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Vanguard research | Portfolio perspectives September 2022

Good health, poor health: Implications for retirement spending and asset allocation

- The most common life-cycle asset allocation option for U.S. investors is the target-date fund. Most TDFs offer a single postretirement asset allocation, designed for investors in a typical financial and health state.
- We explore how different health states can affect both postretirement consumption and asset allocation. We use the Vanguard Life-Cycle Investing Model (VLCM) with new estimated health-based retirement spending paths to gauge the impact of investors' health states on retirement spending and optimal asset allocations during retirement.
- Our analysis provides insights for investors and advisors on how health states in early retirement may affect their portfolio choices. The postretirement asset allocation of a typical TDF is well-suited to most investors. Retirees in poor health, however, may benefit from more personalized investment advice.

TDFs have revolutionized retirement investing, helping workers and retirees navigate market uncertainty with broadly diversified asset allocations (Donaldson et al., 2019). Of course, retirees face more risks than just asset class uncertainty (Jaconetti et al., 2021). Chief among them is their health state and its costs, particularly in countries such as the United States, where out-of-pocket health care spending can be significant. (See "Health and asset allocation" on page 2.)

We explore the impact of health states on the glide-path allocation for a married 60-year-old female investor. We look at three different health states: poor, moderate, and good. We examine how these different health assumptions affect her asset allocation and consumption patterns during retirement.

We compare our results with the baseline glide path for this individual, which considers the same demographic and financial assumptions for poor, moderate, and good health cases but ignores health states. This comparison gives investors and advisors insights into how health states and their costs and longevity implications affect asset allocation and consumption in retirement.

Research design

As our base case, we consider an affluent 60-year-old married female investor with a current salary of $131,000 and financial wealth of $1.1 million.[1] She has a retirement spending target of $92,000 per year.[2] We make no assumptions about her health state, but our target retirement consumption components include traditional health care costs, namely health insurance and out-of-pocket expenses.[3] We summarize the base case in **Figure 1**.

Health and asset allocation

A number of studies have investigated the role of health in portfolio choice (Rosen and Wu, 2004; Love and Smith, 2007; Edwards, 2008; Yogo, 2016; and Wu, 2021). The studies reach mixed conclusions about the impact of health on asset allocation in retirement. Theoretically, when individuals must make choices between covering health expenses or nonhealth expenses, risky health prompts them to lower the risk in their portfolio. However, most data sources have limited power to confirm or disprove the theoretical conclusions (Love and Smith, 2007).

FIGURE 1.

Demographic and financial inputs for base-case persona

	Input
Starting age	60
Retirement age	65
Gender	Female
Marital status	Married
Starting salary (age 60)	$131,000 (in 2021 dollars)
Wage income at age 65 (last year before retirement)	$117,000 (in 2021 dollars)
Starting wealth (age 60)	$1.1 million (in 2021 dollars)
Target annual retirement consumption (including population average health expenses)	$92,000 (in 2021 dollars)
Social Security benefits	$40,100 (in 2021 dollars)

Sources: Vanguard and the Social Security Administration.

Notes on risk

All investing is subject to risk, including the possible loss of the money you invest. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. Investments in bonds are subject to interest rate, credit, and inflation risk. Investments in stocks or bonds issued by non-U.S. companies are subject to risks including country/regional risk and currency risk. Diversification does not ensure a profit or protect against a loss. Annuities are long-term vehicles designed for retirement purposes and contain underlying investment portfolios that are subject to investment risk, including possible loss of principal.

Investments in target-date funds are subject to the risks of their underlying funds. The year in the fund name refers to the approximate year (the target date) when an investor in the fund would retire and leave the work force. The fund will gradually shift its emphasis from more aggressive investments to more conservative ones based on its target date. An investment in target date funds is not guaranteed at any time, including on or after the target date.

1 We forecast the salary and the 50th percentile of wealth (money in savings and investment accounts) at age 60 of a 25-year-old investor with a salary of $52,000 and a saving rate ranging from 8.8% to 12% over the investor's working years. This corresponds to a salary of $131,000 and wealth of $1.1 million at age 60.

