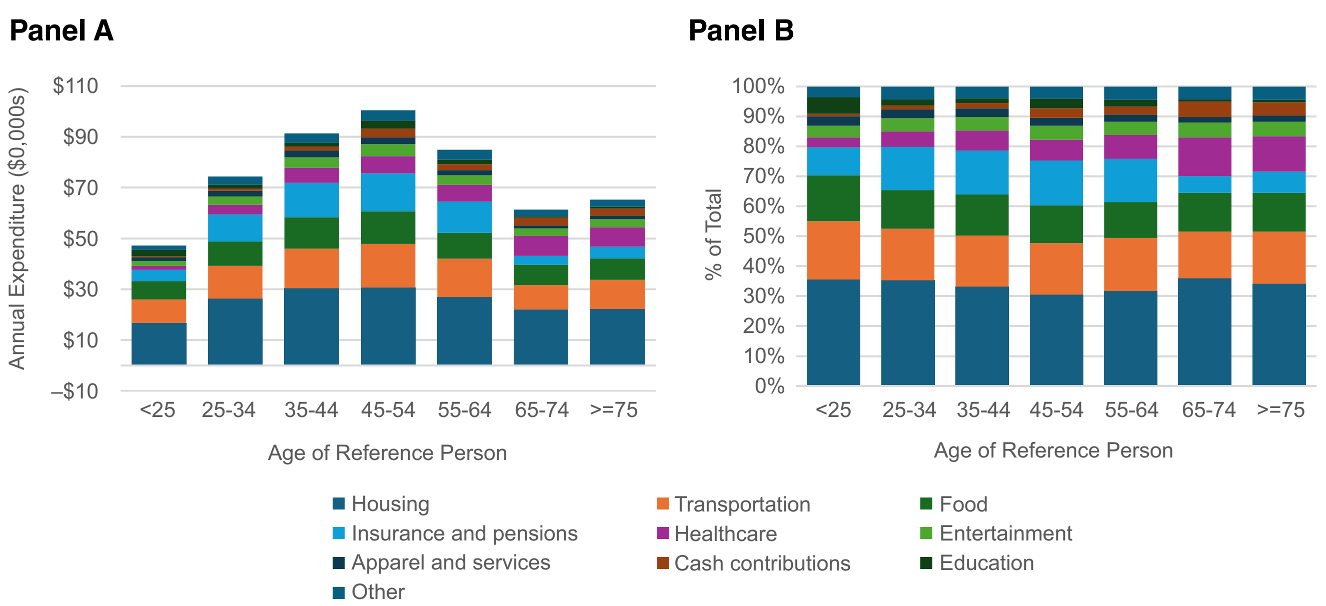

EXHIBIT 1 | Annual total household expenditures by age group. (A) Total spending. (B) Percentage of total. *Source:* 2024 Consumer Expenditure Survey, author's calculations.

the Consumer Price Index (CPI) excluding medical care[5] has averaged 3.56% per year.

There are significant idiosyncratic risks associated with healthcare in the United States, especially related to long-term care expenses. For example, Banerjee (2018) notes that while the median cumulative out-of-pocket healthcare expenses after age 70 until death are slightly above $27,000, for those who die at age 95 or later, the 90th and 95th percentiles are $172,000 and just over $269,000, respectively.

We leverage data from the RAND HRS Longitudinal File 2022 (v1) to provide additional context on the potential distribution of cumulative real lifetime out-of-pocket medical expenses experienced by retirees. Only respondents who have passed away are included in the calculations to ensure any end-of-life expenses are considered in the calculations. All dollars are converted into real terms based on changes in the CPI-U and are as of January 1, 2022.

The underlying calculation focuses entirely on "unexpected" expenses, which include hospital costs, nursing home care costs, doctor visits, dentist visits, outpatient surgery costs, prescription drug costs, home healthcare costs, special facilities costs, and other expenses and does not include Medicare or other insurance (since these are typically known with a greater level of certainty).

Exhibit 2 illustrates the distribution of cumulative real lifetime unexpected out-of-pocket medical expenses incurred after age 70, based on age of death. For reference purposes, the 75th percentile would be the expenses for the highest one in four retirees (at that death age), and the 95th percentile would be the highest one in 20. The percentile calculations include respondent weights.

Consistent with Banerjee (2018), there is evidence of significant variation in potential out-of-pocket medical expenses for retirees, especially those with longer lifespans. For example, among those who passed away at the age of 95, the median cumulative real lifetime unexpected out-of-pocket medical expenses were only about $50,000 compared to roughly $250,000 at the 95th percentile.

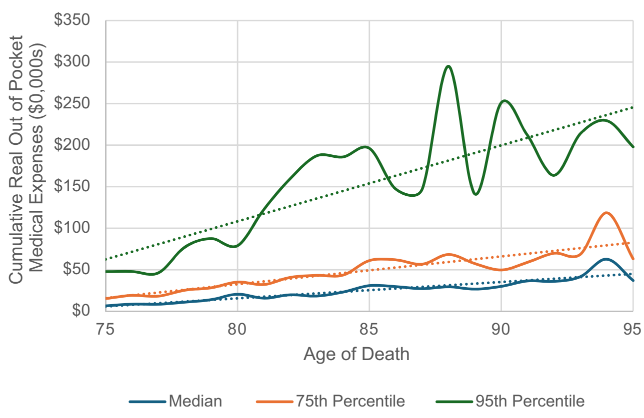

EXHIBIT 2 | Cumulative real lifetime unexpected out-of-pocket medical expenses incurred after age 70 by age of death. *Source:* RAND HRS Longitudinal File 2022 (v1), Federal Reserve Bank of St. Louis, author's calculations.

