

# **Subjective Beliefs, Saving, and Spending for Retirement**

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## **Subjective Beliefs, Saving, and Spending for Retirement**

### *Abstract*

Beliefs about future events are crucial to the decisions that people make when developing financial plans over the life cycle. Yet peoples' subjective beliefs can often differ from the objective probabilities that economists and financial planners use in their models. This paper discusses findings on subjective beliefs, how people might form their beliefs, and how these beliefs affect conclusions drawn from a classical economic life cycle model. The chapter highlights a specific divergence between subjective beliefs and objective probabilities: subjective beliefs about peoples' mortality.

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Expectations about future events are essential to the decisions that individuals make each and every day. For example, consider a 19-year-old who is deciding whether to go to college. A college degree is essentially a calculated bet on one's own abilities and a set of circumstances that are beyond her control. By choosing to go to college, she is forgoing at least four years of income from employment. Therefore, she has to believe she can complete the coursework requirements for the degree. She has to expect that a college education will help her earn a higher wage upon graduation. If her beliefs about such factors are sufficiently high, then the expected returns to a college degree are sizable.

Now, what if she thinks she is likely to be eaten by a shark before turning 40 years old? Does a college degree still make sense to pursue? The expected wage premium from a college degree has to exceed the costs of attendance and the lost wage income while attending college for at least four years. If she believes she will live until the normal retirement age of 65, then she will earn over forty years of the wage premium. If she believes she will live until 40, then she will earn just under twenty. In the latter case, college might not be worth it.

Decisions such as these require a range of inputs that are all forecasts of key economic variables. Classical economic models assume that individual agents have rational expectations, which means that people base their decisions on the information that is available to them. In the example of the decision to attend college, people can look up statistics on the historical wage premium to a college degree. People might have reason to think the premium will grow, as a college degree is essential to entering high paying jobs such as those in the technology sector. Or, maybe it will shrink, as there are fewer people willing to enter trades that do not require a college degree. However, economic models assume individual decision makers use historical averages of the wage premium to make such decisions.

By contrast, many behavioral researchers are willing to relax the assumption of individuals' reliance on available data, such as historical averages. Grounded by findings in psychological research, behavioral economists are willing to incorporate into their models *systematic* patterns of belief formation. Perhaps the most well-known theoretical model of decision-making in behavioral economics is Cumulative Prospect Theory (CPT), developed by Amos Tversky and the Nobel Prize winning economist Daniel Kahneman (Tversky and Kahneman 1992). One crucial aspect of CPT is based on the observation that people assign excessive weight to events with low probabilities and insufficient weight to events with high probability. For instance, some people might think it likely they are attacked by a shark before they turn 40.

This article focuses on a particular *systematic* error in beliefs that the average person makes: individuals while young over-estimate the probability of dying soon and when old, they over-estimate the probability of living very long. This miscalibration in beliefs has potentially sizable effects on the financial decisions people make during their lifetime. From the decision to attend college, to save an extra dollar, to invest in stocks, the horizon that one expects to live matters. The article continues by developing an explanation for the systematic patterns of mortality beliefs: the salience of different causes of death at different ages. The article proceeds to characterize the types of financial decisions economists and financial practitioners can expect to observe when individuals have systematic errors in mortality beliefs. Finally, the article discusses other variables that are crucial to long term financial decision-making that are prone to systematic biases in beliefs.

### **Subjective Beliefs About Mortality**

The behavioral finance literature has identified a systematic pattern of mortality beliefs over the course of an individual's lifespan. Individuals' beliefs go from pessimistic about survival, at young ages, to optimistic as people approach and pass retirement age.

This life-cycle pattern of beliefs about mortality has been documented in a wide range of settings and individual surveys. The finding goes back to at least Hamermesh (1985), which surveys 650 white male economists (an unsurprising sample pool given such times) compared to a sample of 975 people chosen randomly from a telephone directory in the Midwest. Nonetheless, recent literature documents this life-cycle pattern of beliefs in representative surveys in the U.S., in Europe, and Australia, and presumably in other geographic regions as well (see, e.g., Hurd and McGarry 1995; Elder, 2013; Wu, Stevens, and Thorp 2015).

How large are the distortions in people's beliefs about mortality? The answer is not straightforward because researchers have to make choices about how to elicit beliefs in their surveys. For example, Payne et al. (2013) shows that responses differ whether researchers use a "live-to" or "die-by" framing. Surveys might ask respondents to what age they expect to live (e.g., 80 years old) or ask people how likely it is that they live another 10 years (e.g., with 90% probability).

To arrive at an answer to this question, it is useful to consider how economists might use individuals' elicited beliefs. Economists pre-dominantly incorporate mortality expectations in what is broadly termed a "life cycle model." Life cycle models are a way to describe the inter-temporal tradeoffs that people make at different ages, for example between savings and consumption. For example, it can be used to characterize the financial decision to attend college and how such a decision might interact with other variables, such as income variability and the return to savings in equity markets.

Such life-cycle models need to make a choice about how long people expect to live. Specifically, at each age in the model, the individual thinks about how likely she is to live until a terminal age. Someone who expects to live longer has to meet their financial needs post-retirement for an additional number of years.

In a recent paper, (Heimer, Myrseth, and Schoenle 2019), we surveyed individuals' subjective mortality beliefs that the authors use to connect directly to life-cycle models. Specifically, the paper elicits subjective beliefs about the probability of living a specific number of additional years. The paper uses these surveyed beliefs to estimate a function for the probability of surviving until a terminal age of 95 years, although researchers and practitioners can choose a different drop-dead or terminal age.

Figure 1 shows graphically the estimated subjective survival function and compares it to actuarial statistics taken from the Social Security Administration (SSA). The figure shows that a 30-year-old has about a 12% chance of surviving to 95, though she believes the chances of surviving to 95 are close to zero. The error in subjective beliefs flips as he gets older. A 70-year-old has approximately a 15% chance of surviving to 95, though she believes the probability is closer to 20%. Overall, the errors in beliefs about survival chances can be large. However, the size of the error depends on the subject's age.

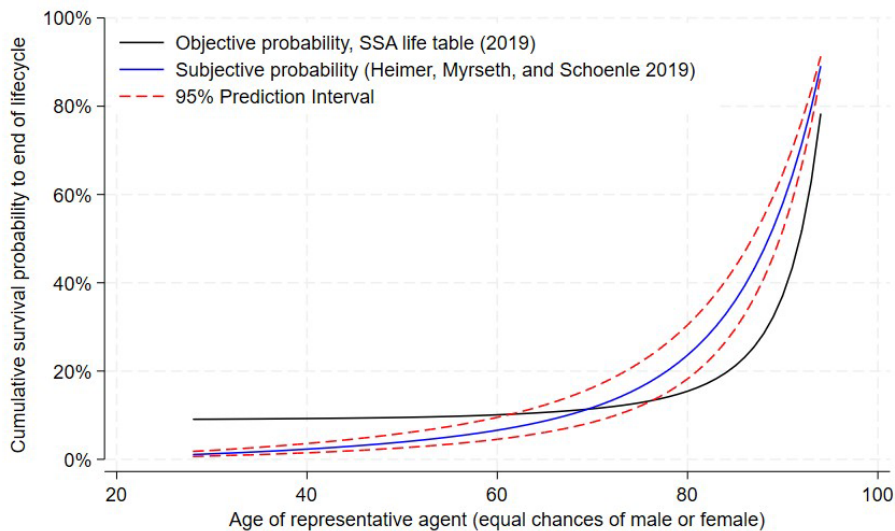


Figure 1

### **Salience Theory as an Explanations for Subjective Mortality Beliefs**

Behavioral economists have also taken to writing theories of belief formation that help explain why people might make systematic errors in judgment. One appealing theory is that of salience (Bordalo, Gennaioli, and Shleifer 2022). Taylor and Thompson describe, “Salience refers to the phenomenon that when one’s attention is differentially directed to one portion of the environment rather than to others, the information contained in that portion will receive disproportionate weighting in subsequent judgments.” Salience theory therefore might explain why some individuals exaggerate the likelihood of experiencing extreme events, for example, a shark attack.

Salience theory is potentially useful in describing the errors in subjective mortality beliefs that people make over the life cycle. Heimer, Myrseth, and Schoenle (2019) show that the decision weights individuals assign to different mortality events can vary as people age (Figure 2). Specifically, younger people are more attuned to rare events, such as shark attacks, natural

disasters, and plane crashes. On the other hand, older individuals focus on health risks and natural aging.

Young people focus on dramatic events, while older people focus on health and aging, which translates into different expected survival rates at different ages. First, people often exaggerate the likelihood of dramatic risk factors (e.g., Hertwig et al 2004). For instance, hours of television and movie content is devoted to the possibility of shark attacks. You might have seen the 1975 movie “Jaws” or watched the annual television event “Shark Week.” This attention to sharks might be misguided because, for example, cows kill roughly twenty times more people per year. Overall, young people focus on rare events, and they overestimate the likelihood of their occurrence. Therefore, the young underestimate their chances of survival to old ages.

As people age, rare events lose their salience. Older individuals devote more attention to health risks and the natural course of aging when formulating beliefs about survival. Yet many health risks are difficult to visualize. The leading cause of death for people over the age of 75 is heart disease. Deaths caused by heart disease are often slow and tragic, as opposed to sudden and vivid like shark attacks, and many people are averse to preventative measures and receiving treatment (Taber, Leyva, and Persoskie 2015). Moreover, the natural course of aging is not something that we easily conceptualize. As such, people *underestimate* the likelihood of these events. Therefore, older individuals overestimate their chances of survival to very old ages.

### **Quantifying the Effects of Subjective Mortality Beliefs on Retirement Savings**

Heimer, Myrseth, and Schoenle (2019) use a quantitative life cycle model to describe how these subjective mortality beliefs might affect people’s consumption, savings, and portfolio choices. The model assumes that people want to maximize their lifetime utility of consumption.



Consumption today is more valuable than consumption tomorrow according to the individual's time discount factor. Nonetheless, people can save year-to-year by investing in a risk-free asset (e.g., treasury bills) or a risky asset (e.g., a diversified portfolio of U.S. equities). People have uncertainty over their income each year of their working life. Upon retirement, their income is stable because it comes from social security and other retirement assets, such as a pension.

Such models tend to deliver hump shaped consumption over the course of the life cycle. People forgo some consumption when young in order to save for retirement. People's wealth peaks around retirement age, and then they draw down their savings to nearly zero upon death. These models often incorporate a desire to leave an inheritance, which increases the levels of wealth at death. Most of the life cycle literature uses actuarial statistics to determine the expected likelihood of surviving from year-to-year.

Heimer, Myrseth, and Schoenle (2019) shows what happens to peoples expected financial decisions when a life cycle model uses subjective mortality beliefs instead of the objective probabilities of survival. This model modification is potentially a more realistic description of decision making because it incorporates the stylized fact from the behavioral literature on surveyed mortality beliefs.

Figure 2 shows the results of the model comparing the two approaches to incorporating mortality beliefs. The paper finds that with subjective beliefs, consumption is higher when young resulting in less savings for retirement. In retirement, people with subjective beliefs are able to consume less.

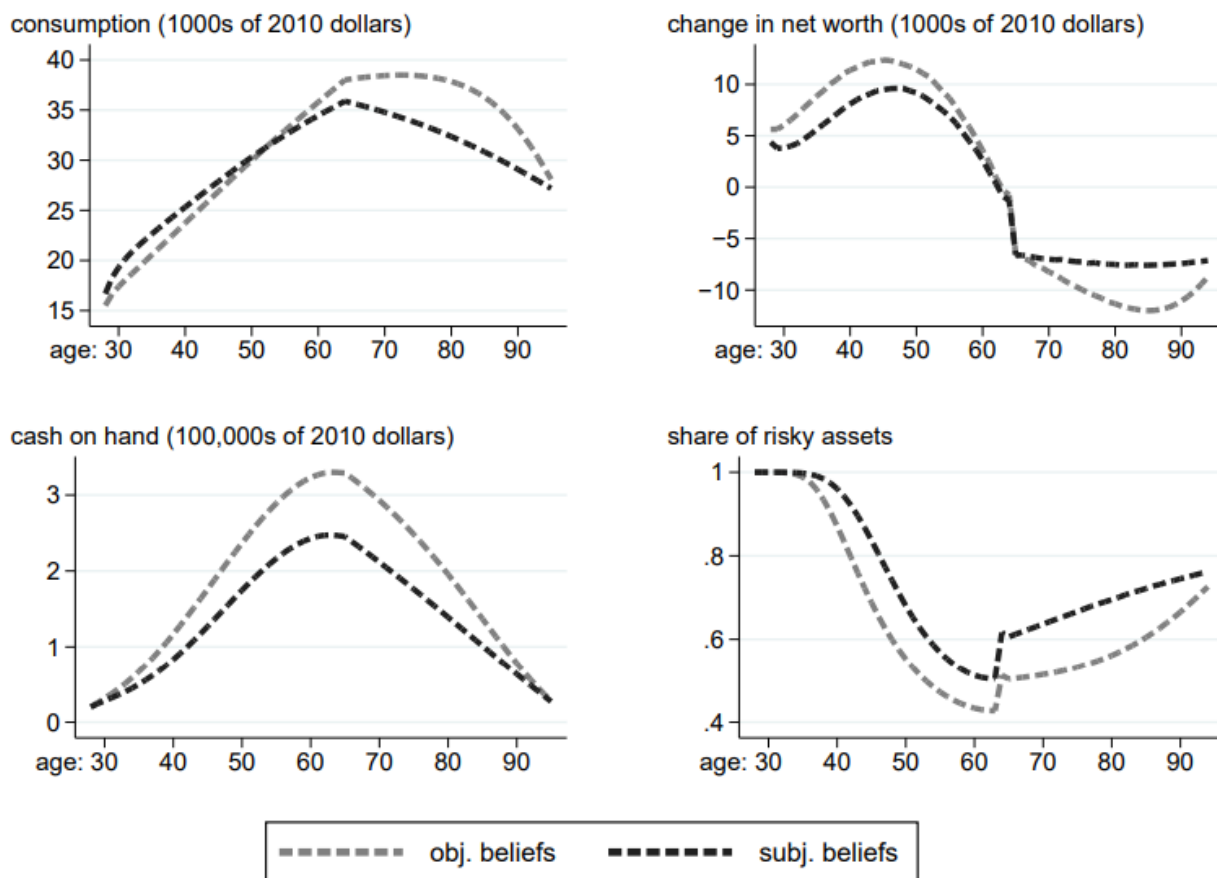


Figure 2

Source: Figure 5; Heimer, Myrseth, and Schoenle 2019

In addition, the difference in mortality beliefs affects the portfolio choices that people make. Because of the under-saving that people have when they use subjective mortality beliefs, they have to find ways to catch up on their savings. Such people are induced to take more risks by investing more in stocks, and this persists at all ages of their life. Between the over-consumption and the increased allocation to stocks, people with subjective mortality beliefs are saying “YOLO!” (you only live once).

Several other scholarly works study the effects of mortality beliefs on a wide range of life cycle financial decisions. Bloom et al. (2006) find that a higher subjective probability of survival

contributes to higher levels of wealth accumulation. A few papers study the relation between survival expectations and decisions to retire and claim social security (Hurd, Smith, and Zissimopoulos 2004; de Bresser 2020).

Several papers focus on the decision to purchase annuities and the effects of subjective mortality beliefs. As a benchmark, economic theory generally predicts that many people should purchase fairly-priced annuities. However, few people actually do. Some papers find a link between optimistic mortality beliefs and demand for annuities (Teppa and Laffourcade 2013; Inkmann et al. 2011). O’Dea and Sturrock (2023) study demand for annuities that are priced by insurers to reflect objective survival probabilities relative to the purchasing decision that people make based on their subjective probabilities.

In response to recent global events, Hurwitz, Mitchell and Sade (2021) study mortality beliefs in the context of the COVID-19 pandemic. The COVID-19 pandemic shortened millions of lives around the world and introduced a new and uncertain mortality risk factor into peoples’ psyche. The authors find that perceptions of the chances of contracting COVID-19 correlate with survival optimism. Relatedly, