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The Retirement Plan Lifetime Income Strategies Assessment

September 2022

Introduction

In this paper, we conduct a quantitative study of lifetime income strategies that are currently available in retirement plans. We define lifetime income strategies as those using a product with an insurance component. First, we compare lifetime income strategy types across a variety of dimensions, such as income guarantee, market participation, liquidity, and bequest. Second, we identify what kind of participants can benefit from a lifetime income strategy. Third, we explore the trade-offs between strategies that participants face. Fourth, we consider the Social Security bridging strategy, focusing on results in a high-inflation environment. Fifth, we investigate the impact of health shocks on the efficacy of lifetime income strategies. Sixth, and finally, we discuss asset-allocation decisions in the context of using lifetime income strategies.

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Executive Summary

In this report, we examine the lifetime income strategies currently available in retirement plans, focusing only on established strategies that have been adopted by plan sponsors. We identify five distinct annuity-based strategies. With each of these strategies, the participant allocates part of their wealth to the annuity product. We conduct a quantitative assessment of each of these strategies. We also include the Social Security bridge strategy as a nonprivate, annuity-based alternative and the portfolio-only strategy as a baseline in our analysis:

Portfolio-only. Use Social Security benefits and systematic withdrawals to fund expenses in retirement.

Social Security bridge. Delay claiming Social Security until age 70, taking larger withdrawals to fund retirement expenses before Social Security benefits start.

Fixed single premium immediate annuity, or SPIA, at retirement. Purchase a fixed SPIA with a portion of wealth at retirement and use Social Security benefits and portfolio withdrawals for remaining expenses.

Variable SPIA at retirement. This approach is the same as the fixed SPIA, except that a variable SPIA is purchased instead. Variable SPIA payments fluctuate with the capital markets.

Dollar-cost average into deferred income annuities, or DIAs. For a period before retirement, purchase a series of DIAs with income starting at retirement. Use Social Security and the investment portfolio to fund remaining expenses.

Qualified longevity annuity contract, or QLAC, at retirement. Purchase a QLAC with income starting at age 80. Use Social Security and portfolio withdrawals to fund remaining expenses.

Variable deferred annuity with guaranteed living withdrawal, or GLWB, rider. For a period before retirement, contribute to a variable deferred annuity and start guaranteed living withdrawals at retirement. Use Social Security and the investment portfolio to cover remaining expenses.

The ratio of wealth a participant has to their annual retirement income need is the most important metric for determining the benefits of a lifetime income strategy. We determine that annuities are not appropriate for all plan participants. They do not add much value when a participant is already well-prepared for retirement. Our analysis indicates that the cutoff point where annuities no longer provide much benefit is when a participant's wealth at retirement is more than 36 times needed annual income (defined as the difference between total annual need and Social Security benefits). Annuities also do not provide much value when Social Security or other cost-of-living adjusted guaranteed income streams already cover the vast majority of anticipated retirement expenses.

We also study the impact of changing the maximum allowable QLAC premium. We find that while larger allocations to QLACs can benefit retirees, the impact is limited in terms of probabilities of success and shortfall protection.

Plan participants face a trade-off between minimizing the risk of shortfalls in retirement or maximizing bequests. Regarding plan participants who may benefit from annuities, we find that the fixed SPIA, dollar-cost average into DIAs, and variable SPIA strategies provide the highest probabilities of success and most shortfall protection in cases where the portfolio-only strategy falls short of the retirement goal. The fixed SPIA and dollar-cost average into DIAs strategies mitigate against market risk and longevity risk and also tend to outperform bonds over longer time horizons due to mortality credits. Though variable SPIAs do not perform as well in bear markets, they hold their own in cases where the market performs reasonably well despite high inflation or despite the participant living a very long time.

On the topic of bequests, we find that the QLAC and deferred variable annuity with GLWB strategies perform the best alongside the portfolio-only strategy. These strategies provide participants with the most liquidity, meaning that in the event of an early death, a larger portion of the participant's assets go to their beneficiaries. These strategies also enable a participant to participate in the market to a larger extent than the fixed SPIA and DIA strategies.

Participants can benefit from personalized recommendations on what type of product to use and how much to allocate to the product, given their specific goals and preferences on income stability and bequests.

Retirees should consider Social Security bridging before other lifetime income strategies. While these annuity strategies can boost guaranteed income or bequests, none can compete with the Social Security bridge strategy under the current benefit framework. In fact, we found that the bridging strategy should be considered before other lifetime income strategies, as it offers more generous benefits. Unlike with private annuities, Social Security has no profit margin requirement. Further, the benefits are based on life expectancies of the United States population, instead of the above-average life expectancies used by insurance companies. There is also inflation protection. While some private annuities offer a cost-of-living feature, it is not comparable to Social Security where the benefits are linked to the Consumer Price Index for Urban Wage Earners and Clerical Workers. Nevertheless, there is still a place for annuities as we find that participants can benefit when annuities are combined with the bridging strategy.

Health shocks can worsen retirees' standards of living, but we do not find that they change the relative value of lifetime income strategies. We study whether certain annuity strategies better enable a participant to absorb health shocks. We find that health shocks do not change the relative value of lifetime income strategies, as long as the participant has the right profile to benefit from annuities to begin with and only uses part of their wealth for the annuity purchase. Fixed SPIAs, variable SPIAs, and DIAs still provide the most shortfall protection.

Asset-allocation decisions can dramatically change the projected usefulness of lifetime income strategies. We find that estimating an annuity's fixed-income asset class exposure and rebalancing the investment portfolio accordingly is critical for successfully using annuity-based strategies. Otherwise, participants can be overly exposed to bond-like investments throughout retirement.

When using a deferred variable annuity, we find that investing the underlying assets more aggressively increases the value of the GLWB. Asset allocation is not the only component that matters though, as the value of a GLWB also depends on the fee and the richness of the guarantee. We find that in-plan GLWBs tend to charge much lower fees compared with their out-of-plan counterparts. However, the income guarantee is less valuable, so much so that the variable annuity with GLWB strategy underperforms the portfolio-only strategy in terms of probability of success and shortfall protection in many scenarios. While the extent of the underperformance depends on our capital market assumptions and our modeling decisions, the point remains. In-plan variable annuity GLWBs need to be more beneficial to participants in scenarios where the portfolio-only strategy fails, even if the GLWB comes at a higher cost.

Summary of Lifetime Income Strategy Performance

Exhibit 1 contains summary-level ratings for each strategy considered in our analysis. Refer to the body of this report for detailed analysis for each strategy.

Exhibit 1: Summary of Lifetime Income Strategy Performance

Strategy	Protection against market risk	Protection against longevity risk	Protection against high inflation	Performance under favorable market returns and shorter retirements
Portfolio-Only	Low	Low	Medium	High
Social Security Bridge	High	High	High	Medium to High
Fixed SPIA at Retirement	High	High	Low	Low to Medium
Dollar-Cost Average into DIAs	High	High	Low	Low to Medium
QLAC at Retirement	Medium	High	Low	High
Deferred VA with GLWB	Low	Medium	Medium	High
Variable SPIA at Retirement	Low	High	High	Low to Medium[1]

Table Notes: This summary table is based on the results displayed in Exhibits 9, 11, 12, and 13.

[1]This result is sensitive to the subaccount asset allocation chosen by the annuitant. If the underlying is invested aggressively, variable SPIAs can compete with the portfolio-only, Social Security bridge, QLAC, and variable annuity with GLWB strategies when there are favorable market returns or early deaths, or both.

Background

Plan Sponsors Have Options if They Choose to Offer Participants Strategies to Attain Lifetime Income

We surveyed the lifetime income landscape and identified seven distinct strategies that plan sponsors could offer to participants, including drawing down from a conventional portfolio. Importantly, we did not consider conceptual products that have little or no take-up today, but we did consider strategies that integrate Social Security delays, which we call Social Security bridging. Although we identify a variety of strategies plans may offer to help participants attain lifetime income, most in-plan strategies use one of two annuity types to generate lifetime income: income annuities and deferred variable annuities with a guaranteed living withdrawal benefit. With the exception of Social Security bridging, all the strategies use one of these two chassis (base insurance contract).

Income Annuities

Income annuities vary in their design, but they all provide a guaranteed stream of income for the rest of the annuitant's life. Income annuities include single premium immediate annuities, or SPIAs, and deferred income annuities, or DIAs. With SPIAs, the income payments start right away (hence the name "immediate"), but with DIAs, the payments are deferred, sometimes for many years. A special case of a DIA is the Qualified Longevity Annuity Contract, or QLAC. This designation means that the annuity is exempt from required minimum distributions until income payments start. Income-annuity payments can either be fixed, meaning they are set at the time of purchase, or variable, indicating that the payments can fluctuate with the capital markets. It is important to distinguish between variable SPIAs and deferred variable annuities with living benefit riders, which we will discuss shortly.

There are multiple ways that participants can access income annuities. They can be offered as an in-plan product or purchased through an annuity marketplace (making it an out-of-plan annuity). They can also be embedded in a target-date fund or managed accounts offering (though the participant still must elect to take the income payments).

Ever since Yaari's seminal paper,[2] researchers have generally found income annuities offer important benefits for retirees. However, retirees generally do not purchase annuities. Researchers refer to this as the "annuity puzzle." Many explanations for the annuity puzzle have been offered, but one possibility is that income annuities require the purchaser to "annuitize" or permanently give up access to their premium in exchange for the guaranteed income stream.[3] This means that the annuitant cannot request an excess amount (over their guaranteed income) after income payments have begun.

Deferred Variable Annuities With a Guaranteed Living Withdrawal Benefit

The alternative to income annuities is a deferred variable annuity with a guaranteed living withdrawal benefit, or GLWB, rider, which is also referred to as a lifetime guaranteed minimum withdrawal benefit, or GMWB.[4] One of the main benefits for these products is the flexibility they may provide to annuitants. Specifically, the GLWB design allows the annuitant to access their account balance throughout their lifetime.

At their core, deferred variable annuities function similarly to any investment account. They are accumulation-focused vehicles with an account balance that fluctuates based on the performance of underlying subaccounts.

The income guarantee mechanism is provided by the GLWB rider. Unlike with income annuities, the deferred variable-annuity account balance is not "annuitized." Instead, when the purchaser decides to start taking withdrawals, the insurer calculates and provides the guaranteed living withdrawal benefit. This is the amount that the purchaser can withdraw from their deferred variable annuity for the rest of their life, even if the account balance falls to zero. Note that the purchaser is free to withdraw more than the guaranteed amount, but then this lowers or resets the guarantee.

The guaranteed living withdrawal benefit amount is determined by multiplying the "payout rate" and the "benefit base." The payout rate is a percentage, for example 5%, that is provided by the insurance company. The payout rate depends on the age that the participant starts taking the withdrawals and whether the guarantee is based on a single life or two lives. Just as with income-annuity payout rates, GLWB payout rates tend to increase at older ages and decrease if the guarantee covers a couple rather than an individual.