If you were to focus on the distribution of expenses, where the allocation to healthcare increases at older ages, and combine this trend with the higher-than-average inflation rate for healthcare/medical expenses, the preliminary assumption could be that retiree spending could increase by *more* than base inflation. The opposite effect has generally been observed in research and surveys, though, where retiree spending is noted to decline in real terms (i.e., not fully keep pace with inflation).

For example, Hurd and Rohwedder (2022) document (in table 3.1) how real retiree spending has declined across virtually all age groups and HRS waves. Their research is backed by decades of other published pieces, and the evidence of declines in real spending has been documented in other countries as well, something that is covered more extensively by Blanchett (2014).

Stein (1988) introduced perhaps one of the more colorful ways to think about how spending actually evolves in retirement, with the "go-go" years, "slow-go" years, and "no-go" years. The go-go years are when retirees maintain lifestyle and travel and do not necessarily consider themselves "old." The "slow-go" years, which occur roughly between the ages of 70 and 84, are brought on by health issues and when retirees start to slow down. Finally, the "no-go" years are characterized by significant changes in retirement lifestyle generally brought on by end-of-life healthcare issues.

If retirement spending continues to decline at older ages, it would suggest that real changes in retiree spending would resemble a "smirk." This is contrary, though, to the research by Blanchett (2014), where the real changes in spending at older ages are noted to tick back up, resulting in the "retirement spending smile." Blanchett attributes the uptick to rising end-of-life healthcare risks, especially the given idiosyncratic healthcare risks faced by Americans.

How spending changes are specifically defined across a given composite of retirees could have an important impact on the noted change. For example, it is possible to reconcile the "smirk" and "smile" shapes when contrasting the potential varied experiences of the median and average retiree. The median retiree has historically not experienced significant health care expenses, which would be reflected in the median results reported by Hurd and Rohwedder (2022). In contrast, any kind of estimate that considers the experience of all retirees (e.g., an average or a regression-based approach) would be more likely to exhibit the "smile" shape reported by Blanchett (2014).

Exhibit 3 includes three different potential retiree spending shapes, each of which is in real terms: constant spending, spending smile, and spending smirk. The "constant spending" model is the most common assumption in existing retirement research and financial plans, where spending is assumed to increase annually with inflation. Spending declines in real terms for both the "spending smile" and "spending smirk," but where they differ is with respect to how spending changes later in retirement (i.e., after age 80).

For reference purposes, the formulas used to estimate the annual real change in spending ($r\Delta S$) for the spending smile and spending smirk in Exhibit 3 are included in Equations (1) and (2), respectively, which are based on the Age (Age) of the retiree.

$$r\,\Delta S = 0.00008Age^2 - 0.0125Age + 0.474589 \quad (1)$$

$$r\,\Delta S = 0.000019Age^2 - 0.0036679Age + 0.155202 \quad (2)$$

The equation for the spending smile (1) is from Blanchett (2014), while the equation for the spending smirk (2) is based on both Blanchett (2014) as well as the additional analysis conducted later in this piece.

As a reminder, Exhibit 3 includes the real change in annual spending by year, not the compounded amount spent over the length of retirement. Exhibit 4 illustrates how an initial retirement income goal of $60,000 would change in real terms (Panel A) and nominal terms (Exhibit 3B) over a 30-year retirement period, assuming a 2.5% annual inflation rate (for Exhibit 3B).

Exhibit 4A highlights that the cumulative total real spending amount looks different than the annual changes noted in Exhibit 3. For example, while the "spending smile" path has a notable uptick in Exhibit 3, especially past age 90, the total spending amount for the "smile" path in Exhibit 4A remains negative and effectively flat when compared to the initial spending amount. Exhibit 4B highlights that each of the three patterns would result in increases in total spending in nominal terms, but the growth of spending varies notably among the three models (especially when comparing the constant spending approach to the spending smile or spending smirk).

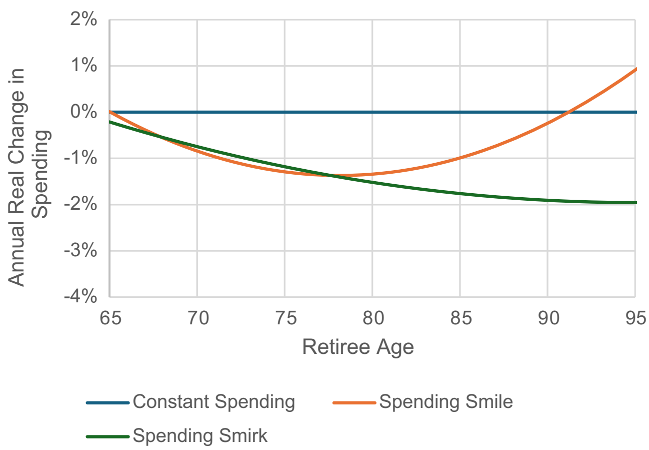

EXHIBIT 3 | Different perspectives on spending could evolve throughout retirement. *Source:* Blanchett (2014), author's calculations.

3 | Analysis

An analysis was conducted to better understand how spending evolves in retirement leveraging data from the 2021 RAND HRS CAMS v1 and the 2022 RAND HRS Longitudinal File v1. Our initial analysis leverages data entirely from the CAMS dataset.

The CAMS is a biennial survey conducted by the University of Michigan in odd number years that serves as a supplement to the larger HRS, which is focused on spending. Beginning in 2001, the CAMS initially included 5000 households that were selected at random from households that participated in the HRS 2000 core survey.

This analysis leverages the RAND version of the CAMS survey, which is a user-friendly version of Part B of the CAMS survey. The RAND CAMS survey contains annualized, cleaned, and aggregated spending and consumption variables.

Blanchett (2014) also leveraged the HRS CAMS dataset for his original research on the retirement spending smile, but this updated analysis is considerably more robust. For context, Blanchett's original analysis relied on the first five CAMS surveys (2001 through 2009) while this piece relies on 11 CAMS surveys (2001 through 2021).

