



# THE COMPOUNDING COMPLEXITIES OF RETIREMENT INCOME PLANNING



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# Executive Summary

As the retirement landscape has shifted over the years from defined benefit to defined contribution plans, the burden of managing retirement income has transferred from employers to employees. This new paradigm pushes many of the risks one faces in retirement, such as level of growth, sequence of returns, inflation, and longevity, onto retirees themselves.

This white paper examines how the compounding complexities of these retirement risks impact the level of income a retiree could achieve. We will also demonstrate how adding guaranteed lifetime income to a balanced portfolio can address these risks and improve outcomes.

## TECTONIC SHIFTS IN RETIREMENT OVER THE LAST 40 YEARS

It has been 40 years since the implementation of the first 401(k) plan. At that time, few could have predicted the massive impact that would have. Four decades later, 401(k)s hold the assets of approximately 60 million active participants to the tune of \$6.9 trillion,<sup>1</sup> and there is a clear delineation of the retirement story that happens pre-401(k) and post-401(k).

In the pre-401(k) world, a much larger percentage of American workers had access to a defined benefit or pension plan, in which employers managed all the financial risk and provided their employees with a steady stream of retirement income. When paired with social security (since 1935), this benefit provided stress-free retirement income.

Since 1981 we have seen a change in both who funds Americans' retirements and how. Initially, it was thought that a 401(k) plan would form a third source of retirement for an average employee – a “three-legged stool” approach.

Pre-401(k)	Post-401(k)
<b>Funding Sources</b>	
Social Security	Social Security
Defined Benefit	Defined Contribution

FROM TO

While this may have been the case early on, the retirement landscape has shifted significantly over the last four decades. Since 1995 less than 10% of active retirement plans are defined benefit plans as the vast majority of employers has shifted to defined contribution (DC) plans.<sup>2</sup> This change in plan design is also a tectonic shift in who is responsible for

<sup>1</sup> Investment Company Institute and Department of Labor

<sup>2</sup> Employee Benefits Security Administration, United States Department of Labor

funding retirement and managing retirement income. That responsibility, and all the risks and uncertainty that come with it, now sits with each individual working American.

<b>FUNDING &amp; MANAGEMENT BURDEN</b>	
The Employer	The Individual Employee
FROM	TO

More recently, an additional shift is emerging in the retirement industry. For most of the history of the 401(k), plan sponsors have focused on the savings phase of retirement wherein employees accumulate funds during their working years. Lately, plans have begun to recognize the importance of assisting their participants in managing income during their nonworking years.

This focus on decumulation comes at a time of convergence. Significant advancements in technology and favorable legislation like the SECURE Act are coming together to create new possibilities for guaranteed lifetime income within a defined contribution plan.

<b>PLAN SPONSOR FOCUS</b>	
Accumulation	Decumulation
FROM	TO

While the shift toward DC plans transfers the burden of managing retirement risks to the employee, the newly emerging focus on decumulation provides effective tools for managing those risks. This paper will examine how an allocation to guaranteed lifetime income in a defined contribution plan can help retirees address the compounding and interconnected risks they face in preparing for a successful retirement.

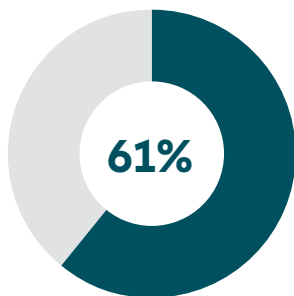
## THE IMPACT OF GUARANTEED LIFETIME INCOME

Before focusing on specific retirement risks, we will set a baseline by analyzing the overall effectiveness of two portfolios. This initial benchmark demonstrates two things: (1) the typical plan participant does not have a high probability of success in generating a target income level for the remainder of their life; and (2) a guaranteed income solution can significantly improve those chances.

The first portfolio utilizes a standard retirement asset allocation while the second allocates a portion to a fixed index annuity with guaranteed lifetime income. The level of success is determined by the average income received across all scenarios as a percentage of the target income needed at age 95.

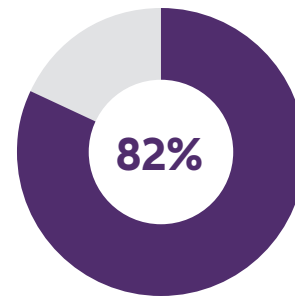
Our assumptions, fully listed in the Appendix, intend to represent a typical plan participant who has a target income need from the 401(k) of approximately \$1,500 per month. We've chosen a planning horizon of 30 years after retirement, to age 95, which has a 6% chance of outliving income for a male and 12% for a female. At age 95, this \$1,500 monthly income target equates to \$39,240 of income per year after adjusting for our assumed 2% annual inflation.

Under our base assumptions, our hypothetical participant will earn on average 61% of their target income at age 95 by using the first portfolio (**portfolio #1**). This means in some scenarios the full target income of \$39,240 is achieved, some scenarios achieve a portion of the target, and in the worst scenarios the retirement balance is depleted and no income is received.