[2]Yaari, M. E. (1965). "Uncertain Lifetime, Life Insurance, and the Theory of the Consumer." *The Review of Economic Studies*, 32(2). https://doi.org/10.2307/2296058

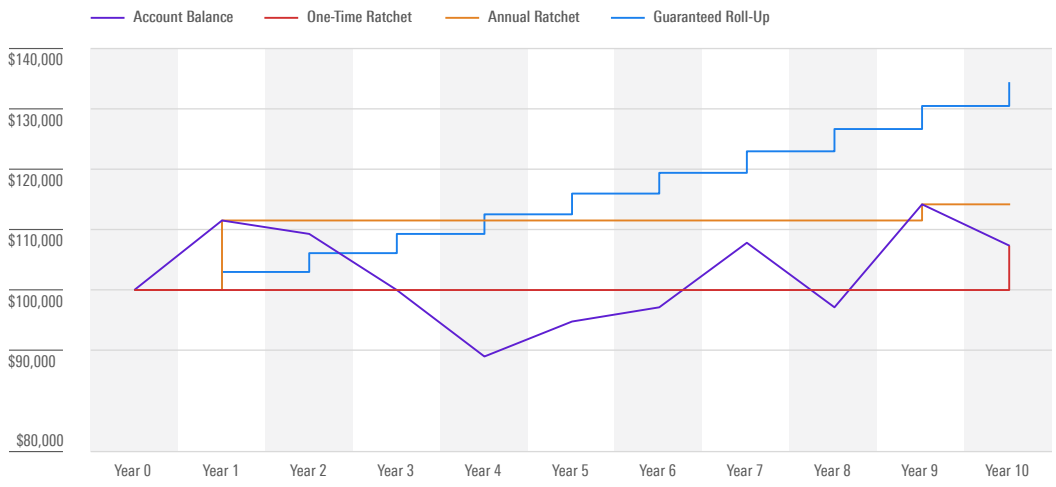
[3]Gale, Iwry, John, and Walker proposed a two-year trial income product to help participants overcome biases against annuities. W. G., Iwry, J. M., John, D. C., & Walker, L. (2008). "The Retirement Security Project: Increasing Annuitization in 401(k) Plans With Automatic Trial Income." https://www.brookings.edu/wp-content/uploads/2016/06/06_annuities_gale.pdf

[4]GMWB and GLWB are sometimes used interchangeably. However, GMWB can refer to a guarantee that only applies for a specific number of years, not the purchaser's lifetime. Nevertheless, in our review of in-plan deferred variable annuities, we only found products with lifetime guarantees.

The benefit base can be thought of as a hypothetical balance only used to calculate the GLWB amount. The benefit base is typically floored at the sum of the participant's contributions. Further, most of the in-plan GLWB designs provide a "ratchet" or "step-up" feature, in which the benefit base is stepped up to the market value of the variable annuity if it is greater than the benefit base. With some designs, the ratchet occurs every year, and with others, the ratchet only occurs at the income start year. GLWB riders can also provide a guaranteed minimum roll-up. With this feature, the benefit base is guaranteed to increase by the roll-up rate every year.

Exhibit 2 contains a comparison of the GLWB benefit base designs under a poor market performance scenario. We also include the deferred variable-annuity account balance. The projected benefit bases and account balance are completely hypothetical in nature and are based on market returns that we chose to illustrate the benefit base increase mechanisms.

Exhibit 2: Illustration of GLWB Benefit Base Designs in a Low-Return Environment



Source: Author's calculations.
Notes: We assume $100,000 is contributed to the deferred variable annuity. The guaranteed roll-up rate is assumed to be 3%. We chose deferred variable annuity subaccount returns to illustrate the benefit base increase mechanisms.

We explore the GLWB benefit base features in more detail in the "Finding Five" section of this report.

Deferred variable annuities can be offered to participants both as a stand-alone option or as an integrated component of a target-date fund or managed accounts solution.

Lifetime Income Strategies Evaluated in This Report

We now address the specific lifetime income strategies that we came across in our review of available annuity options. We categorize the strategies into four distinct income-annuity strategies and one deferred variable-annuity strategy. In every case, we assume participants will allocate only a portion of their investable assets into an annuity product. We also include the Social Security bridge strategy and a portfolio-only strategy as a baseline.

Portfolio-only. The baseline strategy does not include an allocation to an annuity. Instead, the participant takes systematic withdrawals and their Social Security benefits, which are claimed at retirement (age 65), to fund expenses in retirement. This is the strategy most participants use today.

Social Security bridge. With this strategy, the participant delays the claiming of Social Security benefits until age 70. In the interim period, the participants draw down a higher percentage of their plan assets than they otherwise would to fund retirement expenses. The additional withdrawals can be considered the "cost" of using this strategy. This strategy enables the participant to claim the maximum Social Security benefit, which can increase monthly payments by more than 40% (compared with claiming at age 65).

Fixed single premium immediate annuity at retirement. The participant uses a portion of their accumulated wealth to purchase a fixed SPIA at retirement. When this approach is part of an integrated solution, the portion of wealth earmarked for the purchase can be allocated to some type of liability-hedging or prefunding portfolio.

The income payments are, as the name implies, fixed at the time of purchase. Income payments are typically level throughout the annuitant's life, but there are a couple of exceptions. First, if the participant is married and elects a joint and survivor annuity payout option, then the income can be reduced at the first death in a couple (for example, the annuity payment with joint and 75% survivor fixed SPIA would only provide 75% of the original benefit after the first death). Second, the participant can elect a cost-of-living adjustment feature, meaning that the annuity income grows at a specified rate (such as 2%) each year. However, the trade-off is that the initial income payment is lower (assuming the same premium) for participants who elect either of these options.

The participant will supplement Social Security benefits (claimed at 65) and fixed SPIA income payments with withdrawals from their liquid investment portfolio as needed.

Variable single premium immediate annuity at retirement. This strategy is similar to the fixed SPIA approach, and it is also sometimes referred to as a variable payout annuity or an immediate variable-annuity. At retirement, the participant allocates a portion of their assets to the variable SPIA.[5] Unlike with the fixed SPIA, payments are not set at the time of purchase. Instead, the payments fluctuate based on the performance of the underlying subaccounts in which the participant chooses to invest. The participant also chooses an assumed interest rate, or AIR, such as 4%. If the performance of the underlying investments exactly matches the AIR, then the payment will stay the same. If the underlying investments provide a higher (lower) return than the AIR, then the variable payments will increase (decrease).[6] Using a higher AIR (such as 7%) results in a larger initial payment, but it also means there is a bigger chance that subsequent payments will go down. Note that the same joint and survivor adjustment described for fixed SPIAs also applies for variable SPIAs.

This strategy is not widely available in 401(k) plans but is more accessible in 401(a), 403(b), and 457 plans.

Dollar-cost average into deferred income annuities with payments starting at retirement. With this approach, a participant allocates regular contributions to DIAs for some set period before retirement, such as 10 years. Each contribution purchases a guaranteed income stream that is scheduled to start at retirement. Just like with the fixed SPIA strategy, the income stream is set at the time of purchase. Further, the income payments are normally level except for the same two adjustments described above (survivor benefit reduction and cost-of-living adjustment).

The difference between this strategy and the fixed SPIA is that the acquisition of guaranteed income is spread out across multiple years before retirement. This mitigates the point-in-time purchase risk associated with the fixed SPIA strategy (assuming a liability-hedging portfolio is not being used). However, if interest rates are higher at retirement, the fixed SPIA approach may provide more guaranteed income.

[5]Depending on the product, the participant may technically already own shares of a group variable annuity in accumulation. In this case, our approach is tantamount to the participant annuitizing those shares at retirement.
[6]Note that variable SPIA payments can also be impacted by the shared mortality experience of the cohort of annuitants, depending on the contract. However, we do not model group mortality experience in this report.

Qualified Longevity Annuity Contract at retirement with payments deferred to age 80. A participant purchases a QLAC at retirement as longevity insurance, with income payments scheduled to start at age 80. Until that point, the main investment portfolio and Social Security benefits are used to fund retirement expenses. QLACs do not typically have any cost-of-living features, but the joint and survivor structure described above still applies.

This approach is most similar conceptually to the Social Security bridge strategy. The participant must draw down from their plan balance to fund expenses during the 15-year period. After that, the longevity insurance starts providing guaranteed income.

Deferred variable annuity with guaranteed living withdrawal benefit rider. With this strategy, the participant allocates a portion of their contributions to a deferred variable annuity (referred to as "deferred VA" in Exhibits) with a GLWB/GMWB rider. Contributions typically start around 10 years before retirement and can be allocated to subaccounts available within the product. The deferred variable-annuity account balance can go up or down, depending on the market performance and fees assessed. Then, at retirement, the participant starts taking the guaranteed living withdrawals.

The below table contains a comparison of each annuity-based strategy across key participant considerations:

Exhibit 3: Comparison of Salient Characteristics of Insurance Products Designed to Produce Lifetime Income

Strategy/ Characteristic	Fixed SPIA	Dollar-Cost Average into DIAs	QLAC	VA with GLWB	Variable SPIA
Liquidity before income starts	Not applicable. Participant does not own product before income starts.	In-plan solutions tend to provide the ability to reallocate premiums to other in-plan options before income starts.	Unavailable.	Full liquidity is maintained. Note that withdrawals typically reduce the guarantee.	Not applicable. Participant does not own product before income starts.
Liquidity after income starts	Unavailable.	Unavailable.	Unavailable.	Full liquidity is maintained. Note that withdrawals above the GLWB reduce the guarantee in future years.	Unavailable.
Fee on withdrawals	Withdrawals are not available.	Depending on solution provider, surrender charges may apply.	Withdrawals are not available.	None. In-plan VAs are designed such that withdrawals do not incur surrender charges.	Withdrawals are not available.
Market Participation	No market participation. Annuitant does not control how underlying is invested.	No market participation. Annuitant does not control how underlying is invested.	No market participation. Annuitant does not control how underlying is invested.	Purchaser does participate in the market and may have some choices on how contributions are invested.	Annuitant participates in the market. Annuitant chooses how contributions are invested.
Income guarantee before retirement	No income guarantee until purchase.	Each contribution to a DIA purchases a guaranteed stream of income.	No income guarantee until purchase.	Each contribution increases the benefit base, and thus, the guaranteed withdrawal amount.	No income guarantee until purchase.
Possibility for payments to increase after income has begun if underlying investments increase	No, payments are fixed.	No, payments are fixed.	No, payments are fixed.	Yes, some designs allow the benefit base to increase after withdrawals start.	Yes, payments increase.
Possibility for payments to decrease after income has begun if underlying investments decrease	No, payments are fixed.	No, payments are fixed.	No, payments are fixed.	No, income payments cannot be lower than the guarantee.	Yes, payments decrease.
Death Benefit	There is no death benefit with a life-only payout option. However, there may be a benefit with the more commonly selected payout options: life with cash refund and life with period certain.[7]	Same as fixed SPIA.	Same as fixed SPIA.	The beneficiary receives the remaining account balance. Note that death benefit riders are common in out-of-plan VAs and could be offered in plans in the future.	Same as fixed SPIA.
Product Fees	There is no explicit fee paid by the participant. Instead, the payout rate provided reflects the cost to provide the lifetime income guarantee.	Same as fixed SPIA.	Same as fixed SPIA.	There is an explicit fee (base product + GLWB rider) that is deducted from the account balance on a regular basis (often monthly or annual).	There are explicit fees that are netted against portfolio returns.

[7]If a life with period certain payout option is chosen, the beneficiary receives additional payments if the annuitant dies before the certain period is complete (for example, the beneficiary receives two years of payments if the annuity had a 10-year period certain and the annuitant died after eight years). If a cash refund payout option is selected, the beneficiary receives a death benefit if the annuitant has not recouped their premium in nominal terms at the time of their death.

By and large, the in-plan income annuity strategies are comparable with their out-of-plan, retail market counterparts. The same features are generally available, and the biggest difference is that in-plan products are required to use unisex mortality assumptions, instead of gender-specific rates.