2 The target consumption spending level is equivalent to 79% of pre-retirement income at age 65. A study by Aon (2008) suggests a 79% target total replacement ratio to maintain the pre-retirement standard of living for an individual earning $100,000 before retirement in 2008, which is equivalent to $117,000 in 2021 after adjusting for the inflation rate between 2008 and 2021.

3 We assume that the health insurance premiums do not change before and after retirement.

Following the same health care model that our Vanguard researchers have developed (Tan and Smart, 2021), we identify three distinct health states and simulate the trajectory of out-of-pocket health expenses and age-dependent mortality for each of the initial health states.[4] We compare the baseline case with the three health states, which are summarized in **Figure 2**:

- **Baseline:** The investor's health state is not specified. Her out-of-pocket health costs are similar to those for people in moderate health and her life expectancy is about 89 years.[5]
- **Poor health:** The investor has severe long-term care conditions[6] and life expectancy of 69 years. Her out-of-pocket expenses are higher than those of 95% of people in poor health.
- **Moderate health:** The investor is in moderate health, and health costs are not extreme. Her life expectancy is around 79 years, and her out-of-pocket health care expenses are in the 50th percentile of those in a similar health state.
- **Good health:** The investor is in good health with a life expectancy of 89 years. Her out-of-pocket health expenses are in the 25th percentile, well below what those in the same health state would pay.

Our analysis focuses on the differences in out-of-pocket health expenses. We assume that all individuals have the same health insurance costs.

FIGURE 2.

Three health states and their costs and life expectancy

State	Health condition	Percentile of out-of-pocket health expenses	Average life expectancy (years)
Poor	Severe long-term care conditions* (needs help with three or more activities of daily living [ADLs])	95th percentile	69
Moderate	Moderate health** (self-reported poor or fair health state with no need for help with ADLs)	50th percentile	79
Good	Good health*** (self-reported good, very good, or excellent health state with no need for help with ADLs)	25th percentile	89

* According to Health and Retirement Study (HRS) data, 4.59% of the U.S. population has severe long-term care conditions.

** According to HRS data, 23.73% of the U.S. population is in poor health.

*** According to HRS data, 71.68% of the U.S. population is in good health.

Sources: Vanguard and calculations from Tan and Smart (2021).

4 Tan and Smart (2021) developed a health state transition model that estimates the likelihood that different demographic groups will transition from one health state to another and the health state transition's impact on mortality rates at each age. They estimated and simulated 10,000 paths of health states (including mortality) based on an individual's initial demographic characteristics and health conditions calibrated to a nationally representative sample of American retirees in the Health and Retirement Study (HRS). They also estimated and simulated 10,000 paths of out-of-pocket health care costs based on a projected health state from the health state transition model. Each health state at each age has an estimated average out-of-pocket cost based on age, gender, and relationship status using the same HRS data sample. More details for out-of-pocket health care costs used for the three health cases can be found in **Figure A-1** of the Appendix.

5 A life expectancy of 89 years is estimated based on research by the Society of Actuaries (SOA) Research Institute (2021) that includes a wealthier section of the population; this section probably has better access to health care and consequently higher life expectancy.

6 An individual with severe long-term care conditions would require help with three or more activities of daily living (ADLs).

In the following sections, we assess the impact of different health states on retirement consumption and optimal asset allocation by using the VLCM.[7] Return forecasts for the different asset classes are based on those from the Vanguard Capital Markets Model® (VCMM).[8] We compare the different glide paths from a qualitative and quantitative perspective and provide an estimate of the additional amount that an investor would be willing to pay to be placed in the optimal glide path.

How health states affect the replacement ratio

We first compare the health states (poor, moderate, and good) in terms of a desired consumption replacement ratio, which is the retiree's consumption as a percentage of pre-retirement income. A higher replacement ratio means that the individual will need to spend more to maintain her pre-retirement lifestyle.