**Portfolio #1**

For the second portfolio (**portfolio #2**), we've assumed 30% of the fixed income allocation is shifted to a guaranteed lifetime income solution. For the purposes of this analysis, the guaranteed lifetime income is a fixed index annuity with a guaranteed lifetime withdrawal benefit. Our hypothetical participant using this second portfolio will earn on average 82% of their target income at age 95.



**Portfolio #2**

For this white paper, we've focused on income, because for the majority of participants, outliving their assets is the primary problem rather than maximizing legacy benefits.

This is precisely what guaranteed lifetime income solutions are designed for – ensuring that the income a retiree receives will never fall to \$0. So it should not come as a surprise that the annuity will reflect well here.

There are scenarios (often high-return scenarios) where portfolios without the annuity will cover the target income and provide greater legacy benefits than the portfolio with guaranteed lifetime income. In other words, there is some tradeoff to the upside. But in looking at a standard participant, the critical role guaranteed lifetime income can play in providing a sustainable income that can weather a number of retirement uncertainties becomes clear.

The remainder of this white paper will dive deeper into four common retirement risks, highlighting the importance of addressing these risks and demonstrating how a fixed index annuity can mitigate each.

## COMMON RISKS, IN TWO CATEGORIES

While there are many challenges an employee faces while saving during their working years, this white paper will focus on two categories of risks an individual may experience throughout retirement.

We will assess the impact of acute market-related risks that are most impactful in the early years of retirement, and gradual risks that emerge over time impacting the sustainability of income in the later years of retirement. Specifically, we will analyze the four risks below and demonstrate how a guaranteed lifetime income solution can effectively address the compounding difficulty that occurs when multiple risks arise concurrently.



## ACUTE RISKS

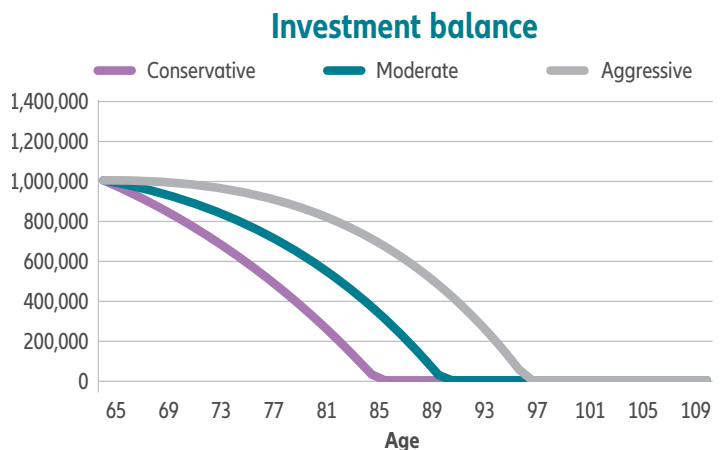
The first category of risks we'll analyze are the acute market risks. These risks can quickly derail a successful retirement in the early years after an individual moves into the retirement phase of their life.

## Growth



There has always been an emphasis on earning high enough returns on retirement savings during working years. However, maintaining a reasonable level of growth during retirement is also crucial to ensure savings don't run out prematurely.

The chart below shows the investment balance of three retirement portfolios of varying aggressiveness with the same level of withdrawals each year. The aggressive portfolio, which is assumed to earn an annual return of 5%, lasts 11 years longer than the conservative portfolio, assumed to earn an annual return of 2%. The asset mix and the expected return on those assets play a big role in determining how long an investment balance lasts.



Hypothetical example assumes \$1 million starting balance, 2% inflation, and retirement age 65. The conservative retirement portfolio represents 0% equity, 100% bonds. The moderate portfolio represents 35% equity, 65% bonds. The aggressive portfolio represents 60% equity, 40% bonds.

Even the moderate retirement portfolio, assumed to have a 3.75% annual return, can experience a wide range of returns in actuality since it represents a 35% allocation to equities and 65% to bonds. The historical average return of the S&P 500 over rolling 20-year periods has a wide range, from a minimum of 2.7% to a maximum of 13.9%. While a retirement portfolio is balanced and not fully exposed to this level of equity volatility, even a 35% allocation to equities could result in a 3.9% difference in portfolio return from this historical range.

If instead we assume we know what returns will be and adjust the level of income to last until age 95 under given return assumptions, we see that a 2% difference in return changes an individual's retirement income payment by 25-30%. This is shown in the table below that determines affordable income under various set growth assumptions.

Growth	Affordable Income
2.0%	17,000
4.0%	22,649
6.0%	29,213

Assumes \$500,000 starting balance, retirement age 65, 2% inflation, affordable income solved to age 95.