The analysis assumes the CAMS surveys are completed in September of the respective survey year. All spending values are converted into real terms using the 2021 survey-year values based on the changes to the CPI-U.

To be included, the real spending amount in the initial wave (when estimating the change) had to be between $25,000 and $500,000, the 2-year real change in spending across waves had to be greater than or equal to −50% and less than or equal to +200%, and the marital status must be consistent across waves

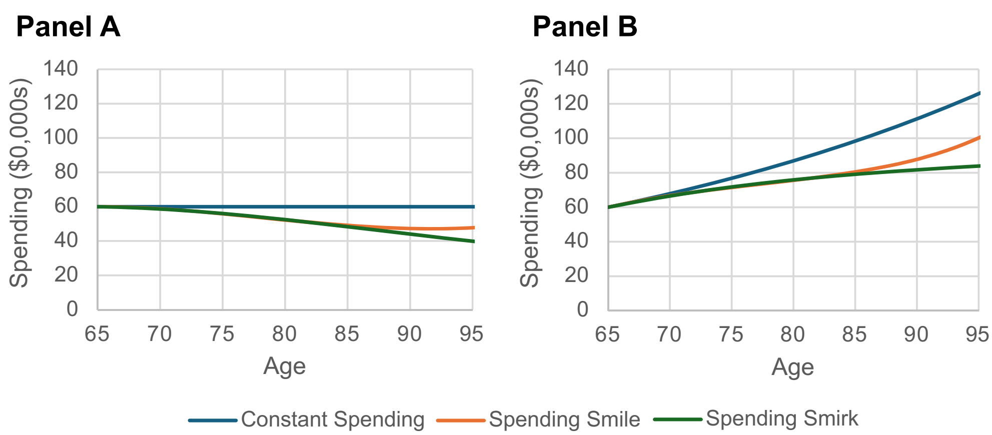

EXHIBIT 4 | Total annual spending assuming a $60,000 initial retirement income goal. (A) Real spending and (B) Nominal spending. *Source:* Blanchett (2014), author's calculations.

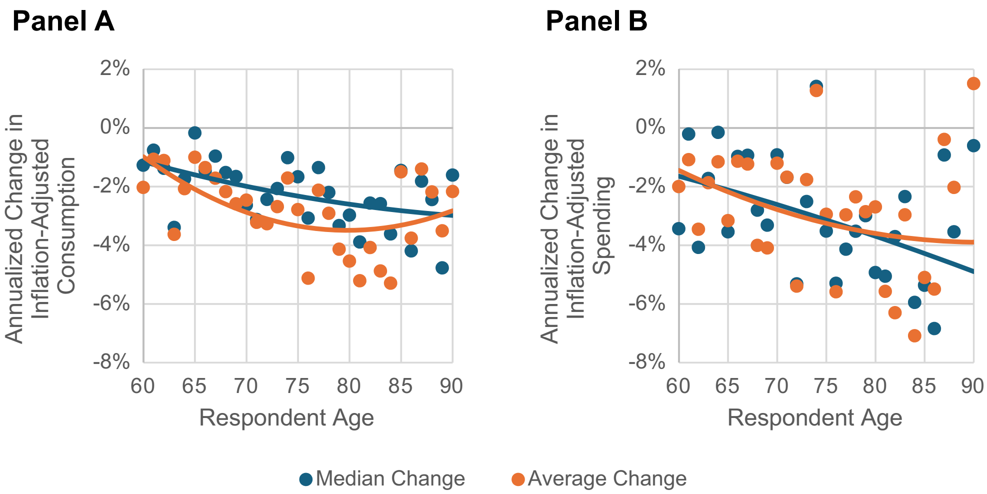

EXHIBIT 5 | Annualized real change in spending by respondent age. (A) Total consumption. (B) Total spending. *Source:* RAND HRS CAMS 2021 Data File v1, Federal Reserve Bank of St. Louis, Author's calculations.

(there are six possible marital status options). While the change constraint is applied in absolute terms, all changes are estimated as the natural logarithm of the change. Additionally, all changes are reported as annualized values so that they are more accessible to readers. The analysis is limited to respondents between the ages of 60 and 90, inclusive. Age 90 is used as the maximum age due to sample size.

The analysis includes calculations for both total household consumption and total household spending; however, changes in (real) total household consumption are the preferred metric for the analysis. The consumption metric, which is estimated by RAND, attempts to smooth out spending on items like consumer durables (e.g., automobile, TV, computer, etc.) where the utility derived from such purchases will be realized for more than one period. Total consumption was only available to 2019 at the time this analysis was conducted, while total spending was available to 2021.

There were a total of 7843 consumption change observations and 7056 spending change observations that met the required filters to be included in the analysis. Note, a respondent could be included more than once. There are 2262 distinct respondents included in the consumption change calculations and 2186 distinct respondents included in the spending change calculations. Respondent weights are used for all calculations included in this piece.

Exhibit 5 includes information about the median and average annualized change in real spending for total household consumption and total household spending, in Exhibits 1A and 1B, respectively, for each of the 31 individual ages included in the analysis (age 60–90, inclusive). A second-order polynomial trendline is included with each graphic to provide perspective on how the trend evolves by age.