In contrast, deferred variable annuities with a GLWB look different when offered inside retirement plans compared with retail accounts. In order to keep product fees down (base product fees can be less than 1%),[8] in-plan VAs tend to provide a less-generous guarantee than out-of-plan deferred variable annuities. In addition, among the solutions we reviewed, there was surprisingly little difference in rider structure. The payout rates for single life and joint life structures are the same or very similar across most providers. The majority of products offered ratchet provisions to increase the benefit base, instead of the guaranteed roll-up rate provision (which is relatively common in out-of-plan deferred variable annuities). The main differences between providers are the rider and investment management fees, and whether the ratchet provision is on an annual or one-time (at retirement) basis. Although we observed that rider fees are typically around 0.9% to 1%, we found that the investment management fees vary widely,[9] with important implications for the relative value of different variable annuities. Lastly, unlike with out-of-plan VAs, in-plan VAs tend to not provide purchasers with investment fund options. Instead, the purchaser's premiums are invested in a balanced fund or a target-date fund.

[8]Note that this does not include investment management fees, which can vary substantially by provider.
[9]Institutional Retirement Income Council. (2021, Aug. 4). IRIC DC Income Product Program Compilation: https://iricouncil.org/. Retrieved July 6, 2022, from https://iricouncil.org/wp-content/uploads/2021/08/IRIC-DC-Income-Product-Program-Compilation-v8.4.21.pdf

Brief Description of Our Comparative Framework

To compare the lifetime income strategies outlined in the previous section, we use a simulation-based model to project retirement outcomes for hypothetical plan participants across 1,000 independent trials.

The simulation starts at age 55 and goes to age 120. The model projects two lives forward (a male and a female), representing a household. Health events, in the form of long-term services and supports, or LTSS, are simulated for each life. Participants are not assumed to pass away at a specific age; instead, the death age is modeled stochastically. We use this approach so that we can model a higher probability of death after the occurrence of an LTSS event.

Interest rates and portfolio returns are based on forward-looking assumptions and modeled stochastically using Morningstar Investment Management's Time Varying Model. We use a glide path based on the target strategic equity allocation weights from a variety of fund families.[10] We model inflation as a stochastic process that allows for periods of higher inflation.

The household's retirement expenses consist of two elements: 1) a deterministic element, representing relatively stable expenses, and 2) a stochastic element, representing LTSS expenses. When only one spouse is alive in the projection, consistent with empirical data, the deterministic expenses are reduced by 30%.[11] All household wealth is assumed to be in a pretax retirement account.

An annuity pricing model is used to calculate the guaranteed income for the income-annuity strategies described above. This model was calibrated against CANNEX income-annuity data. To aid in comparability, all income annuities are priced based on a life with 10-year period certain and a joint and 75% survivor benefit.[12] The deferred variable-annuity guaranteed living withdrawals are calculated based on benefit base features and payout rate data for real products.

[10]Refer to the appendix for more detail on the glide path used for the analysis.
[11]The reduction to expenses after the death of the first spouse is based on analysis of the Consumer Expenditures Survey. We calculated the ratio of total expenses from responders identifying as single and responders identifying as married. More information available upon request.
[12]We use a 75% survivor benefit because this lines up with the reduction in expenses that we assume upon the first death of the couple.

The projected income, wealth, and expense cash flows are converted from a nominal basis to an inflation-adjusted, or real, basis. The model uses this data to calculate three main metrics.

Probability of success: We calculate this as the percentage of trials where the household did not run short of money. This metric is also referred to as the probability of adjustment by some financial advisors in recognition that many retirees would adjust their plan instead of spending at a rate they cannot maintain.[13]

Average percentage of lifetime expenses funded in shortfall scenarios: We calculate the percentage of lifetime expenses for each trial as the sum of real (that is, inflation-adjusted) income produced by a strategy across all retirement years divided by the sum of real expenses (also across all retirement years). This shows the magnitude of the shortfalls. We then calculate the average percentage of lifetime expenses funded for scenarios where a shortfall has occurred. Specifically, we rank the scenarios for the portfolio-only strategy and calculate the average of the worst 50 and worst 150 scenarios. We then calculate averages for the lifetime income strategies based on the same respective 50 and 150 scenarios. This allows us to concentrate our analysis on how the lifetime income strategy fares when the portfolio-only strategy fails.

Average real bequest: We first calculate the bequest for each trial as the inflation-adjusted amount of wealth (including variable-annuity account balance, if applicable) that is left over when both members of the household have died. Similar to the percentage of lifetime expenses funded metric, we sort the portfolio-only scenario results into deciles, and the scenario bequests in each decile are averaged. We then calculate the average bequest by decile for the other strategies by using the portfolio-only scenario decile assignments.[14]

[13]A shortcoming of this measure is that if the trial is $1 short, or runs out of money one year before death, it is deemed unsuccessful even though the economic reality for the household is nearly identical. In other words, the binary success definition does not capture the magnitude of failure.
[14]For example, if scenario 1 is sorted into decile 5 for the portfolio-only results, then scenario 1 will be included in the decile 5 calculation for the Social Security bridge strategy, regardless of scenario 1's ranking within the Social Security bridge results.

More detail about our quantitative framework is provided in the Appendix.

We use two hypothetical households for our analysis. All households are assumed to retire at age 65. Except for the bridging strategy, sample participants claim Social Security at retirement. Refer to Exhibit 4 for the specific inputs we use. Note that we vary the qualified balance at age 55 for sample household one to determine the potential benefit of annuities at different ratios of needed income to wealth.

Exhibit 4: Hypothetical Participant Inputs

Sample Household	Male Age	Female Age	Ret. Age	Annual Household Salary	Annual Household Contributions[15]	Annual Retirement Need[16]	Initial Qualified Balance
One	55	55	65	$150,000	$15,000	$111,500	Varies
Two	55	55	65	$205,000	$25,000	$135,000	$1,535,000

Unless otherwise noted, we assume that 10% of the participant's wealth is allocated to the QLAC and 30% to all other annuity-based strategies. We use these values not only because they are reasonable but also because they represent meaningful allocations to the guaranteed income products.[17]

In the remainder of this report, we investigate the following questions:

- Who can benefit from integrating lifetime income strategies into their retirement plan?
- Under which conditions do different strategies minimize shortfalls in retirement and maximize bequests?
- Which strategies perform best against high inflation?
- Are certain strategies better at enabling a participant to absorb unexpected LTSS/health shocks?
- To what extent do asset-allocation decisions impact the efficacy of lifetime income strategies?

[15]Contributions are assumed to increase by the scenario-specific inflation.
[16]The annual deterministic retirement need is stated in current dollars. The annual retirement need is increased by the scenario-specific inflation.
[17]We model a 10% allocation to the QLAC because of the IRS-imposed limit.

FINDING ONE

The Ratio of Wealth to Annual Needed Retirement Income Is the Most Important Factor in Determining the Benefits of Lifetime Income Strategies

Key Findings

We determine that annuities are not helpful for all plan participants. In particular, if a participant's wealth is more than 36 times their needed annual retirement income (defined as the difference between annual deterministic expenses and Social Security income), there is little room for an annuity to meaningfully impact their retirement. This is because higher-wealth participants can more or less self-insure against longevity risk. Annuities are also not that beneficial for participants for whom Social Security or an inflation-adjusted pension provides a high level of income relative to their expenses. This is because the participants' existing guaranteed income stream already provides protection against market risk and longevity risk. Some participants in these categories can still benefit from additional guaranteed income. Annuities can enable well-funded participants to spend more every year or make a large purchase early in retirement. They can also psychologically benefit participants who have a strong preference for income stability.

In this section, we also study the impact of changing the maximum allowable QLAC premium. While the additional guaranteed income will help some participants, particularly those who live well past life expectancy, we find that larger allocations to QLACs have a limited impact on retirement outcomes.

If Wealth Is More Than 36 Times Needed Annual Income in Retirement, We See Little Benefit From Annuities

If a participant's wealth[18] at the start of retirement is more than 36 times their needed income (defined here as the difference between annual deterministic expenses and Social Security income), under our assumptions, they would succeed at least 95% of the time with a portfolio-only strategy, as demonstrated in Exhibit 5. This leaves little room for any annuity to meaningfully impact the participant's retirement, as the retiree can more or less self-insure against the risk of an unusually long life. Note that the coloring in Exhibit 5 highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately.

[18]All household wealth is assumed to be in a pretax retirement account.

Exhibit 5: Probability of Success by Multiple of Wealth at Retirement to Needed Annual Income

	Wealth is this many times needed annual income...						
Strategy	**20 Times**	**25 Times**	**30 Times**	**35 Times**	**36 Times**	**40 Times**	**45 Times**
Portfolio-Only	51.8%	76.0%	88.6%	94.2%	95.0%	97.4%	98.6%
Social Security Bridge	54.3%	77.4%	88.7%	94.2%	95.0%	96.6%	98.6%
Fixed SPIA at Retirement	53.3%	77.5%	90.4%	95.0%	95.9%	97.9%	99.0%
Dollar-Cost Average into DIAs	52.5%	77.0%	90.3%	94.9%	95.3%	97.9%	98.7%
QLAC at Retirement	52.0%	75.8%	88.8%	94.3%	94.9%	97.3%	98.8%
Deferred VA with GLWB[19]	44.6%	70.5%	85.0%	92.3%	93.1%	95.7%	98.3%
Variable SPIA at Retirement	51.8%	76.5%	89.4%	94.4%	95.2%	97.4%	98.8%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the first household from Exhibit 4, with the starting wealth varying. Needed income is the difference between annual deterministic expenses and Social Security income. These participants face the random risk of LTSS expense shocks. The results presented are based on a 10% allocation for the QLAC strategy and a 30% allocation for all other annuity-based strategies. See the Appendix for additional assumptions.

However, participants at higher wealth-to-needed-income multiples can still benefit from partial allocations to income annuities, especially fixed-income annuities (fixed SPIA, DIAs, and QLAC). These lifetime income products provide additional security against the risk of outliving one's retirement assets. They also can enable a well-funded participant to spend more of their assets every year or make a large purchase early in retirement (such as funding a grandchild's college education). Further, some participants may have a strong preference for income stability, psychologically benefiting from knowing that most or all their normal expenses are funded by guaranteed sources.

This rule of thumb is a good starting point to determine whether an annuity-based strategy is worth considering. However, we note that the multiple of wealth at retirement to needed annual income where the benefits of annuities diminish depends on what percentage of expenses are covered by Social Security, pensions and other guaranteed income sources.[20] For this finding, we use the first sample household from Exhibit 4 for whom Social Security covers about 60% of their annual deterministic expenses. We use this level of Social Security coverage because households who rely on Social Security for a higher percentage of their expenses (that is, in the 70% to 80% range), may be better off without an annuity.

This rule of thumb can also be affected by the tax status of the participant's wealth. We assume that all the participant's wealth is in a pretax qualified retirement account. We think this is reasonable for this analysis, but we note that the cutoff point may be lower for participants who have most of their wealth concentrated in post-tax or Roth accounts.

[19]The probabilities of success with a variable annuity with GLWB strategy are lower than the portfolio-only strategy across the board. This is a result of the benefit structure of the in-plan GLWBs. We discuss this result in detail in the "Participants Face a Trade-Off Between Minimizing the Risk of Shortfalls in Retirement or Maximizing Bequests" section.
[20]Existing nominal guaranteed income sources reduce the need for annuities. However, note that they are not a perfect substitute for Social Security or other inflation-adjusted guaranteed income.