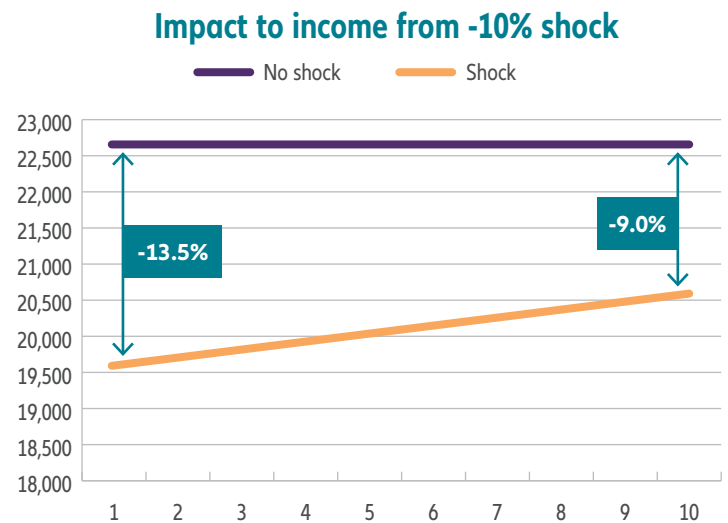
### Sequence of Returns



The second acute risk we will analyze is the risk of a poor sequence of returns. While average investment performance over an entire retirement has a significant impact on affordable income throughout retirement, even high growth can be wiped out if the first years of retirement experience negative growth.

When assets are withdrawn while the market is down, losses on those assets are “locked in.” Unlike during the accumulation phase, that money no longer has the potential to increase if the market rises. That loss also diminishes the total value of remaining assets and could cause money to run out more quickly than anticipated.

The first 5-10 years, when the retirement account balance is the largest, are the most impactful – and vulnerable – to market volatility. The chart below shows the impact of a -10% shock to growth that occurs in different years after beginning distributions. The impact to income of this level of shock in year 1 is 50% higher than if it were to occur in year 10. Since 1950, calendar year returns of the S&P 500 have been -10% or less 11 times, or 15% of years. This shock is not unrealistic for individuals to have experienced at the start of their retirement.



Assumes \$500,000 starting balance, retirement age 65, 2% inflation, 4% growth except for shock year, affordable income solved to age 95.

## THE COMPOUNDING OF ACUTE RISKS AND THE POSITIVE IMPACT OF GUARANTEED LIFETIME INCOME



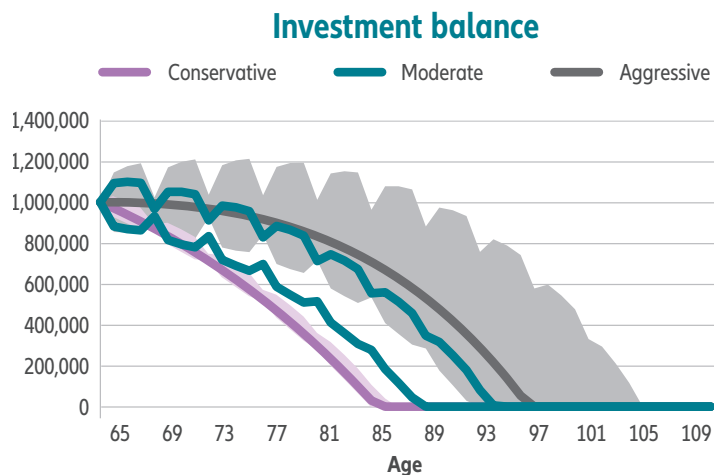
Each acute risk is difficult to manage on its own, but when combined they create a tension, compounding the complexity.

The traditional way of balancing this tension is through a diverse mix of investments to address each risk on its own. Assets with higher expected returns, such as equities, may help address the risk of low investment performance but may increase the sequence of returns risk due to increased volatility. Conservative assets, such as bonds, generally have lower volatility and may help address the sequence of returns risk, but also may come with lower expected returns and the risk of assets running out prematurely.

An alternative way to address these risks concurrently can be accomplished by adding a fixed index annuity (FIA) with a guaranteed lifetime withdrawal benefit (either built in to the contract or available through an additional-cost rider) to a retirement portfolio. An FIA allows for modest upside growth potential through interest credits that are linked to an external index, like the S&P 500. FIAs won't achieve the same upside potential as equities, however they can still mitigate the risk of poor investment performance. Through the withdrawal benefit, the guaranteed lifetime income that the annuity provides relieves some of the burden on the rest of the portfolio. This income is guaranteed to last for life, even after the portfolio value in the annuity is depleted, ensuring a retiree will never be in a situation where they are receiving no income later in retirement.

FIAs are also unique in that they provide protection against market downturns. In other words, the value of an FIA will never decrease due to market performance (the value in an annuity could decrease from any product fee charged in any year that the contract does not earn interest). This feature provides strong protection against the sequence of returns risk by removing the impact of negative market returns on a portion of the portfolio.

Even when the overall level of growth is the same, the ordering of returns plays a significant role in determining when an investment balance could run out. The chart below shows the investment balance of three portfolios of varying aggressiveness for an individual at retirement age, each starting in an up market and a down market. Flipping the ordering of returns to start in an up market versus a down market, even while keeping the same average annual growth, has a significant impact on how long the balance lasts while taking steady income. An aggressive portfolio that has greater allocation to assets with higher volatility has a wider range of outcomes. Despite the same average return, the aggressive portfolio beginning in an up market could last 12 years longer than the same portfolio beginning in a down market.