There is a significant amount of noise associated with the changes estimated for the individual ages in Exhibit 5, albeit more so with spending (Exhibit 5B) than consumption (Exhibit 5A), though. Both panels suggest evidence of a spending smile and a spending smirk, to some extent, based on whether one

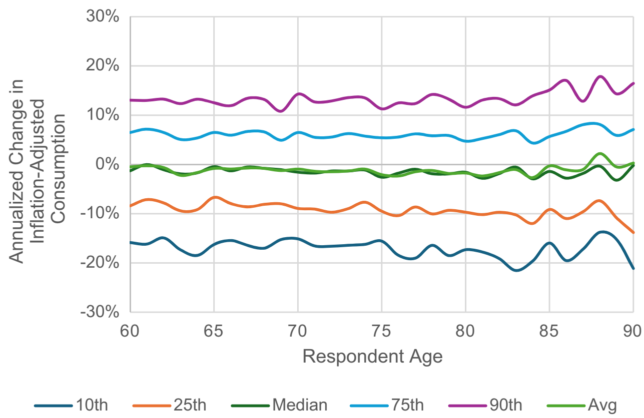

EXHIBIT 6 | Distribution of changes in real consumption by respondent age. *Source:* RAND HRS CAMS 2021 Data File v1, RAND HRS Longitudinal File 2022 v1, Federal Reserve Bank of St. Louis, author's calculations.

focuses on the average or median change. Regardless of the precise shape formed by these changes (smirk versus smile), the changes in spending are typically negative in real terms.

Exhibit 5 masks the considerable variation in the changes in spending (or consumption) at the individual respondent level. Spending is typically assumed to increase lockstep with inflation each year of retirement in a financial plan; however, the reality is quite different, where there is a significant amount of noise present. Exhibit 6 includes information about the distribution of changes in real consumption by retirement age. For context, the 10th percentile would be the respondent with the lowest change in one in 10 households, while the 90th percentile would be the highest change in one in 10 households.

While most retirees have a decline in real consumption, as illustrated in Exhibit 6, there is considerable dispersion of changes among retirees, and the dispersion increases with age. For example, the weighted standard deviation of changes in consumption is approximately 12% for those in their early 60s and closer to 18% for those in their late 80s. The increased variation contributes to the increase in the average change in spending at older ages while the median change continues to decline.

Also, while only approximately 55% of respondents who are age 60 and approximately 60% of respondents at age 80 experience a decline in real consumption across HRS waves when focusing on a 2-year period, if we change the analysis to a 10-year period difference, the percentage of households with a decline in real spending increases to approximately 75% and 85%, respectively.

4 | What Is Driving the Decline?

While there is evidence that spending declines, in real terms, as retirees age, a key question is what is driving this change? Are retirees spending less because they want to or because they are forced to do so? This question has important implications with how these overall results should be interpreted.

There is a widely-held belief in the US that there is a "retirement crisis," whereby its existence would imply that retirees reduce spending because they are underfunded (i.e., circumstances), not because they choose to. For example, 79% of Americans agree there is a retirement crisis.[6] There is mixed evidence on the actual existence of a retirement crisis as noted by researchers such as Biggs (2025), among others, especially when reviewing metrics such as retirement satisfaction or financial well-being among retirees (who, on average, tend to be overwhelmingly satisfied with retirement).

To better understand how retiree financial circumstances could be related to changes in real spending levels, spending data from the 2021 RAND CAMS survey is merged with data from the 2022 RAND HRS Longitudinal File (v1). The economic viability of the spending level for each respondent is determined using a metric based on the "funded ratio."

The funded ratio is a metric commonly used to describe the health of pension plans but can more generally be used to estimate the ability of any portfolio to fund a specific goal (i.e., retiree consumption). The funded ratio is the total value of the assets, which includes both current balances and present value of future expected income, divided by the present value of the liability, which would be future expected spending. A funded ratio of 1.0 would imply that an individual has just enough assets to fully fund that goal. A funded ratio greater than 1.0 implies the individual has a surplus, while a funded ratio of less than 1.0 implies an individual has a shortfall.

The funded ratio for each respondent is calculated by dividing the estimated total amount that could be spent by the amount of actual real spending, which is estimated from the 2022 RAND HRS Longitudinal File and the 2021 RAND CAMS, respectively, for each respective survey year.

The total estimated potential income is the total household income for the year plus the projected amount that could be spent from total financial wealth. The spending amount is estimated by applying a distribution factor to total wealth in a manner like the rules for required minimum distributions (RMDs) from qualified accounts. The base target is a 5% withdrawal rate for age 65 and increases with age consistent with declining life expectancy. The metric is intended to be a high-level approximation of how much could be spent from savings with the specific values that are included in Appendix A.

Respondents are placed into five groups based on their funded level: very underfunded, underfunded, ok funded, overfunded, and very overfunded. These groups correspond to funded ratios of: less than 0.50, 0.50–0.99, 1.00–1.49, 1.50–1.99, and greater than or equal to 2.0, respectively.

Only approximately 65% of respondents have funded ratios greater than or equal to one. This suggests that while most retirees can approximately maintain their current spending level, many are unlikely to do so (and even among those that can, the margin of error is not especially large).

Appendix B provides additional perspective about the distribution of funded ratios by age (in Panel A, which includes the simple counts, not weights) and the distribution of respondents by age in Panel B (which is based on weights). Note, Panel B of Appendix B illustrates that funded status levels tend to increase at older ages, consistent with the general idea that spending proportionately declines with age.

Only respondents who classify themselves as completely or partially retired are included in this analysis. Additionally, there must be information on total household assets and total household income. The assets and income values are technically from the year prior to the spending amount year since the base HRS takes place on even numbered years while the HRS CAMS takes place on odd numbered years. There are 5894 observations available. For this analysis, consumption is used as the sole definition of spending.

Exhibit 7 includes information about the distribution of real annual changes in spending by the funded status of the respondent.

There are significant differences in the annual change in spending by the funded status of the respondent in Exhibit 7. The average change in real spending for retirees who were very funded was +1.1% versus −7.5% for those who were very underfunded. For perspective, those who are very underfunded are spending at least double what is estimated, while those who are very underfunded are spending only less than half. To put some numbers to these differences, if 4% is assumed to be the optimal withdrawal rate, the very underfunded respondents would be spending 8% versus only 2% for those who are very overfunded. This is a relatively staggering difference.