In our analysis, we compare individuals in different health states with our base case, that of an individual with average health care costs who aims to fund a fixed level of real (that is, inflation-adjusted) consumption throughout retirement. We model the costs in these different states by increasing or decreasing consumption during retirement relative to the base case. For each health state, we simulate 10,000 health cost paths throughout retirement and select the path that corresponds to the percentiles specified in Figure 2. The choice of percentiles in health states is to highlight the differences among the three health cases. For example, for the poor-health case, we choose the 95th percentile of health costs for individuals who have poor health conditions.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modeled asset class. Simulations as of June 30, 2021. Results from the model may vary with each use and over time. The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

7 The VLCM is a proprietary quantitative model developed by Vanguard's Investment Strategy Group for the construction of glide paths for retirement and nonretirement goals, such as college savings.

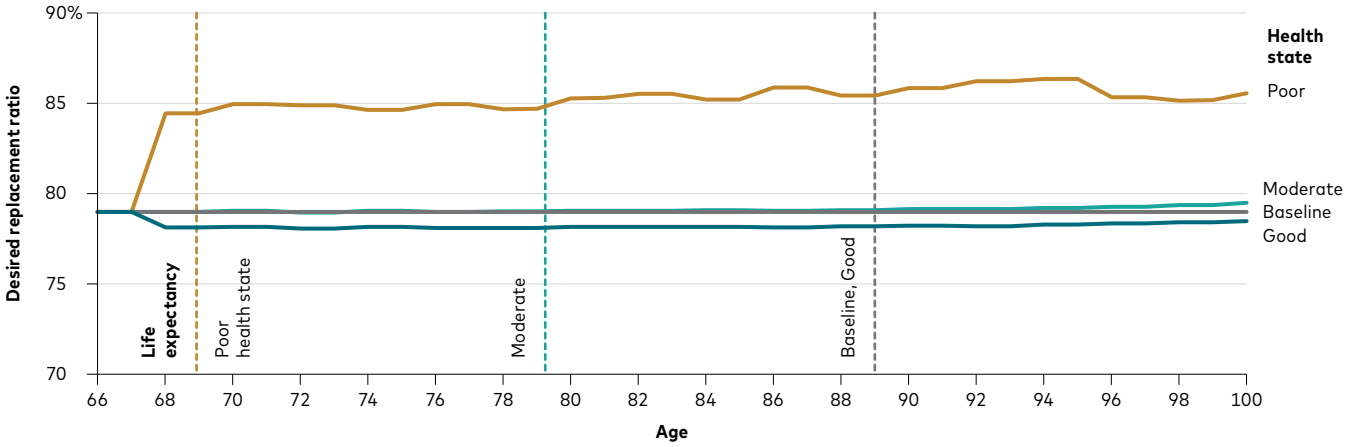
8 The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes.

Figure 3 shows the desired replacement ratio for each state and life expectancy (vertical dashed lines). This ratio accounts for both typical pre-retirement spending and the variable costs of different health states. It represents the level of retirement spending that investors in different health states would like to achieve, compared with their pre-retirement income.

For the baseline case, the replacement ratio is set at 79%; this case has costs similar to those for our moderate-health case. For the good-health state, the replacement ratio is slightly lower, around 78%, because of below-average out-of-pocket expenses. For the poor-health state, the replacement ratio is significantly higher, up to 86%, because of higher out-of-pocket health costs during retirement.

FIGURE 3.

Poor health can affect retirement consumption and thus the target replacement ratio



Sources: Vanguard calculations, based on data from the HRS and a model developed in Tan and Smart (2021), as well as assumptions about the income and target replacement ratio for the baseline case in Figure 1.

How health states affect asset allocation

In our analysis, we focus on consumption during retirement. Consumption has two components—how much and for how long. Out-of-pocket health expenses affect the "how much" and health-state-based mortality and life expectancy affect the "how long."[9] **Figure 4** shows the impact of these two factors on the optimal glide paths for our base case and the three health states.

We assume that until age 60, the investor is on the same path as a common age-determined TDF glide path.[10] If we ignored health states and health-based mortality, given this investor's wealth at age 60, the optimal glide path would be the baseline. In this glide path, the equity allocation steadily decreases after age 60, when it is at 59%, and it ends at 30%.