Hypothetical example assumes \$1 million retirement balance, 2% inflation, and retirement age 65. The conservative portfolio returns: 7%, 3%, 2%, -3%. Moderate portfolio returns: 14%, 5%, 4%, -7%. Aggressive portfolio returns: 20%, 7%, 6%, -10%. Ordering of market returns is reversed to represent an up- and down-market.

This sensitivity puts a lot of pressure on retirees. The same catalyst driving poor market performance, be it the mortgage crisis in 2008 or the COVID-19 pandemic in 2020, often causes unemployment to rise and forces many into premature and unplanned retirement during a recession.

## MONTE CARLO ANALYSIS FOR ACUTE RISKS

Using the same scenario analysis as before, we analyzed the impact of each acute risk on both the portfolio without guaranteed lifetime income, portfolio #1, and the one with it, portfolio #2.

To quantify the impact of poor investment growth, we've reduced the assumed equity return from 7% to 6%. The table below shows the impact on the average income at age 95 as a percent of the \$39,240 target we calculated earlier.

**Portfolio #1** is more sensitive to the decreased growth than **Portfolio #2** due to the guaranteed lifetime income.

Average income achieved at 95 as percent of income needed		
	Baseline	Reduced Growth
<b>Portfolio #1</b>	61%	48%
<b>Portfolio #2</b>	82%	73%

We can look at more aggressive portfolios that may do better in the base case but are much more sensitive, or vice versa for more conservative portfolios. Regardless of the aggressiveness of the remainder of the portfolio, guaranteed lifetime income can still improve outcomes and reduce the sensitivity to investment performance.

	Portfolio #1		Portfolio #2	
	Baseline	Reduced Growth	Baseline	Reduced Growth
<b>Aggressive</b>	71%	58%	85%	77%
<b>Moderate</b>	61%	48%	82%	73%
<b>Conservative</b>	7%	5%	54%	48%

Moving to the sequence of returns risk, we applied a market shock to all the scenarios at the retirement age of 65 and included recovery by age 68. The impact to the aggressive and moderate portfolios, the ones with higher allocation to more volatile assets, are much more sensitive to the impact of the market shock. As shown below, this sensitivity to market volatility can be mitigated by allocating to less risky assets, or alternatively by allocating to an FIA that provides downside protection. All portfolios with the guaranteed lifetime income have a higher level of success than their counterpart without guaranteed lifetime income.

	Portfolio #1		Portfolio #2	
	Baseline	Sequence Shock	Baseline	Sequence Shock
<b>Aggressive</b>	71%	63%	85%	82%
<b>Moderate</b>	61%	49%	82%	79%
<b>Conservative</b>	7%	3%	54%	50%

The impact is compounded when these two acute risks are combined, as shown in the table below for the moderate portfolio. For **portfolio #1**, the sensitivity from these combined risks results in a 25% range of the average percent of income achieved. **Portfolio #2** provides more protection, only resulting in a 13% difference of the average percent of income achieved. The protection from market declines of an FIA reduces the sensitivity to these acute market risks, and the guaranteed lifetime income ensures a level of income will always be provided, even when the portfolio balance is depleted.

	Portfolio #1		Portfolio #2	
	Baseline	Sequence Shock	Baseline	Sequence Shock
<b>Base</b>	61%	49%	82%	79%
<b>Reduced Growth</b>	48%	36%	73%	69%



## GRADUAL RISKS

The second category of retirement risks we'll analyze are gradual risks to retirement income. These risks occur slowly over time and may take a decade to realize, potentially creating significant challenges for retirees later in retirement. Two common gradual risks we will focus on are inflation and longevity, starting with inflation.

### Inflation



When the cost of living increases over time due to inflation, it creates additional challenges for retirees. Earlier in life, inflation is often offset through career advancement with salary increases and investing in more aggressive assets like equities.

As an individual nears retirement, they typically will have fewer inflation offsets. Additionally, their portfolio will shift toward a more conservative investment mix to reduce the sensitivity to market volatility as called out in the acute risks. A conservative portfolio with higher allocation to fixed income assets can inadvertently increase sensitivity to inflation due to its relationship with interest rates. Rising inflation typically leads to increasing interest rates, which diminishes the value of fixed income assets because prices of fixed income assets move opposite their yields.

In addition to conservative assets falling in value, inflation reduces purchasing power by requiring more money be withdrawn from retirement savings each year to maintain the same standard of living. Just 2% inflation can increase the cost of an item by 50% in 20 years, so the same amount of money cannot purchase the same amount of goods due to inflation.

When planning for retirement, the level of assumed inflation can have a significant impact on affordable income. For example, when planning to age 95, a 2% increase in inflation results in a 23% decrease to affordable income.