Exhibit 7 does demonstrate, though, that those who are funded or overfunded still reduce spending. The fact that even overfunded households reduce real spending suggests that choice plays an important role in terms of reduced spending among retirees. However, average changes in real spending are lower when only considering those households who do not appear to need to reduce spending (because they are underfunded).

While we do not observe any meaningful patterns in terms of how real changes evolve within the funded groups by age, we do, however, observe a pattern when grouping by the level of total spending, which is illustrated in Exhibit 8.

When focusing on total spending levels we can see that changes in spending tend to increase almost monotonically by the amount being spent. Only those respondents who were the most well-funded and spending at lower levels tended to increase in spending. Average real spending declined for all respondents spending $80,000 or more, regardless of funded status, although spending declines were lower as funded status tended to improve. This effect has important implications for households who use financial advisors, since these households tend to have significantly more wealth than the average household and therefore tend to spend at significantly higher levels as well.

Next, a series of fixed effect regressions are performed for robustness purposes. For the regression, the dependent variable is the real change in total consumption. The independent variables include whether the household is coupled or single (coded as one if coupled, zero if single), race (coded as one if nonwhite and nonblack, else zero), age (where respondents 60–64 years old are the omitted variable), initial retiree spending level (where those spending $25,000–$39,999 are the omitted variable), and funded status of the retiree household (where those with funded ratios less than 0.50 are the omitted variable). Appendix C includes the results. It is worth noting that while many of the coefficients of the regression are statistically significant, the overall explanatory power of the model is relatively low. In other words, the variables included appear to provide some insight into the drivers of changes in spending, but there is a significant amount of changes in spending that is unexplained by the model.

With respect to age, there is evidence of a spending smile when viewing how the coefficients evolve across ages, although the statistical significance of the coefficients is relatively weak (and economically weak compared to the coefficients for spending levels and funded status). With respect to the level of spending, those who spend more tend to have the highest spending

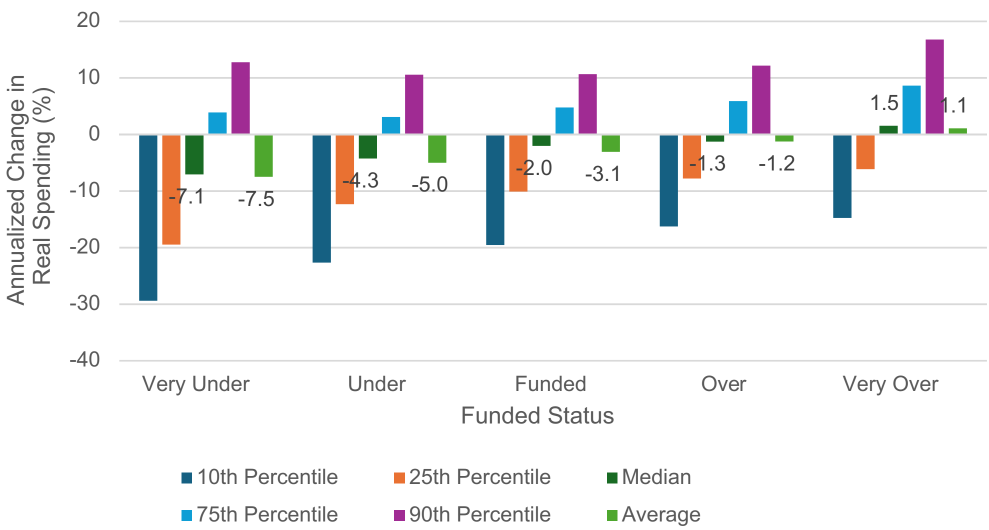

EXHIBIT 7 | Average annualized changes in real retiree spending by funded status. *Source:* RAND HRS CAMS 2021 Data File v1, RAND HRS Longitudinal File 2022 v1, Federal Reserve Bank of St. Louis, author's calculations.

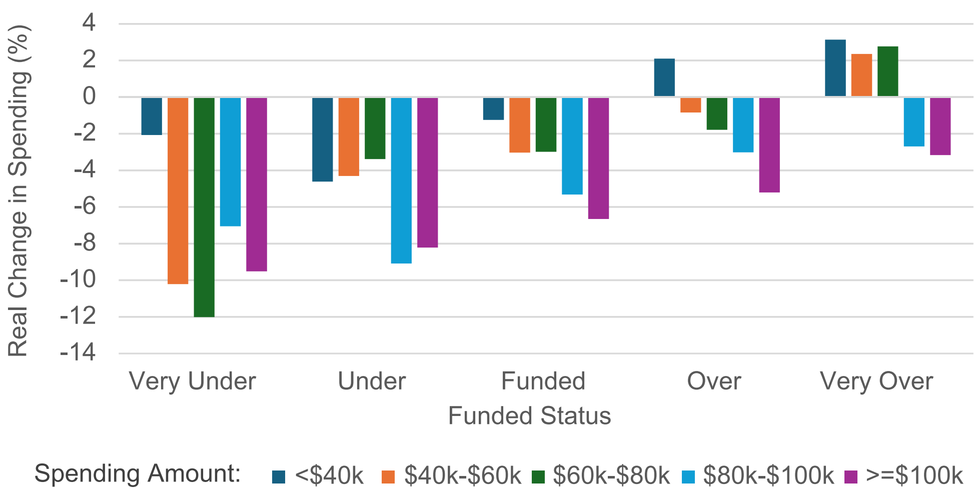

EXHIBIT 8 | Average annualized changes in real retiree spending by funded status and respondent age. *Source:* RAND HRS CAMS 2021 Data File v1, RAND HRS Longitudinal File 2022 v1, Federal Reserve Bank of St. Louis, author's calculations.

reductions. With respect to funded ratio, there is a monotonic effect where those who are better funded tend to have higher increases in spending (or reduce spending by less, depending on one's perspective). These effects are very consistent with the previously noted individual or grouped values.