When we add health states and corresponding health costs to the base case, we find some changes in the glide paths, in particular for the poor-health state.

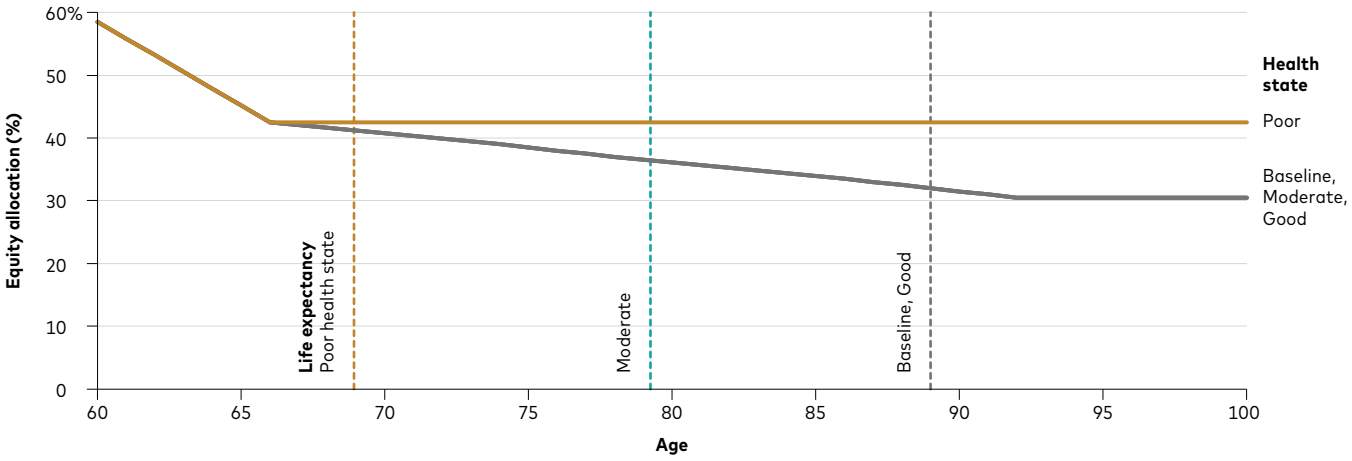
We find that the optimal glide paths for the baseline, moderate-health, and good-health states are similar—they start at an equity allocation of 59% and end at a 30% allocation. However, for the poor-health state, it ends at a higher equity allocation—42%.

The optimal glide path is the one that enables the investor to derive the maximum utility for consumption and for leaving a bequest. Given the shorter life expectancy in the poor-health case, leaving a bequest has a bigger weight in the utility calculation, and it drives the higher equity exposure in later stages of retirement. Furthermore, an investor in poor health needs to fund more potential spending because of higher health expenses if she survives beyond her life expectancy. (See "Caveats on interpreting the results" on page 7.)

FIGURE 4.

Health states can affect optimal asset allocation in retirement

Glide paths



Notes: Optimal glide paths for baseline, good-health, and moderate-health states overlap in the chart.
Source: Vanguard calculations, based on the Vanguard Life-Cycle Investing Model.

9 Mortality refers to the probability that a person will die over the next year while life expectancy is the age to which a person can, on average, expect to live.

10 We use Vanguard TDFs as an example.

We also find that health state-based forecasted mortality has a bigger impact on asset allocation than the health expenses themselves. In fact, even for those in poor health, these expenses still represent a relatively small percentage of the annual consumption in retirement. Conversely, health state-based forecasted mortality and respective average life expectancy, represented by the vertical dashed lines in Figure 4, can change considerably from health state to health state. In fact, in our baseline case, it is around 89 years, whereas for the poor-health state it is around 69 years.

How meaningful are the differences in equity allocations for different health states? A utility function clarifies this.

Utility functions combine investor preferences on risk, consumption, and possible bequests to estimate the value that an investor assigns to a particular asset allocation. Put differently, these functions can help researchers assess how much an investor would be willing to pay to transition from the status quo (a common glide-path asset allocation suited for the baseline case) to a spending strategy and asset allocation calibrated to her individual characteristics or health state. This certainty fee equivalent (CFE) is the fee, measured in basis points of return, that an investor would be willing to pay to move to an optimized glide path. (A basis point is one-hundredth of a percentage point.)