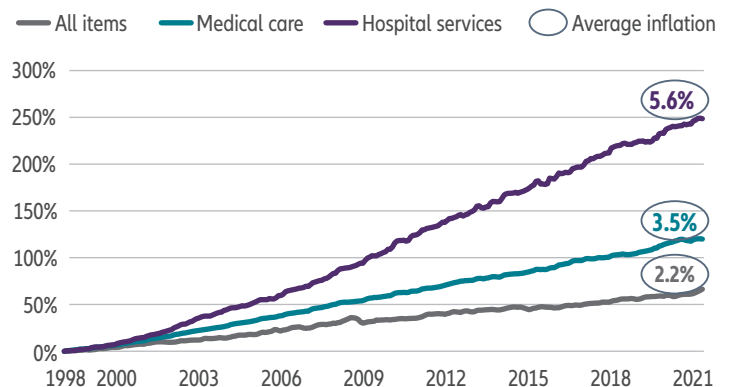
For some time, the United States has experienced stable inflation rates of around 2%. The long-term average annual inflation for the U.S. is 3.2% with periods of very high inflation in the 1970s. The table at right shows the historical U.S. average inflation rates over the 20-year period starting in the year shown.

20-year average inflation	
2000	2.17%
1990	2.79%
1980	4.28%
1970	6.32%
1960	4.72%
1950	2.21%

More specifically, price changes of specific goods and services vary significantly with some of the largest increases in expense categories where retirees naturally spend more of their income.

For example, a 65-year-old typically spends 10% of total expenses on health care, but that expenditure doubles to 20% by age 85. The graph below shows inflationary changes in the basket of medical services compared to all consumer goods.

### CPI for U.S. city average



Source: U.S. Bureau of Labor Statistics

## Longevity

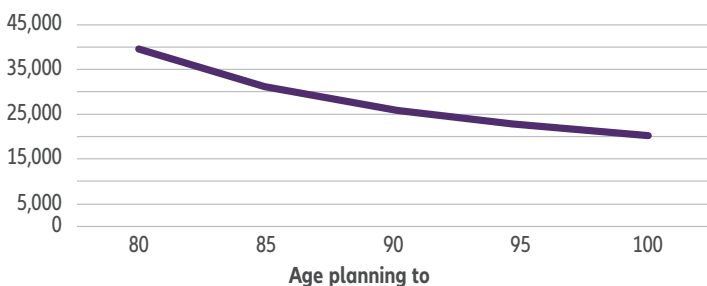


The second gradual risk we will analyze is longevity – how long someone will live. The amount of time an individual must prepare for retirement income to last is lengthening, creating more uncertainty in retirement planning. According to the Social Security Administration, in 1940, a 65-year-old male was expected to live another 12.7 years and another 14.7 years for a 65-year-old female. In 2019, the life expectancy has increased to 18.1 and 20.7 for men and women, respectively – approximately a 40% increase in the expected length of retirement one must prepare for.

Traditionally, the way to plan for the uncertainty of longevity is to plan far enough out that the chance of outliving assets is reasonably low. This can be thought of as self-insuring, but it means that an individual takes a much lower income than their portfolio could afford in planning to life expectancy.

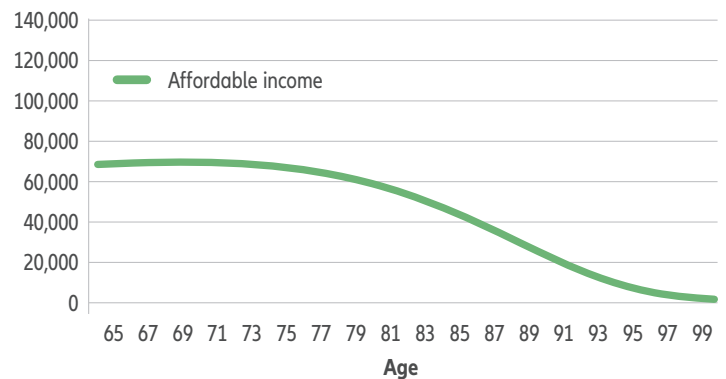
The amount of retirement income an individual can afford is highly sensitive to the expected length of retirement. Planning to the average life expectancy of 83 for a male results in over 65% more annual income than planning to age 100. However, only planning to life expectancy means there is a 50% chance of outliving retirement income, versus only a 3% chance of outliving income when planning to age 100.

### Affordable income living to a known age



Assumes \$500,000 starting balance, retirement age 65, 2% inflation, 4% growth.

Alternatively, there is the wait-and-see approach, which requires bigger adjustments later on if longevity is realized. As a retiree ages, their life expectancy increases, creating a moving target for income planning. The male life expectancy at the retirement age of 65 is 83. But once that same retiree reaches age 80, their new life expectancy is 90. The chart below shows the amount of income a retiree can afford at each age when adjusting to their updated life expectancy each year. As they age, they must adjust both for their shrinking investment balance and their increased life expectancy, reducing the level of income they can afford each year. After 20 years, their affordable income has decreased 34%.



Example assumes \$1 million retirement balance, 4% growth, 2% inflation, and retirement age 65.