Overall, the analysis demonstrates that while there are a variety of factors related to changes in retirement spending, spending tends to decline in real terms, even among those who have the resources to potentially spend more. While some very overfunded retirees do increase real spending slightly, the increases are not remotely consistent with the potential increase in spending available.

5 | Impact of Retirement Spending on Initial Withdrawal Rates

An additional analysis is performed to determine the impact of reduced real spending on retirement income levels. The analysis leverages a model introduced by Blanchett (2023), which decomposes spending into essential and flexible components, dynamically adjusts withdrawals over time, and uses an outcomes (utility) model that is more robust than focusing on success rates. The specific utility model is detailed more fully in Appendix D.

The analysis focuses on a single hypothetical scenario. The retiree is assumed to receive \$30,000 in Social Security retirement income benefits and has a retirement income goal (i.e., total expenditures) of \$60,000. These assumptions are consistent with the data from the 2023 Consumer Expenditure Survey for those 65 and older based on the dataset used to create Exhibit 1.

The \$60,000 total income goal is decomposed into \$40,000 of essential spending and \$20,000 of discretionary (or more flexible) spending. If the total real spending goal is reduced (e.g., based on the spending smirk), 25% of the change is assumed to apply to the needs (essential) spending goal and 75% is assumed to apply to the wants (flexible) spending goal. The retirement period is assumed to last a fixed 30 years.

The portfolio is invested in a portfolio that is 40% in equities and 60% in fixed income and assumed to be constant throughout retirement. The portfolio has an assumed total real return of 4.1% and a standard deviation of 7.8%. For reference purposes, the assumed real return for equities is 6.5% versus 2.5% for fixed income. Inflation is assumed to be static as a simplifying assumption (i.e., not stochastic like asset class returns) and taxes are ignored.

The required level of savings is estimated to fund the desired income goal where the initial spending level is assumed to evolve during retirement based on the three potential spending paths noted in Exhibit 3: constant spending, spending smile, and spending smirk. The initial balance is converted to a withdrawal rate to convey the different required savings levels.

Withdrawal rates are estimated assuming three different levels of income risk aversion: low, mid, and high. While different, the income risk aversion levels would be akin to targeting different probabilities of success in the retirement projection. For example, the low, mid, and high income risk aversion levels could loosely be mapped to probabilities of success that are 70%, 80%, and 90%, respectively.

Exhibit 9 includes the initial withdrawal rates estimated for the respective scenarios.

The estimated withdrawal rates in Exhibit 9 are relatively high compared to more traditional estimates (e.g., compared to the "4% Rule"). For example, using the constant spending model and assuming a moderate level of income risk aversion, the resulting initial withdrawal rate is 5.2%. The higher estimated withdrawal rates can be attributed to the model used, which is designed to better capture retiree preferences, as well

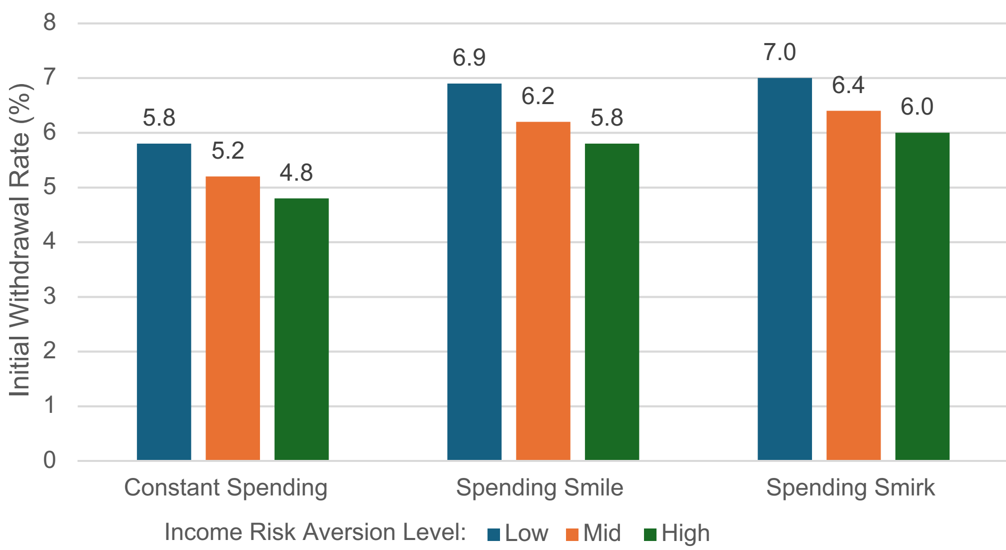

EXHIBIT 9 | Impact of different retirement spending models on optimal initial withdrawal rates by income risk aversion level. *Source:* Author's calculations.

as the role of the portfolio as part of an overall retirement income strategy versus focusing on the portfolio in isolation (e.g., with some type of probability of success-related metric). While safety, generally defined as not depleting a retiree's portfolio, is an important consideration in the model, the risk of future underspending must be balanced with spending too little earlier in retirement.

The initial withdrawal rates for both the spending smile and spending smirk models are considerably higher than the constant spending approach, at 6.2% and 6.4%, respectively, for the moderate-income risk aversion levels. These are both approximately 20% higher than the respective constant spending scenarios.

The noted withdrawal rates for the spending smile and spending smirk models are much more similar to each other than the constant spending withdrawal rates, which suggests moving beyond a constant spending model is likely significantly more important than the specific shape selected to incorporate real spending declines.

6 | Retirement Considerations

There are several important considerations when recognizing that spending is not likely to increase annually (lockstep) with inflation during retirement.