Annuities Are Not That Helpful for People for Whom Social Security or an Inflation-Adjusted Pension Already Provides High Levels of Income Relative to Expenses

Annuity strategies offer few benefits to participants who will rely on Social Security or an inflation-adjusted pension to meet most of their expenses. Annuities can be a great way to acquire a predictable income stream to help pay for planned expenses in retirements. However, if existing guaranteed income sources already cover most expenses, the participant likely would be better off investing their remaining assets in the capital markets.[21]

We now model hypothetical participants for whom Social Security covers about 80% of their anticipated deterministic retirement expenses. The results for participants who have relatively little wealth at retirement are presented in Exhibit 6.

Exhibit 6: Probability of Success by Multiple of Wealth at Retirement to Needed Income for Participants Where Social Security Covers Approximately 80% of Needed Income – Lower Wealth Multiples

	Wealth is this many times needed annual income...				
Strategy	**5 Times**	**7.5 Times**	**10 Times**	**12.5 Times**	**15 Times**
Portfolio-Only	10.0%	13.6%	22.1%	34.2%	47.5%
Fixed SPIA at Retirement	9.3%	12.6%	21.1%	33.2%	46.6%
Dollar-Cost Average into DIAs	9.3%	12.8%	20.9%	32.9%	46.5%
QLAC at Retirement	9.5%	12.9%	21.5%	33.7%	46.7%
VA with GLWB	7.7%	10.9%	17.3%	28.2%	40.5%
Variable SPIA at Retirement	8.7%	11.9%	20.2%	32.6%	45.1%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the first participant from Exhibit 4, with the starting wealth varied and with adjustments to expenses such that Social Security covers 80% of needed income. Needed income is the difference between annual deterministic expenses and Social Security income. These participants face the random risk of LTSS expense shocks. The results presented are based on a 10% allocation for the QLAC strategy and a 30% allocation for all other annuity-based strategies. See the Appendix for additional assumptions.

[21]Participants who have a very strong preference for income stability may still benefit from an annuity purchase, even if existing guaranteed income sources will already fund most of their retirement expenses.

The results demonstrate that annuity-based strategies lead to a slightly lower probability of success vis-à-vis a portfolio-only strategy at lower wealth/needed income multiples. The reason for this result is that participants cannot afford to allocate any of their liquid assets toward an annuity; it equates to adding a small dollar-amount income stream that still is significantly below the retirement need. Annuity-based strategies cannot save people who do not have enough put away for retirement from running out of money as they age.

Annuity-based strategies cannot save people who do not have enough put away for retirement from running out of money as they age.

We now examine participants who have more saved, but for whom Social Security still covers about 80% of retirement expenses. Results are shown in Exhibit 7.

Exhibit 7: Probability of Success by Multiple of Wealth at Retirement to Needed Income for Participants Where Social Security Covers Approximately 80% of Needed Income – Higher Wealth Multiples

	Wealth is this many times needed income...				
Strategy	**20 Times**	**25 Times**	**30 Times**	**35 Times**	**40 Times**
Portfolio-Only	66.0%	80.2%	88.9%	93.7%	96.2%
Fixed SPIA at Retirement	66.3%	81.2%	89.7%	94.1%	96.6%
Dollar-Cost Average into DIAs	66.1%	80.8%	89.4%	93.7%	96.5%
QLAC at Retirement	65.9%	80.1%	89.1%	93.7%	96.2%
VA with GLWB	61.1%	76.2%	86.2%	92.1%	95.0%
Variable SPIA at Retirement	65.2%	80.0%	89.0%	94.1%	96.1%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the first participant from Exhibit 4, with the starting wealth varied and with adjustments to expenses such that Social Security covers 80% of needed income. Needed income is the difference between annual deterministic expenses and Social Security income. These participants face the random risk of LTSS expense shocks. The results presented are based on a 10% allocation for the QLAC strategy and a 30% allocation for all other annuity-based strategies. See the Appendix for additional assumptions.

The impact of lifetime income strategies is muted, especially compared with the results in Exhibit 5. While annuity-based strategies can still offer modest increases in the probability of success, the participants are already well insulated from market risk and longevity risk due to their existing guaranteed income stream.

Lastly, we find that annuities are generally less helpful for plan participants with shorter life expectancies because there is a lower chance that these participants live to advanced ages.

Increasing the Allowable QLAC Amount Has Limited Impact on Retirement Outcomes

If a bill is passed that increases the dollar limit on QLAC premiums to $200,000, participants will be able to purchase more guaranteed income with a QLAC. While this will reduce shortfalls, it will not necessarily translate to higher probabilities of success for participants who elect QLACs.

To provide some context for the magnitude of the impact, consider a QLAC that is paying out 16.5% of premium at age 80. This translates to $23,925 of income at the current limit of $145,000 and $33,000 at the proposed limit. After adjusting for inflation,[22] the higher-limit QLAC provides about $60,000 more lifetime income, assuming the participant lives until age 90. While this is significant by itself, when factoring in the $55,000 difference in premium, the additional income that can be generated with a QLAC at the higher limit is only about $5,000.[23] The additional guaranteed income will be beneficial for some participants, especially those who live well past life expectancy or those who have a strong preference for income stability, but we hope this simplified example illustrates that the proposed QLAC limit change will not increase the probability of success in retirement for many participants.

We now more formally explore the impact of changing the limit by generating pairwise comparisons with the current and proposed QLAC limits. We use the same hypothetical participant as before, for whom Social Security covers about 60% of their expenses.[24] We again calculate the probability of success but now include the percentage of lifetime expenses funded metric. This metric tells us what proportion of expenses can be supported by a strategy, with a smaller percentage indicating larger shortfalls. We use it here because it is difficult to detect the impact of changing the QLAC limit by studying only the probability of success metric. The results are presented in Exhibit 8.

[22]Calculation assumes a constant 2.25% inflation rate.
[23]For simplicity, this example assumes the $55,000 difference in premium is spent in year one.
[24]We think using this hypothetical participant is appropriate because many plan participants rely on Social Security to cover a majority of their expenses, and we do not want to overstate the benefits of the proposed QLAC limit change by using a more well-funded participant.

Exhibit 8: Probability of Success and Percentage of Lifetime Expenses Funded at Current and Proposed QLAC Dollar Limits by Multiple of Wealth at Retirement to Needed Income

		Panel A: Probabilities of Success					
		Wealth is this many times needed income...					
Strategy	**Limit**	**20**	**25**	**30**	**35**	**40**	**45**
Portfolio-Only	n.a.	51.8%	76.0%	88.6%	94.2%	97.4%	98.6%
QLAC at Retirement	$200,000	52.1%	76.1%	88.6%	94.3%	97.4%	98.8%
QLAC at Retirement	$145,000	52.2%	75.7%	88.7%	94.3%	97.3%	98.8%

		Panel B: Average Percentage of Lifetime Expenses Funded in Worst 50 Scenarios					
		Wealth is this many times needed income...					
Strategy	**Limit**	**20**	**25**	**30**	**35**	**40**	**45**
Portfolio-Only	n.a.	64.1%	71.7%	79.7%	86.8%	90.4%	97.2%
QLAC at Retirement	$200,000	66.7%	74.4%	81.7%	88.3%	91.8%	97.5%
QLAC at Retirement	$145,000	66.2%	73.7%	81.2%	87.9%	91.5%	97.4%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the first household from Exhibit 4, with the starting wealth varying. Needed income is the difference between annual deterministic expenses and Social Security income. These participants face the random risk of LTSS expense shocks. The results presented are based on a 25% allocation to a QLAC. The QLAC dollar limit is applied at the time of purchase (age 65) and is increased by the scenario-specific cumulative inflation. Regarding the percentage of lifetime expenses funded metric, the 50 lowest-ranking values are averaged for the portfolio-only strategy. The averages for the QLAC strategies are based on those same respective 50 scenarios. See the Appendix for additional assumptions.

Probability of successes are virtually the same between strategies using the current and the proposed limit. The differences for the average percentage of lifetime expenses funded are slightly more noticeable, with the higher QLAC limit strategy consistently providing more than the current QLAC limit strategy, as expected. However, even with this metric, the impact is not substantial.

FINDING TWO

Participants Face a Trade-Off Between Minimizing the Risk of Shortfalls in Retirement or Maximizing Bequests

Key Findings

Regarding plan participants who can benefit from annuities, we find that the fixed SPIA, dollar-cost average into DIAs, and variable SPIA strategies provide the highest probability of success and the lowest shortfalls. The fixed SPIA and dollar-cost average into DIAs strategies mitigate against market risk and longevity risk. They also tend to outperform bonds over long time horizons due to mortality credits. Variable SPIAs do not perform as well in bear markets, but they still provide mortality credits. Further, they can outperform fixed SPIAs and DIAs in cases where the market performs reasonably well despite high inflation or despite the participant living a very long time. The only strategy that underperforms the portfolio-only approach, in terms of shortfall and probability of success, is the deferred variable annuity with GLWB strategy. This occurs because the guaranteed living withdrawal amount is too low to provide much protection in scenarios where the portfolio-only strategy falls short.

In terms of bequests, we determine that the QLAC, deferred variable annuity with GLWB, and portfolio-only strategies perform the best. These strategies provide participants with the most liquidity. This means that in the event of an early death, a larger portion of the participant's assets go to their beneficiaries. These strategies also enable a participant to participate in the market to a larger extent than the fixed SPIA and dollar-cost average into DIAs strategies.

Participants may benefit from personalized recommendations on what type of product to use and how much to allocate to the product, given their specific goals and preferences on income stability and bequests.

Partial Allocations to SPIAs and DIAs Produce the Highest Probability of Success and the Lowest Shortfalls

Focusing now on participants with the right ratio of wealth to needed income such that they can benefit from allocations to annuities, we find that the probability of success and the level of shortfall reduction are highest for the fixed SPIA, the dollar-cost average into DIAs, variable SPIA, and Social Security bridge strategies. The QLAC strategy does provide a higher probability of success and lower shortfalls relative to the portfolio-only strategy, but the variable annuity with GLWB strategy does not.

This finding is based on analyzing a hypothetical participant's outcomes with a wealth-to-needed-income multiple of 28 and for whom Social Security funds about 40% of their anticipated retirement expenses (in all cases except the Social Security bridge). We use this hypothetical participant because their level of wealth and Social Security benefits relative to their retirement expenses indicate they are a good candidate for an annuity. We focus on the probability of success and the average percentage of lifetime expenses funded metric in scenarios where the portfolio-only strategy did not completely fund the participant's projected retirement expenses.[25] Results are presented in Exhibit 9.

[25]As a reminder, the percentage of lifetime expenses funded are ranked for the portfolio-only strategy. Then the worst 50 and worst 150 scenarios are averaged. These same scenarios are then used for the calculation for the other strategies.

Exhibit 9: Probability of Success and Average Percentage of Lifetime Expenses Funded by Strategy

Strategy	Probability of Success	Average Percentage of Lifetime Expenses Funded	
		Worst 50 Scenarios	Worst 150 Scenarios
Portfolio-Only	85.0%	76.4%	87.5%
Social Security Bridge	86.7%	78.0%	88.3%
Fixed SPIA at Retirement	87.0%	80.0%	89.8%
Dollar-Cost Average into DIAs	87.0%	78.6%	89.4%
QLAC at Retirement	85.5%	77.7%	88.0%
VA with GLWB[15]	80.7%	76.9%	86.4%
Variable SPIA at Retirement	86.0%	79.7%	89.5%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make annual retirement contributions of $25,000. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 10% allocation for the QLAC strategy (capped at the current limit) and a 30% allocation for all other annuity-based strategies. See Appendix for additional assumptions.

The fixed SPIA, dollar-cost average into DIAs, and variable SPIA strategies provide the biggest boost in terms of probability of success and the average percentage of lifetime expenses funded metric.

Fixed SPIAs and DIAs outperform the portfolio-only strategy because they both protect against poor portfolio returns (the income payments are fixed) and longevity risk (income is guaranteed for life). Further, for the strategies in question (and the QLAC strategy), funds used to purchase the annuity take the place of fixed income. What this means is that the remaining funds in the liquid investment portfolio are invested more aggressively such that the total portfolio's equity level still follows the glide path.[26] Fixed-income annuities can outperform bond funds over longer time horizons due to the impact of so-called mortality credits. Mortality credits can be thought of as a credit or an additional "return" that is embedded in the payout rate of the income annuity. Insurance companies put similar annuitants into a group and pay them assuming they live to life expectancy, with annuitants who die earlier helping to fund the payouts for annuitants who die later.

[26]We quantify the value of the annuity income stream in each year of the projection (and rebalance accordingly) using an approach inspired by Blanchett and Finke. Refer to Blanchett, D., & Finke, M. (2017, September 22). "Annuitized Income and Optimal Asset Allocation." Social Science Research Network. Retrieved May 17, 2022, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3041717

The variable SPIA strategy also outperforms the portfolio-only strategy, providing a higher probability of success and funding a higher percentage of lifetime expenses. Just like with fixed SPIAs and DIAs, the variable SPIA benefits from mortality credits, as the payments are based on the same actuarial calculation. While income is guaranteed for life, it is not fixed, meaning that annuity income can decrease during bear markets. However, scenarios in which the portfolio-only strategy falls short of the goal are not only due to poor portfolio returns. There are also cases in which the market performs reasonably well despite high inflation or despite the participant living a very long time. These latter two cases are where the variable SPIA shines and can outperform the fixed SPIA and DIAs (as well as the portfolio-only strategy).

The variable SPIA may outperform the fixed SPIA, DIA, and portfolio-only strategy in cases where the market performs reasonably well despite high inflation or despite the participant living a very long time.

Now turning our attention to QLACs, these products can provide a boost in terms of probability success and average lifetime expenses funded in the worst portfolio-only scenarios. However, the impact is muted relative to the other income annuity strategies because the allocation to the QLAC is much smaller due to the IRS limit. This means that a smaller portion of the participant's portfolio is made up of the annuity and thus, the participant keeps a larger portion of the portfolio in bond funds which tend to underperform fixed-income annuities in these downside scenarios. QLAC strategies still provide protection against longevity risk and, because a smaller portion of assets are used for purchase, they offer more liquidity than other income-annuity strategies.

In the next section of this report, we address the Social Security bridge strategy, which is unique because the amount of additional Social Security benefits a participant can "buy" varies. The results in Exhibit 9 show that delaying Social Security leads to benefits that are very comparable with the income-annuity strategies, though it lags behind the SPIA and DIA strategies. This result occurs because the percentage of assets used to "buy" the Social Security bridge is only around 10%-20%,[27] whereas 30% of assets are allocated to the income-annuity strategies (except the QLAC, which is at 10%). When the same percentage of assets are used, the Social Security bridge strategy tends to outperform other lifetime income strategies, which we elaborate on in the next section. This result also shows that participants could benefit from combining a Social Security bridge strategy with another lifetime income strategy.

[27]This is calculated based on the difference in projected wealth at the beginning of age 70 between the portfolio-only strategy and the Social Security bridge strategy. The cost of "buying" the Social Security bridge strategy varies across Monte Carlo scenarios. The average cost is 15.15% of projected wealth.

The only approach that underperforms the portfolio-only strategy is the deferred variable annuity with GLWB strategy, providing a lower probability of success and a lower percentage of expenses funded (in the worst 150 scenarios). This is an unexpected result. The GLWB rider provides guaranteed withdrawals for life, meaning that this strategy should theoretically allow a participant to fund a higher percentage of their retirement expenses in scenarios where their portfolio is exhausted.

The only approach that underperforms the portfolio-only strategy is the deferred variable annuity with GLWB.

Instead, in many of these downside scenarios, we find that the deferred variable annuity with GLWB has an above-zero account balance at the death of the spouse who dies second. This means that the participant and spouse, who are withdrawing the GLWB amount each year in the projection, do not exhaust their deferred variable-annuity account balance because the guaranteed withdrawal amount is too low. This is an ironic result. Variable annuities have the most liquidity of all annuity strategies we consider, but to receive the maximum guarantee, participants cannot withdraw what they actually need for expenses in retirement.

This finding highlights the issue with in-plan deferred variable-annuity guarantee structures. Even though the product fees are generally lower than out-of-plan GLWBs, the resulting guarantee is less generous and does not provide much help to participants in cases where the portfolio-only strategy fails.

Consider an out-of-plan GLWB with a combined product and rider fee of 2.0% that provides a 5.5% guaranteed roll-up to the benefit base along with an annual ratchet and a payout rate of 4.5% at age 65. Note that these rider assumptions are based on real out-of-plan GLWB products.[28] The fees are considerably more than the in-plan GLWB (which are around 0.90% - 1%), but the guarantee is much richer. Exhibit 10 presents a comparison of the out-of-plan GLWB with the in-plan GLWB.

[28]We reviewed deferred variable annuity with GLWB product specifications via Morningstar's Annuity Intelligence service.

Exhibit 10: Probability of Success and Average Percentage of Lifetime Expenses Funded for Variable Annuity With Guaranteed Living Withdrawal Benefit by Plan Status

Strategy	Probability of Success	Average Percentage of Lifetime Expenses Funded	
		Worst 50 Scenarios	Worst 150 Scenarios
Portfolio-Only	85.0%	76.4%	87.5%
In-Plan VA with GLWB	80.7%	76.9%	80.7%
Out-of-Plan VA with GLWB	85.6%	78.3%	88.7%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. The equity allocation and fund fees for the out-of-plan variable annuity with GLWB are the same as the in-plan version for sake of comparison. However, note that fund fees for out-of-plan deferred variable annuities can be much higher than in-plan versions.

The higher-fee GLWB provides a better probability of success and better shortfall protection. This occurs because the roll-up feature is guaranteed to increase the benefit base, and thus the GLWB amount. The cost to the participant is that their variable-annuity account value can be substantially lower than with the in-plan design in cases where the guarantee is not needed, meaning lower bequests.

A key reason our metrics do not tend to favor variable annuities is that the average percentage of expenses funded metric does not explicitly reward income stability across time. While the variable annuity with GLWB strategy provides less real income than the portfolio-only strategy, it does produce a smoother income stream across the participant's lifetime. Thus, this strategy may provide more value than the portfolio-only strategy from an income stability, or consumption smoothing, perspective.

Deferred Variable Annuity With a GLWB, Portfolio-Only, and QLAC Strategies Allow Participants to Maximize Bequests During Bull Markets and Early Deaths

Deferred variable annuity with a GLWB, portfolio-only, and QLAC strategies can enable participants to leave behind higher legacies under certain conditions for two reasons. The first is longevity, referring to how long the couple survives into retirement, and the second is market performance. Deferred variable annuity, portfolio-only, and QLAC strategies provide the most liquidity relative to the other lifetime income strategies. Further, these strategies, especially the variable annuity with GLWB, allow for a higher degree of market participation than the others.

Exhibit 11 presents the real bequest values for all strategies. Just like with the percentage-of-expenses-funded calculation, the results are displayed based on the ranking of the portfolio-only bequests.

Exhibit 11: Average Real Value of Bequests by Portfolio-Only Strategy Decile and Strategy

Strategy	5th	6th	7th	8th	9th	10th
Portfolio-Only	1,288,821	1,606,711	1,926,000	2,263,798	2,780,319	3,983,850
Social Security Bridge	1,295,653	1,612,065	1,952,469	2,229,589	2,878,925	3,961,609
Fixed SPIA at Retirement	1,301,109	1,624,703	1,865,865	2,195,106	2,670,653	3,840,039
Dollar-Cost Average into DIAs	1,260,956	1,615,981	1,851,346	2,171,962	2,659,456	3,768,649
QLAC at Retirement	1,302,651	1,629,324	1,934,050	2,264,220	2,779,662	3,991,504
VA with GLWB	1,278,653	1,627,347	1,926,728	2,301,783	2,848,812	4,107,148
Variable SPIA at Retirement	1,229,412	1,545,953	1,820,749	2,149,199	2,697,703	3,920,259

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make annual retirement contributions of $25,000. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 10% allocation for the QLAC strategy (capped at the current limit) and a 30% allocation for all other annuity-based strategies. See Appendix for additional modeling assumptions.

The portfolio-only, QLAC, and variable annuity strategies tend to provide the largest bequests, outside of the Social Security bridge strategy, which we will cover in the next section. Unlike the prior section where the portfolio-only strategy failed to fund the retirement goal, these deciles tend to have more scenarios with bull markets, or early deaths, or both.

Starting with bull markets, these three strategies better enable market participation, compared with the other lifetime income strategies. The portfolio-only and deferred variable-annuity strategies allow for control of the investments, and with the QLAC strategy, only a small percentage of assets are allocated to the product. This means that the participant can benefit more from high portfolio returns compared with the other lifetime income strategies where a large portion of assets are locked in at a payout rate based on the yield curve at the time of purchase.

These three strategies also provide the most liquidity, which means that in the event of an early death, a larger portion of the participant's assets go to their beneficiaries. With the portfolio-only strategy, no capital is allocated to a product. Regarding the deferred variable-annuity strategy, the participant has access to their account value because they do not annuitize their assets. With the QLAC strategy, again, only a small portion of assets are used to purchase the product, allowing the participant to maintain control of a larger percentage of their wealth. It is also worth noting that the QLAC strategy (and all other income-annuity strategies) are priced with a 10-year period certain, which is reflected in the bequest values.

Plan participants who elect variable SPIAs may also leave large bequests for their descendants. We assume the underlying subaccounts are invested following the same glide path used for the liquid investment portfolio.[29] If the participant elects to invest a higher portion of assets in equities, the variable SPIA strategy can be competitive with the variable annuity with GLWB, portfolio-only, and QLAC strategies.

Product allocation decisions can help participants boost downside risk protection or potential bequests, depending on their specific goals. Although we assume a fixed percentage of assets are allocated to the products, namely 10% for the QLAC strategy and 30% for all other annuity-based strategies in this report, participants can set different allocations to match their preferences for income stability versus leaving a large bequest.

[29]We assume the variable SPIA follows the same glide path as the liquid investment portfolio to facilitate comparison between the strategies.

FINDING THREE

Retirees Should Consider Social Security Bridging Before Using Other Lifetime Income Strategies

Key Findings

We find that the Social Security bridge strategy should be considered before other lifetime income strategies. It is a top-two or top-three strategy from both a shortfall and bequest perspective. It performs well because it offers more generous payments than the other lifetime income strategies. Unlike with private annuities, Social Security has no profit margin requirement. Further, the benefits are based on life expectancies of the United States population instead of the above-average life expectancies used by insurance companies. It also provides the best protection against inflation, as Social Security benefits are indexed to the Consumer Price Index for Urban Wage Earners and Clerical Workers. Nevertheless, there is still a place for annuities as we find that participants who want or need more guaranteed income can benefit from combining a private annuity with the bridging strategy.