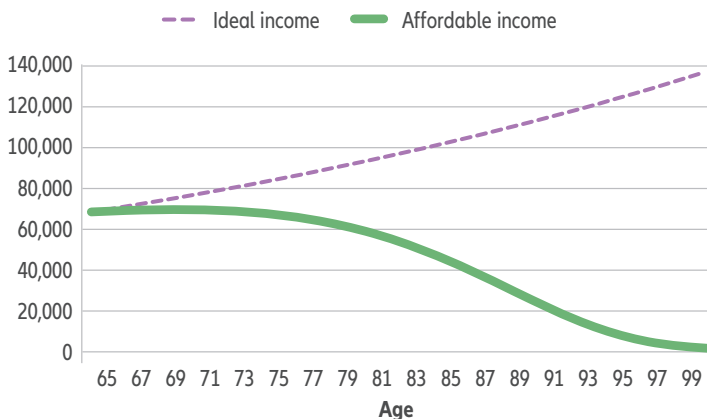
Affordable income is the amount of income the retiree can take in a given year and resets each year based on remaining retirement savings and future life expectancy.

## THE COMPOUNDING OF GRADUAL RISKS AND THE POSITIVE IMPACT OF GUARANTEED LIFETIME INCOME



Each of these gradual risks on their own can have a significant impact on income, but inflation stresses longevity as it continues to compound and reduces purchasing power through retirement. This is a relatively new challenge retirees must face as life expectancy increases and the amount of time in retirement lengthens. The chart below shows how the impact of these two risks emerges gradually over time.

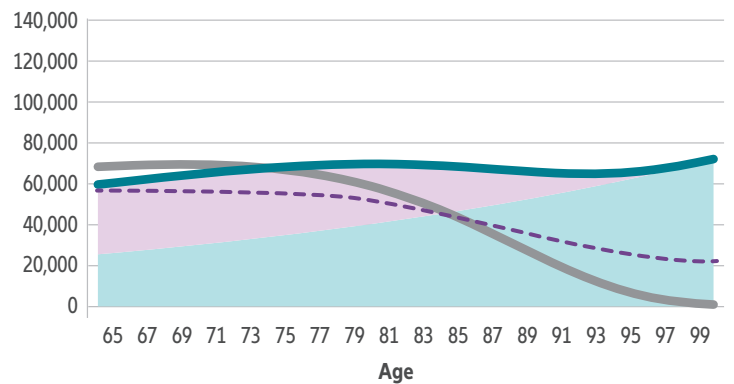
The ideal income represents starting retirement income increasing each year for inflation. The affordable income is the same as referenced above – the amount of income a retiree can take if they adjust each year for updated life expectancy and remaining investment balance. The gap widens over time to a point where the retiree must greatly reduce their standard of living.



Hypothetical examples assume \$1 million retirement balance, 4% growth, 2% inflation, and retirement age 65.

Guaranteed lifetime income solutions are specifically designed to address the risk of outliving one's assets by providing income even after the annuity's value is depleted. The chart below shows the same simplified example as above, but includes another solution with guaranteed lifetime income from an FIA with increasing income potential. The increasing income feature in the annuity used in this analysis means the guaranteed income has potential to grow each year based on interest credits. These increases can help address the impact from inflation. While there is some tradeoff early on (the starting income with the annuity is 13% lower), the annuity significantly reduces the gap between affordable income and ideal income later in life, cutting it in half at age 95.

- Nonguaranteed income
- Guaranteed lifetime income
- Affordable income without guaranteed lifetime income solution
- Affordable income with guaranteed lifetime income solution
- Guaranteed lifetime income with 0% growth



Hypothetical example assumes \$1 million retirement balance, 4% growth, 2% inflation, and retirement age 65. Assumes 50% of the starting retirement balance is allocated to the annuity with 10-year deferral, 2% indexed interest credits, and 4.25% payment percentage.

## MONTE CARLO ANALYSIS FOR GRADUAL RISKS

Using the same scenario analysis as before, we analyzed the impact of each gradual risk for our hypothetical participant for both portfolios with and without guaranteed lifetime income. To understand the sensitivity to longevity risk of each portfolio, we adjust the planning horizon to ages 90, 95, and 100. The table below shows the probability of outliving each of these ages for a male and female 65 year old, as well as the likelihood that one spouse will live to these ages. For example, a 65-year-old female has a 32% chance of living beyond age 90. In other words, planning to age 90 may not be sufficient for 32% of female retirees.

	Survival Probability		
	Male	Female	Joint
<b>Age 90</b>	21%	32%	46%
<b>Age 95</b>	6%	12%	17%
<b>Age 100</b>	1%	3%	4%

Applying these different planning horizons to our two portfolios, we see the reduced sensitivity of **portfolio #2** from the guaranteed lifetime income kicking in. For **portfolio #1** without guaranteed lifetime income, extending the investment horizon from age 90 to age 100 decreased the average income percent 34%, from 79% to 45%. This is compared to the portfolio with the annuity that only decreased 12%. For **portfolio #1**, the cost of planning to the wrong age is much higher without the protection of the guaranteed lifetime income.