First, retirees can probably spend more than commonly suggested (or alternatively, retirees should be just fine with lower levels of savings). A benefit of higher initial savings rates is that it should free up cash earlier in retirement when retirees are more likely to be able to enjoy it (e.g., go on vacations while they are still healthy). Alternatively, lower required savings rates suggest many retirees are likely more "on track" for retirement than implied by models which require constant real spending throughout retirement.

Second, health care risks are a clear wildcard when it comes to planning for retirement given the significant amount of idiosyncratic risk present, at least in the United States. In theory, transferring this risk to some type of third party via insurance (e.g., long-term care insurance) would seem optimal, but many retirees in the United States are unable to qualify for long-term care insurance (due to poor health) and many of those who have had long-term care insurance have experienced significant premium increases over time (as insurers more appropriately reprice the risk). This seems like an area for a more attractive public option (which is Medicaid, to some extent in the United States) is necessary.

Third, while inflation is still an important risk to consider when building portfolios, retirees do not appear to need a perfect hedge. If retiree spending increased lockstep with inflation, investments and solutions that could explicitly track inflation would be especially valuable. However, retirees have varying levels of flexibility when it comes to spending, which is very unlike a pension plan. Additionally, most retirees globally receive some type of public pension benefit (e.g., Social Security retirement benefits), which are explicitly indexed to inflation. In theory, these public pension benefits can provide some, if not all, of the explicit inflation protection required during retirement, allowing the portfolio to be more focused on nominal spending (but still needs to be inflation-aware).

Fourth, nominal lifetime income solutions may be more attractive than if retiree spending were to increase (lockstep) with inflation. This is similar to the previous point, but there are few private lifetime income annuities that currently provide explicit (uncapped) income benefits linked to inflation (and none in the United States). While there are a variety of reasons for this (e.g., the cost of hedging), since retiree spending tends to decline in real terms, and since retirees typically have other forms of lifetime income explicitly linked to inflation (e.g., Social Security retirement benefits), this would suggest that nominal lifetime income solutions may be more attractive for certain retirees (e.g., those who already have a solid base of Social Security retirement benefits) when viewed comprehensively versus in isolation.

Fifth, some considerations must be made when extrapolating the findings more generally. The excludes individuals with very low or very high spending changes, unstable marital status, or missing wealth information. Therefore, actual spending volatility levels among all households are likely to be higher than the sample included in the analysis.

Sixth, it is unclear how other broader, structural shifts related to retirement may impact spending trajectories. For example, retirees are living and working longer, which may significantly impact how spending changes during retirement. The notion of retirement itself is likely to continue change, especially as job market continues to evolve, providing new opportunities for older workers and potentially additional interest in keeping older workers engaged in the workforce.

Finally, while this research provides some perspective about spending changes for US retirees, the findings should be placed in the correct context before being applied globally. For example, the uptick in spending later in life noted in the original "smile" research, and in this piece, is likely to be less relevant in countries that offer more robust health systems (e.g., outside the United States), especially with respect to long-term care services. Retirees in countries with better public cover long-term care services are more likely to have spending that resembles a "smirk" versus a "smile." Therefore, additional research on this subject is warranted before applying these US-based findings globally.

7 | Conclusions

Retirement is incredibly complex and incredibly personal. While it is difficult to generalize any specific assumptions to all retirees, there does appear to be a relatively robust body of research documenting that retiree spending does not increase annually with inflation. This is contrary to most existing financial planning tools and retirement research, which typically assume that retiree spending grows relatively lockstep with inflation.

While some of the reduced spending can likely be attributed to retirees who need to cut back because they are underfunded, this analysis suggests even those retirees who could materially increase spending do not tend to do so, especially those who are older and spending at higher levels. In other words, while there are both circumstance and choice elements to the observed reductions in real spending, they cannot be written off entirely to circumstances.

While this piece provides mixed evidence regarding the specific shape of the retirement spending trajectory (e.g., is it a smile, smirk, or something else?), the key implication is more generally acknowledging the reduction in real spending throughout retirement, especially as it affects retirees who are spending at higher levels and who are more likely to be working with a financial planner.

Integrating reduced real spending into retirement income models not only improves the outcome of decisions around appropriate portfolio withdrawal rates, but also optimal portfolios, allocations to lifetime income, and so forth. Therefore, the more widely reduced real spending is leveraged in retirement research and financial planning tools, the more realistic the guidance is going to be!

Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] Access the data here: https://www.bls.gov/cpi/research-series/r-cpi-e-home.htm.

[2] Access the data here: https://www.bls.gov/cpi/tables/relative-importance/.

[3] Access the data here: https://www.bls.gov/cex/tables.htm#calendar, data is from Table 1300.

[4] Access the data here: https://fred.stlouisfed.org/series/CPIMEDSL.

[5] Access the data here: https://fred.stlouisfed.org/series/CUSR0000SA0L5.

[6] https://www.nirsonline.org/reports/retirementinsecurity2024/.

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Appendix A

See Figure A1

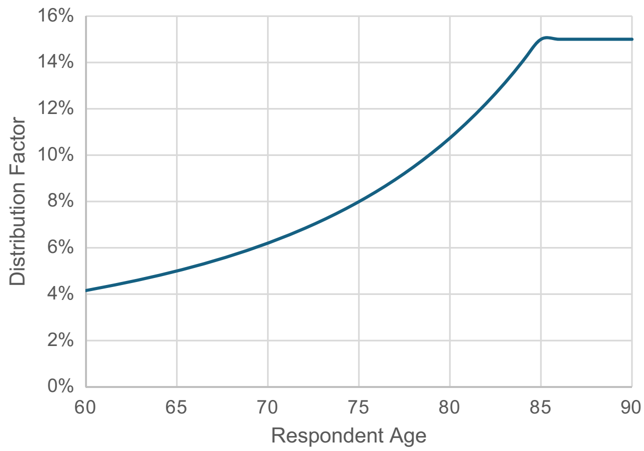

FIGURE A1 | Distribution factors by respondent age. *Source:* Author's calculations.