Focusing now on a strategy's ability to help mitigate against high inflation, we note that only the Social Security bridge and variable SPIA strategies boost probabilities of success and reduce shortfalls when "normal" inflation increases from 2% to 4%. Fixed-income annuity strategies (fixed SPIA, dollar-cost average into DIAs, and QLAC), which are top performers when inflation is typically around 2% a year, underperform the portfolio-only strategy in this sensitivity analysis.

Social Security Bridging Is a Lower-Cost Equivalent to a Private Annuity

Social Security bridging is a top-two or top-three lifetime income strategy from both a shortfall and bequest perspective, as demonstrated in prior exhibits. It also provides arguably the best protection against inflation, as the Social Security benefits are indexed to the Consumer Price Index for Urban Wage Earners and Clerical Workers. In fact, we believe that Social Security bridging should be considered before other lifetime income strategies.

Earlier in this report, we noted that the percentage of assets used to "buy" the Social Security bridge strategy was around 10%-20%. Exhibit 12 shows results where 20% of wealth, instead of 30%, is allocated to each product (except the QLAC, which still uses 10%). This is still not a perfect comparison, as the percentage of wealth to fund the Social Security bridge varies across scenarios, but it is fairer than the comparison in Exhibits 9 and 11.

Exhibit 12: Probability of Success, Average Percentage of Lifetime Expenses Funded, and Real Bequests by Strategy With Product Allocations at 20% of Wealth

Strategy	Probability of Success	Average Percentage of Lifetime Expenses Funded		Average Real Bequest		
		Worst 50 Scenarios	Worst 150 Scenarios	5th Decile	7th Decile	9th Decile
Portfolio-Only	85.0%	76.4%	87.5%	1,288,821	1,926,000	2,780,319
Social Security Bridge	86.7%	78.0%	88.3%	1,295,653	1,952,469	2,878,925
Fixed SPIA at Retirement	86.6%	78.9%	89.2%	1,296,754	1,885,693	2,707,650
Dollar-Cost Average into DIAs	86.3%	77.8%	88.9%	1,270,104	1,875,981	2,699,493
QLAC at Retirement	85.5%	77.7%	88.0%	1,302,651	1,934,050	2,779,662
VA with GLWB	82.0%	76.7%	86.6%	1,285,766	1,933,379	2,818,708
Variable SPIA at Retirement	85.9%	78.6%	88.8%	1,238,114	1,845,663	2,710,970

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make annual contributions of $25,000. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 10% allocation for the QLAC strategy (capped at the current limit) and a 20% allocation for all other annuity-based strategies. See Appendix for additional assumptions.

The results demonstrate that the Social Security bridging strategy helps both in terms of average percent of expenses funded and real bequest.[30] Further, the bridging strategy leads to the highest probability of success. These results are in line with other studies on Social Security bridges.[31]

The bridging strategy performs well because it offers more generous payments than the other lifetime income strategies. There are three main reasons for this. First, Social Security benefits are based on life expectancies of the United States population, whereas private annuity income benefits are based on life expectancies of individuals who exceed average life expectancy. Second, there is no profit margin requirement for Social Security. Third, as noted above, Social Security benefits are adjusted for inflation.

However, we do note that the additional guaranteed income that can be "bought" with the Social Security bridge is limited (our hypothetical participant could only allocate between 10-20% of their wealth to this strategy). Thus, households that want or need more guaranteed income can benefit from using a private annuity in conjunction with the bridging strategy.

[30]The bridging strategy still slightly lags behind the fixed SPIA and DIAs strategies in terms of shortfall because the additional income from delaying claiming is not quantified and counted as fixed-income asset class exposure.
[31]For example, refer to Munnell, A., Wettstein, G., & Hou, W. (2019). "How Best to Annuitize Defined Contribution Assets?" *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3478061

Social Security Bridging Provides Better Protection Against High Inflation Than Other Lifetime Income Strategies

We now illustrate how the Social Security bridge strategy protects against high inflation. We generate scenarios where the normal inflation target is set at 4%, instead of the 2% target used for the base case, but real portfolio returns are kept the same.[32] Results are presented in Exhibit 13.

Exhibit 13: Probability of Success, Average Percentage of Lifetime Expenses Funded and Real Bequests by Strategy With Product Allocations at 20% of Wealth – High Inflation Sensitivity

		Average Percentage of Lifetime Expenses Funded		Average Real Bequest		
Strategy	**Probability of Success**	**Worst 50 Scenarios**	**Worst 150 Scenarios**	**5th Decile**	**7th Decile**	**9th Decile**
Portfolio-Only	85.0%	77.4%	88.1%	1,252,586	1,855,341	2,640,222
Social Security Bridge	87.1%	79.9%	90.1%	1,267,978	1,864,479	2,677,466
Fixed SPIA at Retirement	84.8%	78.5%	88.2%	1,159,470	1,690,305	2,422,749
Dollar-Cost Average into DIAs	83.3%	77.1%	87.4%	1,118,158	1,661,453	2,384,770
QLAC at Retirement	83.9%	77.5%	87.3%	1,195,294	1,785,331	2,555,494
VA with GLWB	79.6%	77.3%	86.3%	1,227,167	1,827,505	2,608,675
Variable SPIA at Retirement	85.8%	79.6%	89.5%	1,209,005	1,766,239	2,570,497

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make contributions of $25,000 on an annual basis. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 10% allocation to the QLAC strategy and a 20% allocation to all other annuities. See Appendix for additional modeling assumptions.

The Social Security bridge strategy performs the best out of all lifetime income strategies. Further, compared with Exhibit 12 results, it is the only strategy where the probability of success did not decrease. This is because Social Security cost of living adjustments are based on changes to the Consumer Price Index for Urban Wage Earners and Clerical Workers.

[32]We increase the portfolio returns by the difference between the high inflation and base inflation values.

Inflation erodes the real value of fixed-income annuity (fixed SPIA, DIA, and QLAC) payments. Despite that, fixed-income annuity strategies tend to be top performers when inflation is typically around 2% a year.[33] However, as illustrated in Exhibit 13, if the new normal for inflation is higher, fixed-income annuity strategies without cost-of-living adjustments, which we are modeling in this report, do not boost income and bequests.

While a cost-of-living adjustment may help fixed-income annuity strategies in this high-inflation analysis, it is an expensive feature that substantially reduces the starting payment, compared with a normal fixed-income annuity. Further, we are unaware of any cost-of-living adjustments that are indexed to the Consumer Price Index, like Social Security. Instead, the adjustment is specified up front by the purchaser (for example, a 1% increase each year). For these reasons, we believe that a fixed-income annuity with a cost-of-living adjustment would still underperform the Social Security bridge and variable SPIA strategies.

Outside of Social Security bridging, the only other strategy to provide a higher probability of success than the portfolio-only strategy is the variable SPIA. This strategy is an effective inflation hedge because the income payments are directly linked to the performance of the underlying subaccounts. Provided the annuitant invested aggressively enough such that their subaccount returns keep pace with inflation, the real value of variable SPIA payments will not decrease.

Deferred variable annuity with GLWB strategies can also help hedge against high inflation in retirement. The prerequisite is that the design must allow for benefit base increases after withdrawals start. Assuming it does, the variable-annuity contract value must grow larger than the benefit base. The benefit base will then be stepped up, and a new GLWB amount will be calculated.

Finally, there are a few factors that could change the ranking of the Social Security bridging strategy. The first is the risk that Social Security benefits are reduced. Current projections show that Social Security reserves will run out in 2034. Given that Social Security is extremely popular, we do not think that it is likely benefits will be substantially cut, particularly for current retirees or near retirees (and we do not think that there is any chance that benefits go to zero). However, if benefits are substantially reduced, other lifetime income strategies may become more appealing.[34] Second, Social Security benefits have not been updated for improvements in life expectancy since 1983.[35] If this occurs, the bridging strategy would have to be reevaluated.

[33]We model periods of high inflation in our base analysis, but inflation in most scenarios is concentrated around 2%. With this sensitivity analysis, "normal" inflation is around 4%. We continue to model periods of high inflation in the sensitivity where inflation values are well in excess of 4%.
[34]We note that a 5% reduction to Social Security benefits when claimed at age 70 is enough to move the bridge strategy below the portfolio-only strategy in terms of probability of success, assuming that Social Security benefits when, claimed at age 65, remain unchanged.
[35]Social Security Administration. (1984). Social Security Amendments of 1983. Ssa.Gov. Retrieved July 7, 2022, from https://www.ssa.gov/history/1983amend.html#:%7E:text=The%20law%20made%20other%20changes,will%20be%20made%20in%20January.

SECTION FOUR

Health Shocks Can Worsen Retirees' Standards of Living but Do Not Change the Relative Value of Lifetime Income Strategies

Key Findings

We study the impact of health shocks on lifetime income strategies. We find that health shocks do not change the relative value of lifetime income strategies, assuming that the participant has the right profile to benefit from annuities to begin with and that the participant only uses part of their wealth to buy an annuity.

Health Shocks Do Not Change the Relative Performance of Lifetime Income Strategies, Despite Varying Liquidity

Health shocks are a major risk that retirees face, but regardless of whether they occur, we find that the ranking of lifetime income strategies is unchanged. This is because we only model partial allocations to income annuity products. Thus, a household's ability to withstand health shocks is more a function of a strategy's income-generating ability than its liquidity profile.

We include health shocks in our analysis by simulating health events that would require long-term services and supports, namely home healthcare or a stay in a nursing home. These health events are simulated for both household members, and when they occur, an additional expense is added to the household's yearly expenses. We also simulate a higher probability of death in the year after a health event.

Exhibit 14 presents results both with and without health shocks for comparison. We also include a variable-annuity strategy run where the participant surrenders their contract value to pay for health expenses (which breaks the guarantee).

Exhibit 14: Average Percentage of Lifetime Expenses Funded With and Without Health Shocks by Strategy

	With Health Shocks		Without Health Shocks	
Strategy	**Worst 50 Scenarios**	**Worst 150 Scenarios**	**Worst 50 Scenarios**	**Worst 150 Scenarios**
Portfolio-Only	76.4%	87.5%	78.1%	89.1%
Social Security Bridge	78.0%	88.3%	79.9%	89.7%
Fixed SPIA at Retirement	80.0%	89.8%	81.7%	91.3%
Dollar-Cost Average into DIAs	78.6%	89.4%	80.5%	90.9%
QLAC at Retirement	77.7%	88.0%	78.8%	89.4%
Deferred VA with GLWB without surrenders	76.9%	86.4%	77.9%	87.4%
Deferred VA with GLWB with surrenders	76.5%	88.0%	78.4%	89.5%
Variable SPIA at Retirement	80.1%	89.8%	81.5%	91.0%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make contributions of $25,000 on an annual basis. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 10% allocation for the QLAC strategy (capped at the current limit) and a 30% allocation for all other annuity-based strategies. See Appendix for additional modeling assumptions.

The ranking is the same regardless of whether health shocks are included in the analysis, with the Social Security bridge and income-annuity strategies funding more expenses when the portfolio-only strategy falls short.

The variable-annuity strategy with surrenders slightly outperforms the portfolio-only strategy. This occurs because the participant accesses their variable-annuity account balance. Though this breaks the guarantee, the participant can fund a higher percentage of their retirement expenses instead of leaving an above-zero balance to their beneficiaries.

Lastly, we note that if the participant fully annuitizes (or allocates a much higher percentage of their total wealth to an annuity) or does not have much liquid wealth to begin with, health shocks can change the relative ranking of lifetime income strategies. Strategies with more liquidity will likely perform better in terms of probabilities of success and shortfalls. Nevertheless, participants who want to be able to fund unanticipated expenses should not use annuities in either of the ways described above.

FINDING FIVE

Asset-Allocation Decisions Dramatically Change the Projected Usefulness of Lifetime Income Strategies

Key Findings

We find that participants must invest more aggressively than they otherwise would to effectively use annuity strategies. In particular, participants (or their advisor) should estimate an annuity's fixed-income asset class exposure and rebalance the investment portfolio accordingly to successfully use an annuity-based strategy. If they do not, participants can be overly exposed to bond-like investments throughout retirement. This point applies to both fixed annuities and variable annuities.

Now we focus on the different GLWB designs. We find that the value of a GLWB hinges on the interaction between the underlying asset allocation, all-in fees, and the benefit base features. We determine that investing the underlying assets aggressively increases the value of the GLWB. Further, we find that GLWBs with a guaranteed roll-up provide better downside protection than GLWBs with just a ratchet feature because the benefit base is guaranteed to increase. Lastly, we note that the GLWB product with the lowest all-in fee will not necessarily be the best product for participants. Lower-fee GLWBs come with a commensurate guarantee that may not provide much protection in scenarios where the portfolio-only strategy falls short.

Participants Must Invest More Aggressively to Effectively Use Annuity Strategies

To realize the benefits of an annuity-based strategy, participants must invest more aggressively than they otherwise would. If they do not, they run the risk of maintaining too high of an exposure to bond-like assets, leaving less wealth to fund expenses later in retirement.

The benefits we highlighted of partial allocations to fixed SPIAs and DIAs depend on investors counting allocations to fixed-income annuities as part of the fixed-income asset class exposure and rebalancing the rest of the portfolio accordingly. Failing to do this can result in higher shortfalls and lower probabilities of success compared with the portfolio-only strategy, as shown in Exhibit 15.

Exhibit 15: Probability of Success and Average Percentage of Lifetime Expenses Funded by Strategy Without Dynamic Rebalancing for Fixed-Income Annuity Strategies

Strategy	Probability of Success	Average Percentage of Lifetime Expenses Funded	
		Worst 50 Scenarios	Worst 150 Scenarios
Portfolio-Only	85.0%	76.4%	87.5%
Fixed SPIA at Retirement	83.1%	77.8%	86.7%
Dollar-Cost Average into DIAs	83.6%	76.9%	87.0%
QLAC at Retirement	83.6%	76.7%	86.4%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make annual retirement contributions of $25,000. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 10% allocation for the QLAC strategy (capped at the current limit) and a 30% allocation for all other annuity-based strategies. See Appendix for additional modeling assumptions.

While the fixed-income annuity-based strategies provide a small boost in terms of the percentage of expenses funded in the worst 50 scenarios, the portfolio-only strategy outperforms in the worst 150 scenarios and in probability of success. This is because the overall allocation to equities in the portfolio has not been adjusted upward to acknowledge the additional fixed-income exposure.

The benefits from the Social Security bridge strategy are large enough that the participant does not need to count the additional guaranteed income (compared with claiming at age 65) as fixed-income exposure to see improvements in shortfall and bequest. Regardless, the same rationale applies for the Social Security bridge strategy, and participants should invest more aggressively to realize the full extent of the benefits.

Participants should also adjust their asset allocations when using variable annuities (both deferred and immediate). However, unlike with fixed-income annuities, variable-annuity allocations should not be counted as 100% fixed-income asset class exposure. Instead, the effective risk level should be estimated.

Starting with the deferred variable annuity, before retirement, we consider the variable-annuity account balance asset allocation directly in our rebalancing procedure. For example, if the variable-annuity assets are invested more aggressively than the overall target risk level,[36] the liquid investment portfolio is rebalanced to a more conservative allocation such that the overall risk level meets the target. In retirement, we do not use the variable annuity's asset allocation. Rather, we quantify the fixed-income asset class exposure as the present value of the GLWB payments and consider any excess variable-annuity account balance[37] as equity asset class exposure. Although the deferred variable annuity underperformed the portfolio-only strategy when using this approach, it underperforms by a larger magnitude if the variable-annuity is ignored in rebalancing, as demonstrated in Exhibit 16.

[36]Note that we do not solve for the overall risk-level targets. The projection-year specific target equity levels come from our industry-representative glide path, and we assume this is the appropriate level of risk for each participant.
[37]This is calculated as the difference between the account balance and the present value of GLWB payments, capped at $0.

Exhibit 16: Probability of Success and Average Percentage of Lifetime Expenses Funded by Strategy With and Without Dynamic Rebalancing for Deferred Variable-Annuity Strategy

Strategy	Probability of Success	Average Percentage of Lifetime Expenses Funded	
		Worst 50 Scenarios	Worst 150 Scenarios
Portfolio-Only	85.0%	76.4%	87.5%
Deferred VA with GLWB with Rebalancing	80.7%	76.9%	86.4%
Deferred VA with GLWB without Rebalancing	79.9%	76.1%	85.5%

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make annual retirement contributions of $25,000. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 30% allocation to the deferred variable-annuity strategies. See Appendix for additional modeling assumptions.

Regarding the variable SPIA, we do not use a present value approach to quantify the fixed income and equity asset class exposures. Instead, we assume that the assets underlying the variable SPIA follow the same glide path as the investment portfolio to aid in comparability.[38] While we acknowledge that participants are not going to use this same approach, they should consider how their variable SPIA asset allocation compares with their overall target asset-allocation. If the underlying variable SPIA assets are invested more aggressively (conservatively) than their overall target risk level, they should consider more conservative (aggressive) allocations in their investment portfolio. More detailed guidance on this topic is something we leave for future research.

Plan sponsors can provide participants access to lifetime income strategies as an integrated solution — that is, embedded within a target-date fund or managed accounts — or as an independent solution, enabling participants to buy an annuity if they choose. Asset allocation adjustments can be made with either approach. However, integrated solutions are more likely to consciously consider the annuity purchase and make updates to the asset allocation. Therefore, plan sponsors looking to add a lifetime income strategy to the plan may prefer an integrated solution.

[38]We think this is a reasonable way to compare the variable SPIA with the portfolio-only strategy, though we acknowledge that a quantitative method could be used. We also note that the asset allocation of the underlying can impact the efficacy of the variable SPIA strategy. We leave these topics for future research.

The Benefit of Deferred Variable Annuities Depends on the Interaction Between Underlying Asset Allocation, Fees, and the Benefit Base Design

The value of a deferred variable annuity with a GLWB hinges on the underlying asset allocation, all-in fees, and the benefit base features. Plan sponsors need to consider these three factors together when assessing whether to offer this product to participants.

We now vary the asset allocation, fee, and benefit base parameters. The specific parameter variations we include are detailed in Exhibit 17.

Exhibit 17: Variable Annuity With GLWB Parameter Sensitivities

Parameter Value	All-in Fees	Maximum Allowable Asset Allocation	Benefit Base Increase Mechanism	Benefit Base Increases in Retirement
Low	1.00%	45%	One-time ratchet at retirement	False
Baseline	1.35%	60%	Annual ratchet	True
High	1.70%	75%	Annual ratchet + 5% guaranteed roll-up	n.a.

These parameter values are not intended to represent real GLWB products, but rather show the effect of different product design decisions. In our runs, we vary each parameter independently to demonstrate the magnitude of the impact on income and bequest metrics. Results are in Exhibit 18.

Exhibit 18: Probability of Success, Average Percentage of Lifetime Expenses Funded, and Real Bequests by Deferred Variable Annuity Parameter Sensitivities

Strategy	Probability of Success	Average Percentage of Lifetime Expenses Funded		Average Real Bequest		
		Worst 50 Scenarios	Worst 150 Scenarios	5th Decile	7th Decile	9th Decile
Baseline	82.2%	77.0%	86.7%	1,301,062	1,965,153	2,880,689
Low Underlying Equity Allocation	81.0%	75.8%	85.4%	1,199,083	1,851,200	2,703,587
High Underlying Equity Allocation	83.6%	78.2%	88.1%	1,426,953	2,108,450	3,112,927
One-Time Ratchet at Retirement	76.6%	76.2%	85.0%	1,198,870	1,823,677	2,661,768
Annual Ratchet + 5% Guaranteed Roll-Up	85.2%	78.4%	88.8%	1,357,574	2,029,108	2,935,174
No Benefit Base Increase in Retirement	78.2%	76.6%	85.6%	1,224,408	1,858,665	2,688,401
Low All-In Fee	82.7%	77.8%	87.5%	1,387,289	2,061,516	3,006,798
High All-In Fee	81.5%	76.2%	85.9%	1,224,099	1,878,951	2,767,285

Table Notes: The coloring highlights the strategies that perform relatively better (green), near the middle (gray), and relatively poorly (red). The coloring is applied to each column separately. Results are based on the second household in Exhibit 4. This couple has a $1.535 million starting balance at age 55. They make contributions of $25,000 on an annual basis. In retirement, they require $135,000 in annual deterministic expenses, which are offset by Social Security income. They also face the random risk of LTSS shocks. The results presented are based on a 30% allocation to the variable annuity with GLWB strategy. See Appendix for additional modeling assumptions.

The results illustrate the importance of product design in the potential benefits of the variable annuity and key features plan sponsors should consider. First, it is generally better for the underlying assets to be invested aggressively, as results are better across the board when the variable annuity is allocated to higher risk levels. Higher equity levels increase the value of the GLWB rider, typically leading to higher guaranteed withdrawal amounts and a better chance that the benefit base will increase after withdrawals have started. Plan sponsors selecting a variable-annuity lifetime income solution should ensure that the underlying strategy is not too constrictive.

Higher equity levels increase the value of the GLWB rider.

Second, guaranteed roll-ups are valuable to participants in downside scenarios. When paired with an annual ratchet, they provide good protection against a bad sequence of returns in the years leading up to retirement, unlike GLWBs that have just an annual ratchet or a one-time ratchet at retirement.

Third, the impact of lower fees, when changed in isolation, is intuitive. However, plan sponsors should keep in mind the point that we made in section "Partial Allocations to SPIAs and DIAs Produce the Highest Probability of Success and the Lowest Shortfalls." A higher-fee GLWB product, when accompanied with an appropriately rich guarantee, can provide far more downside protection than a lower-fee GLWB with a less-generous guarantee.

Conclusion

Annuities Are Not Alchemy, But They Can Be Good Medicine for Some Participants

Like other forms of insurance, annuities are not magic. They will not take an underfunded participant and deliver them to the Elysian Fields. However, annuities can help participants with lower levels of guaranteed income who are nonetheless reasonably well prepared for retirement. Specifically, we found that partial allocations to fixed and variable SPIAs and DIAs tended to provide the best shortfall protection, while deferred variable annuity with GLWB and QLAC strategies lead to larger bequests.

While these annuity strategies can benefit participants, none can compare against the Social Security bridge strategy under the current benefit framework. In fact, we believe this strategy should be considered first over the other lifetime income strategies. However, there is still room for an annuity here, as we find that participants can still benefit from combining annuities with a bridging strategy. In future research, we will dive more deeply into whether these strategies would still perform well considering different Social Security-reform regimes.

In this report, we also studied the impact of health shocks on lifetime income strategies. We found that the relative performance of strategies is unchanged, provided that the participants who purchase the annuities are those who have enough wealth to do so without stretching their liquidity.

Lastly, we investigated how asset allocation and other strategy inputs can impact the value of a lifetime income strategy. We found that estimating an annuity's fixed-income asset class exposure and rebalancing the investment portfolio accordingly is critical to successfully using annuity-based strategies. When using a deferred variable annuity, we found that higher risk levels increase the value of the GLWB. Further, the value of a GLWB depends not only on the product fees but also on the richness of the guarantee. Elaborating on that point, we find that the existing in-plan products charge a low fee but provide less-generous income guarantees compared with out-of-plan versions. These in-plan guarantees do not provide much shortfall protection, as these products actually underperform the portfolio-only strategy in many scenarios. While this result may not be exactly replicated with different capital market assumptions or output metrics (for example, utility-based measures), the point remains: in-plan deferred variable annuity GLWBs need to be more valuable to participants in downside scenarios, even if the GLWB comes at a higher cost.

Appendix 1: Model Methodology

We now discuss our quantitative framework in more detail. We use a Monte Carlo simulation model to project retirement outcomes for hypothetical plan participants across 1,000 independent scenarios.

The projection starts at age 55 and goes to age 120. The model projects two lives forward (a male and a female), representing a household. Home healthcare, or HHC, and nursing home, or NH, events are independently simulated for each life, with higher probabilities of occurrence at older ages. Instead of mortality weighting or assuming participants pass away at a specific age, we model the death age stochastically. We use this approach so that we can model a higher probability of death in the period after the occurrence of an LTSS event.

The Society of Actuaries mortality table used is the Pri-2012 Private Retirement Plan Mortality table with scale MP 2021 generational mortality improvement applied. The probabilities of HHC and NH events are calibrated based on data from Johnson (2019).[39] The result is that, for a given individual, about 48% of the simulations have either a HHC or NH event, with HHC events occurring about twice as often as NH events. Because we simulate higher probabilities of death after an LTSS event, we modify the death ages of scenarios where no HHC or NH events occur such that average death age across our simulations is consistent with the average death age from the Pri-2012 table.[40]

The participant's salary is not modeled stochastically. Instead, we leverage Morningstar salary curve methodology to estimate both forward- and backward-looking real wages. These values are used to estimate the participant's Social Security benefits.

The household's retirement expenses consist of two elements: 1) a deterministic element, representing relatively stable expenses, and 2) a stochastic element, representing LTSS expenses. When only one spouse is alive in the projection, the deterministic expenses are reduced by 30%. The deterministic expenses we use in our analysis are provided in Exhibit 4, and the LTSS expenses are based on national median costs from Genworth's 2021 Cost of Care Survey.[41]

[39]Johnson, R. (2019, April 3). What Is the Lifetime Risk of Needing and Receiving Long-Term Services and Supports? Office of the Assistant Secretary for Planning and Evaluation. Retrieved June 6, 2022, from https://aspe.hhs.gov/reports/what-lifetime-risk-needing-receiving-long-term-services-supports-0

[40]Additional information available from the authors upon request.

[41]Cost of Long Term Care by State | Cost of Care Report | Genworth. (2022, February 16). Genworth. Retrieved June 6, 2022, from https://www.genworth.com/aging-and-you/finances/cost-of-care.html

Interest rates and portfolio returns are based on forward-looking assumptions and modeled stochastically using Morningstar Investment Management's Time Varying Model. Equity returns are based on a combination of U.S. large cap, U.S. mid-cap, U.S. small cap, and international equity asset classes. Bond fund returns are based on U.S. aggregate bond, international government bond, and U.S. Treasury-Inflation Protected Securities asset classes. Refer to Appendix 2 for more information.

Inflation is modeled with a stochastic regime-switching Ornstein-Uhlenbeck model, inspired by Ahlgrim and D'Arcy (2012).[42] There are two regimes incorporated into the model. The "normal inflation" regime corresponds to a period where inflation is relatively stable and stays near the Federal Reserve's target. The "high inflation" regime represents periods of high inflation, well above the Fed's target. We use a 2% inflation target for most of our analysis and a 4% inflation target for our analysis of lifetime income strategy performance when inflation is consistently higher. Other model parameters are calibrated based on historical data.

An annuity pricing model is used to calculate the guaranteed income for the income-annuity strategies described in this paper. The pricing model uses the Society of Actuaries 2012 Individual Annuity Mortality table with scale G2 generational mortality improvement and a 15% load applied. The discount rate for the annuity-factor calculation is the projected Moody's AAA corporate bond yield at the time of purchase. All income annuity payout rates are based on a life with 10-year period certain and a joint and 75% survivor benefit. The pricing model was calibrated against CANNEX income-annuity data. An annuity pricing model was used in this analysis because the projection starts at age 55, but most purchases do not occur until age 65.

For the variable SPIA strategy, the annuity pricing model is only used for the payment in the first year of retirement. In all subsequent years, the net subaccount returns are compared against the assumed interest rate of 4%. The variable SPIA benefit is then increased (decreased) if the return is above (below) the AIR. We do not model group mortality experience. Thus, the variable SPIA benefit only fluctuates due to subaccount returns versus the AIR.

[42]Ahlgrim, K. C., & D'Arcy, S. P. (2012). "A User's Guide to the Inflation Generator." Society of Actuaries. Retrieved April 22, 2022, from https://www.soa.org/globalassets/assets/Files/Research/Projects/research-2012-02-effect-deflation-user-guide.pdf

We do not use a pricing model for the variable annuity with GLWB. Instead, we calculate the GLWB amount directly from the projected benefit base and payout rates based on real product data. Our results are based on an average of three separate GLWB rider structures. Specifically, we model an annual ratchet, a one-time ratchet at retirement, and a one-time ratchet at retirement with guaranteed roll-up design.[43] The guaranteed roll-up rate is 3%. The product fees (which do not include fund fees) ranged from 0.75% to 1%. All three designs used a joint GLWB payout rate of 4.5%. Further, we assume that 60% of the underlying assets are invested in an equity fund.

For sake of comparison, we use the same fund fee for the investment portfolio, deferred variable annuity, and variable SPIA. We assume the fund fee is 0.39%, which is based on the median fee for mega plans according to a Morningstar report on the retirement plan landscape.[44]

Social Security benefits are estimated separately for each member of the household. Specifically, we divide the household salary by two, and then apply our salary curve methodology to estimate historical wages for each individual. We then use this information, along with the individual's birth year, planned retirement age, and other Social Security data to calculate Social Security benefits.

We use a glide path that represents the industry consensus. It is calculated as the average of the target strategic equity allocation weights for the fund families (both CITs and mutual funds) available in Morningstar Direct. Linear interpolation is used to populate the equity weights for points in between the five-year increments. Every year in the projection, the liquid investment portfolio is rebalanced according to the glide path. Further, as outlined in the "Finding Five" section, our rebalancing procedure also counts the present value of annuity income/GLWB payments as fixed-income asset class exposure.

Every year in retirement, we add up the guaranteed income from Social Security and annuities (if applicable) and deduct it from the simulated expenses. The investable portfolio is used to fund any leftover amount. Note that the model does calculate both state[45] and federal income taxes, which are added to the next year's required expenses. We also model required minimum distributions, taxing, and then reinvesting any excess withdrawals that are not needed to fund expenses into a brokerage account that follows the same glide path as the pretax retirement account. For simplicity, capital gains are ignored.

[43]Note that none of the three GLWB designs outperformed the portfolio-only strategy in terms of shortfall prevention and probability of success.
[44]Mitchell, L., & Szapiro, A. (2022, March). "Retirement Plan Landscape Report." Morningstar.
https://www.morningstar.com/lp/retirement-plan-landscape
[45]We use the state of Virginia for the analysis.

All projected income, wealth, and expense cash flows are converted from a nominal basis to an inflation-adjusted, or real, basis. Shortfalls are calculated as the difference between real expenses and real income when at least one household member is alive. This data is then used to calculate three metrics that are used herein.

Probability of success. We calculate this metric as the percentage of trials where the participant's household did not run out of money. The outcome for this metric is binary, and thus can too harshly penalize strategies that fall just short of the goal. Nevertheless, we use this metric in our analysis because it is well known and easy to understand.

Average percentage of lifetime expenses funded. To compensate for the pitfall of the probability of success metric, we calculate a metric that shows what percent of projected expenses can be funded by a given strategy, thus, showing the magnitude of shortfall in scenarios where the strategy falls short of the goal.

We calculate the percentage of lifetime expenses funded for each of the 1,000 trials as the sum of real income produced by a strategy across all retirement years, divided by the sum of real expenses (also across all retirement years).

We then average the worst 50 or worst 150 scenarios, based on the portfolio-only strategy ranking. To be clear, we use the same 50 or 150 scenarios from the portfolio-only average calculations when calculating averages for the lifetime income strategies.

Average real bequest at death. We start by calculating the real bequest for each of the 1,000 trials as the inflation-adjusted amount of wealth that is left over when both members of the household have died. This metric includes the variable-annuity account balance, if applicable. Further, any period-certain payments that are owed are discounted to the year of death and included in this metric.

We then sort the real bequest values from the portfolio-only strategy into deciles and then calculate averages for each. For the lifetime income strategies, we use the same decile assignments to calculate averages.

While we considered a utility-based method, we decided to use the metrics described above instead for ease of understanding.

Appendix 2: Capital Market Assumptions and Time Varying Model

The below table contains the arithmetic means, standard deviations, and correlation coefficients from Morningstar Investment Management's Time Varying Model simulated paths.

Exhibit 19: Capital Market Assumptions

	Mean (Arithmetic)	Standard Deviation	Correlation Coefficients			
			Equities	Bonds	Inflation	AAA Yields
Equities	9.9%	18.2%	1.00	0.09	0.05	-0.10
Bonds	4.2%	5.3%	0.09	1.00	-0.11	0.45
Inflation	2.7%	2.1%	0.05	-0.11	1.00	-0.06
AAA Yields	4.5%	1.8%	-0.10	0.45	-0.06	1.00

The Time Varying Model forecasts returns for many global asset classes over a long time horizon. The model incorporates current market conditions in its forecast (for example, valuations and interest rates), which influence returns in the first 20 years of the projection. After that, the model's forecasts are based on unconditional, long-run return assumptions.

Disclosures

The information, data, analyses, and opinions presented herein do not constitute investment advice; are provided as of the date written and solely for informational purposes only and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. Past performance is not indicative and not a guarantee of future results.

This white paper contains certain forward-looking statements. We use words such as “expects”, “anticipates”, “believes”, “estimates”, “forecasts”, and similar expressions to identify forward looking statements. Such forward-looking statements involve known and unknown risks, uncertainties and other factors which may cause the actual results to differ materially and/ or substantially from any future results, performance or achievements expressed or implied by those projected in the forward-looking statements for any reason.

Monte Carlo is an analytical method used to simulate random returns of uncertain variables to obtain a range of possible outcomes. Such probabilistic simulation does not analyze specific security holdings, but instead analyzes the identified asset classes. The simulation generated is not a guarantee or projection of future results, but rather, a tool to identify a range of potential outcomes. The Monte Carlo simulation is hypothetical in nature and for illustrative purposes only. Results may vary with each use and over time. The results from the simulations described within are hypothetical in nature and not actual investment results or guarantees of future results.

This should not be considered financial planning advice. Please consult a financial professional for advice specific to your individual circumstances.