We find that a 60-year-old individual in poor health would benefit the most from a tailored glide path (**Figure 5**). In fact, when given the option of investing according to a glide path suited for the base case when no health state is considered, this person would be willing to pay a fee of up to 12 basis points, depending on the wealth level, to be placed in a personalized glide path. This value would be almost nil for the moderate- and good-health cases.

FIGURE 5.

The CFE quantifies the financial benefit of switching from a common TDF glide path to a glide path optimized for an investor's health state

State	Certainty fee equivalent
Poor	0.12%
Moderate	0.01%
Good	0.00%

Source: Vanguard calculations.

Caveats on interpreting the results

One feature of the VLCM tool is that it optimizes the glide path for specific customizable individual characteristics including risk preference, initial wealth, and wage profile, among others.

We study only the implications of health state on asset allocation and its financial consequences for an affluent female investor.

Another important component of the discussion is the financial plan: household budgeting and its impact on retirement outcomes. Retirees should incorporate health care costs into their annual spending plans to maximize the probability that they will achieve their financial goals and minimize the risk of running out of money too early.

Conclusion

Investing models that can incorporate sources of uncertainty such as health states and their longevity and cost implications will help advisors provide clients with tailored retirement investment strategies.

Our research shows that different health states can have different effects on retirement spending, mostly because of health-related costs, and on the optimal asset allocation, mostly because of health-based forecasted life expectancy.

Given the similarities of the baseline, moderate-health-state, and good-health-state asset allocations to traditional target-date postretirement asset allocations, we conclude that the typical TDF is well-suited to the health state of most investors. However, retirees might benefit from personalized advice when they form their health care spending plans for retirement, especially those in poor health.

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Appendix

FIGURE A-1.

Estimated average annual health care costs are similar in baseline, good-health, and moderate-health states but are substantially higher for investors in poor-health state

Health state	Annual health care costs (age 66, 2021 dollars)
Baseline	$2,536
Good	$2,045
Moderate	$2,568
Poor	$10,515

Notes: We assume the investors in the baseline case and all other health states have original Medicare coverage (Part A and Part B) and pay a $148 monthly premium. We assume investors have the same annual health care costs of $2,572 across health states before retirement. Health care costs during retirement may fluctuate because of the assumption that the health state is uncertain and might transition to a different state.

Sources: Vanguard calculations, based on data from the HRS and the health care cost risk model developed in Tan and Smart (2021).

The Vanguard Life-Cycle Investing Model

The Vanguard Life-Cycle Investing Model (VLCM) is a proprietary model for glide-path construction that can assist in the creation of custom investment portfolios for retirement as well as nonretirement goals, such as saving for college. The main principle behind life-cycle investing and VLCM is to maximize the expected utility of consumption and wealth for people's financial goals. The VLCM selects optimal glide paths for given risk tolerances, goals, and demographic characteristics by assessing the trade-offs, across someone's life and/or time horizon, between taking investment risk to increase potential wealth and spending and the downside of increased uncertainty and volatility associated with more investment risk. Thousands of glide paths are compared, and the glide path with the highest utility score (the one that strikes the optimal balance between expected outcome and risk) is the best solution for the investor's preferences, circumstances, and goal.

The VLCM utilizes the distributional forecasting framework of the Vanguard Capital Markets Model (VCMM) and uses asset return simulations to calculate consumption and wealth outcomes for any glide path across 10,000 future possible scenarios.

Vanguard Capital Markets Model

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta).

At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time. The asset-return distributions shown in this paper are drawn from 10,000 VCMM simulations based on market data and other information available as of June 30, 2021. The model uses index returns, without any fees or expenses, to represent asset classes. Taxes are not factored into the analysis. Readers are directed to the research paper titled *Vanguard Global Capital Markets Model* (Davis, Aliaga-Díaz, Ahluwalia, Polanco, and Tasopoulos, 2014) for further details.

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