Appendix B

See Table B1

TABLE B1 | Breakout of funded level and respondent age groups.

		Funded level					
		Very under	**Under**	**Ok**	**Over**	**Very over**	**Total**
Panel (A): Respondent counts							
Respondent age	60–64	138	243	266	162	201	1010
	65–69	112	350	363	246	333	1404
	70–74	111	381	373	227	273	1365
	75–79	102	307	264	166	272	1111
	80–84	64	156	149	86	200	655
	85–90	32	71	87	45	114	349
	Total	559	1508	1502	932	1393	
Panel (B): Distribution by respondent age (included weights)							
Respondent age	60–64	11.6	23.0	27.2	17.6	20.6	
	65–69	5.9	23.1	26.2	18.1	26.8	
	70–74	6.9	26.7	27.5	16.4	22.5	
	75–79	9.4	28.5	24.4	13.4	24.2	
	80–84	9.8	24.4	21.8	12.0	32.0	
	85–90	9.4	19.8	24.7	13.2	33.0	
	Avg	8.81	24.24	25.30	15.12	26.53	

Source: RAND HRS CAMS 2021 Data File v1, RAND HRS Longitudinal File 2022 v1, Federal Reserve Bank of St. Louis, author's calculations.

Appendix C

See Table C1

TABLE C1 | Results from fixed effects regression where the dependent variable is the change in spending.

Variable	Model 1	Model 2	Model 3	Model 4
Gender: male	−0.565	−1.052**	−0.322	−1.016**
Race: white	0.147	−0.706	0.286	−0.126
Race: Black	−0.327	−0.146	−1.037	−0.572
Couple household	1.390***	0.900*	2.949***	2.158***
Age: 65–69	0.449			−0.267
Age: 70–74	−0.243			−0.740
Age: 75–79	−1.240*			−1.824***
Age: 80–84	−1.942**			−3.049***
Age: 85–90	0.799			−0.385
Funded status: underfunded		2.298***		1.964**
Funded status: funded		4.138***		3.678***
Funded status: overfunded		5.914***		5.761***
Funded status: very overfunded		8.302***		8.454***
Real spending: \$40k–\$60k			−1.990***	−2.115***
Real spending: \$60k–\$80k			−2.046***	−2.263***
Real spending: \$80k–\$100k			−5.154***	−5.619***
Real spending: ≥\$100k			−6.379***	−7.052***
R^2	0.42%	3.72%	2.50%	6.61%
Adj. R^2	0.13%	3.45%	2.24%	6.22%

***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$.
Source: RAND HRS CAMS 2021 Data File v1, RAND HRS Longitudinal File 2022 v1, Federal Reserve Bank of St. Louis, author's calculations.

Appendix D

Utility Model

The expected utility (u) of a given amount of income (i) for a given year (t) is based on the respective total income goal (g). The goal is decomposed into needs (n), wants (w), and excess (e), each with an assumed income risk aversion level (γ) for that level income, based on Equations D1, D2, and D3.

$$\text{If } \frac{i_t}{g_t} \leq n_t \text{ then } u_t = \left(\left(\frac{1}{\left(\frac{i_t}{n_t}\right)^{-\gamma_n}}\right)\frac{n_t}{g_t}\right) \tag{D1}$$

$$\text{If } \frac{i_t}{g_t} > n_t \text{ and } \frac{i_t}{g_t} \leq 1 \text{ then } u_t = \left(\left(\frac{1}{\left(\frac{i_t - n_t}{g_t - n_t}\right)^{-\gamma_w}}\right) \times \left(1 - \frac{n_t}{g_t}\right)\right) + \left(\frac{n_t}{g_t}\right) \tag{D2}$$

$$\text{Else } u_t = \left(\frac{1}{\left(\frac{i_t}{g_t}\right)^{-\gamma_e}}\right) \tag{D3}$$

Given the expected utility for a level of spending in a given year (u_t), we can estimate the constant amount of income with the same utility as the actual income path (*II*). This would be the utility-equivalent constant income level and provides insight into the elasticity of intertemporal substitution. This is given by Equation (D4), where u_t is the utility-adjusted income in year t, T is the final year of retirement (i.e., the length of the assumed simulation), and ρ is the investor's subjective real discount rate.

$$II = \left(\frac{\sum_{t=0}^{T}(1+\rho)^{-t}u_t}{\sum_{t=0}^{T}(1+\rho)^{-t}}\right) \tag{D4}$$

The overall expected utility of a given strategy is measured using the CRRA utility function with a risk tolerance parameter (λ) as noted in Equation (D5), where R is the number of paths (or runs), p_i is the probability of path i occurring (which is set to $1/R$, that is, the number of runs), and U_t would be the certainty-equivalent of the stochastic utility-adjusted income II. For this analysis λ is assumed to be 2.

$$U_t = \left[\sum_{i=1}^{R} p_i (II_i)^{-\lambda}\right]^{\frac{1}{-\lambda}} \tag{D5}$$

The analysis targets three different "goal completion scores," based on three different assumed levels of income variability, as noted in Equation (D6).

$$\text{Goal completion score} = \frac{U_t}{g} \tag{D6}$$

This metric provides context around the percentage of the goal completed, adjusted for utility. The goal completion score can be used to convey the overall efficacy of a given strategy to a retiree that is in the spirit of more common metrics used in financial plans, such as the probability of success (higher is better, with a target of ~100), but is more holistic in that it considers preferences around spending elasticity. The target goal completion scores for low, mid, and high assumed levels of income variability are 0.975, 0.95, and 0.9, respectively.