Average income achieved at target age as percent of income needed		
	Portfolio #1	Portfolio #2
<b>Age 90</b>	79%	89%
<b>Age 95</b>	61%	82%
<b>Age 100</b>	45%	77%

As mentioned earlier, inflation compounds the impact of longevity by reducing the purchasing power of retirement income. Layering on a 50bp increase to inflation to a total annual inflation of 2.5%, we see this compounding effect on both portfolios and the protection that guaranteed lifetime income provides. For **portfolio #1**, the uncertainty from these risks that we show below results in a 50% (79%-29%) range of the average percent of income achieved. **Portfolio #2** provides much more protection, only resulting in a 26% (89%-63%) difference of the average percent of income achieved. Guaranteed lifetime income ensures that the income a retiree receives will never fall to \$0, regardless of the value of their investment balance or how long they live.

	Portfolio #1		Portfolio #2	
	Baseline	Increased Inflation	Baseline	Increased Inflation
<b>Age 90</b>	79%	66%	89%	79%
<b>Age 95</b>	61%	45%	82%	71%
<b>Age 100</b>	45%	29%	77%	63%

While all annuities provide protection against longevity risk, not all annuities provide the same level of protection against inflation. The annuity used in this analysis has an increasing income feature, described above, that allows for potential increases to the guaranteed income based on the interest credits. As shown in the results above, this feature can help address the impact of inflation and relieve some pressure from the rest of the portfolio.

## HELPING PARTICIPANTS ADDRESS THE COMPOUNDING RISKS IN RETIREMENT

Over the last 40 years, the retirement landscape has seen tectonic shifts, while the burden on individual working Americans to both fund and manage their retirement income has increased substantially. With the application of new technology, favorable legislation like the SECURE Act, and a heightening emphasis on decumulation, guaranteed income solutions are quickly becoming available within employer-sponsored defined contribution plans.

While no one investment option addresses all challenges perfectly, a guaranteed lifetime income solution like a fixed index annuity can help mitigate the effects of all four common risks analyzed in this paper. This table shows the impact of individual risks, but when combined, the gap between the portfolios was even greater.

Average income achieved at 95 as percent of income need					
	Baseline	Reduced Growth	Sequence Risk	Increased Longevity	Increased Inflation
<b>Portfolio #1</b>	61%	48%	49%	45%	45%
<b>Portfolio #2</b>	82%	73%	79%	77%	71%

An annuity complements a balanced retirement portfolio by providing guarantees where traditional investments may fall short. Annuities provide accumulation potential with protection from market downturns while also offering guaranteed income with the potential to address the effects of inflation for life. By allocating a portion of their portfolio to a guaranteed lifetime income solution, participants may have greater confidence in their retirement income strategy.

To understand the impact of guaranteed lifetime income for the plan participants you serve, you can request a customized portfolio impact report based on your participant demographics, capital market assumptions, and asset allocations. Visit [www.allianzlife.com/dcplan](http://www.allianzlife.com/dcplan) or email [retirement-income@allianzlife.com](mailto:retirement-income@allianzlife.com)

# Appendix A

## ADDITIONAL ANALYSIS OF GUARANTEED LIFETIME INCOME

### Guaranteed Lifetime Income in Tail Scenarios

Previous analysis has focused on the income achieved on average across all scenarios. With retirement planning, it is important to assess all scenarios to understand the range of possible outcomes. Now we will analyze the 15<sup>th</sup> and 85<sup>th</sup> percentile to understand the impact of guaranteed lifetime income closer to the tails.

The table below shows the income and the remaining investment balance, or legacy wealth, at age 95 for different scenarios. The low scenario in the tables below is the average of the 10% of scenarios centered on the 15<sup>th</sup> percentile, the high scenario is centered on the 85<sup>th</sup> percentile, and the median is centered on the 50<sup>th</sup> percentile.

In the median and high scenarios, both portfolios are equally successful in providing the income needed and each have assets remaining in their portfolio. Counterintuitively, **portfolio #2** with the annuity results in higher remaining assets than **portfolio #1**. The increasing income from the annuity can help address the impact of inflation, relieving the burden on the rest of the portfolio.

The low scenario, on the other hand, is where the value of the annuity is highlighted. Annuities are uniquely designed to address the risk of outliving one’s assets. In the low scenario where the investment balance has been depleted, the guaranteed lifetime income still provides a portion of the income needed.

	Annual income at age 95		Legacy wealth at age 95	
	Portfolio #1	Portfolio #2	Portfolio #1	Portfolio #2
<b>Low</b>	\$0	\$13,104	\$0	\$0
<b>Median</b>	39,240	\$39,240	\$164,822	\$361,880
<b>High</b>	39,240	\$39,240	\$771,111	\$1,186,551

### The Median Plan Participant

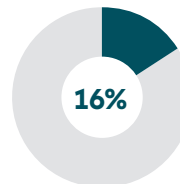
So far we have focused on the value of guaranteed lifetime income for an above-average participant. Now, we will adjust our demographic assumptions to reflect the median participant, keeping all other capital market and allocation assumptions the same.

The median participant balance for a 55-year-old employee is just under \$100,000 and the median salary is \$75,000. Again applying the average annual contribution rate, we come to annual contributions of \$7,500 each year. The median income for a 65-year-old retiree is \$30,000. Again assuming a 401(k) will need to cover 42% of that total income need, we come to a monthly income need of \$1,000 per month from this 401(k) analysis. This equates to \$26,160 in annual income at age 95 after adjusting for inflation.

For **portfolio #1** (without guaranteed lifetime income), the participant will earn on average only 16% of their target income at age 95. In the majority of scenarios, their investment balance will have run out. Even in the 85<sup>th</sup> percentile of scenarios, representing a high scenario, the participant is still earning less than 20% of their target income need. While this is a bleak picture, this represents half of working Americans today.

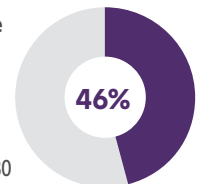
#### Portfolio #1

**Monthly income at age 94 (terminal value)**  
 Low \$0  
 Median \$0  
 High \$403



#### Portfolio #2

**Monthly income at age 94 (terminal value)**  
 Low \$494  
 Median \$629  
 High \$2,180



These hypothetical examples are for illustration purposes only.

When we add just a 30% allocation to guaranteed lifetime income, we see large improvement across most scenarios.

On average, they will achieve 46% of their target income need. More notably, in the low and median scenario, even though their investment balance has run out, they still receive a portion of income guaranteed for life. While the participant still does not achieve their target income in the majority of scenarios, the median participant’s situation could be significantly improved due to the guaranteed lifetime income.

# Appendix B

## ALLIANZ LIFE PORTFOLIO IMPACT REPORT

The results shown throughout this white paper are based on the assumptions below. Allianz Investment Management US LLC built the Portfolio Impact Report to demonstrate the probability of achieving retirement goals by using model hypothetical portfolios and 5,000 Monte Carlo simulations. It was built as a tool to show lifetime income using forward-looking capital market assumptions.

The annuity used in this analysis is the **Allianz Lifetime Income+<sup>SM</sup> Fixed Index Annuity** and its **Lifetime Income Benefit** that can be added to a defined contribution retirement plan. In addition to providing tax deferral, accumulation potential, and a death benefit for beneficiaries, contributions to **Allianz Lifetime Income+** can help manage the combined risks through its innovative **Lifetime Income Benefit**, which has an increasing lifetime income design.

	Portfolio #1 (without annuity)	Portfolio #2 (with annuity)
<b>Age</b>	55	
<b>Retirement Age</b>	65	
<b>Planning Horizon</b>	95	
<b>Income</b>	\$1,500/month <sup>1</sup>	
<b>Initial Value</b>	\$250,000 <sup>2</sup>	
<b>Contributions</b>	\$12,000/month, 3% growth <sup>3</sup>	
<b>Equity Allocation*</b>	70% to 40%	70% to 40%
<b>Bond Allocation*</b>	30% to 60%	0% to 30%
<b>Annuity Allocation</b>	0%	30%
<b>Inflation</b>	2%	
<b>Equity Return/Volatility</b>	7% / 16%	
<b>Bond Return/Volatility</b>	2% / 4%	
<b>Equity-Bond Correlation</b>	-15%	

<sup>1</sup> Average annual income at age 65 is \$42,000. 58% of this income comes from sources other than personal savings, such as Social Security or pensions. Social Security Administration

<sup>2</sup> Morningstar

<sup>3</sup> Morningstar and Vanguard How America Saves 2019 study

	Allianz Lifetime Income+ Assumptions
<b>Payout Rate</b>	4.25%
<b>Fee</b>	0.50%
<b>S&amp;P 500 Index Cap</b>	2.50%

	Sensitivities Applied
<b>Growth</b>	-1% shock to equities throughout projection
<b>Sequence of Returns</b>	At age 65: -30% to equity return, -5% to bond return; includes recovery by age 68
<b>Inflation</b>	+0.50% shock to inflation throughout projection
<b>Longevity</b>	Investment horizon to ages 90, 95, and 100

\*All portfolios begin with 70% allocation to equities, but grade to different levels of equities at the retirement age of 65. The aggressive portfolio allocates 60% to equities at 65, the moderate portfolio allocates 40%, and the conservative portfolio allocates 0% to equities.

Methodology and assumptions used in simulations: S&P 500<sup>®</sup> used as a proxy for US Large Cap, BBgBarc US Agg Bond used for US Bonds, and MSCI EAFE or MSCI EM used for Global Equity (depending on allocation). Hypothetical outcomes were derived from 5,000 Monte Carlo simulations. This goal increases annually with inflation. No advisory fees or taxes are reflected. Bonds yields are mean reverting. Equity dividends are reinvested continuously. Bonds are zero-coupon with a constant 7-year maturity. Monthly income goal is not changed as account balances decrease. Annuities are given first priority as an income source, followed by the sale of securities. Securities are sold in proportion to asset class account values. Income accelerator for guaranteed income is 150% with an income builder credit of 2.00%.

Increasing income potential of the Allianz Lifetime Income+<sup>SM</sup> Annuity is provided through an automatically included income rider at no additional cost.

Withdrawals are subject to ordinary income tax and, if taken prior to age 59½, a 10% federal additional tax.

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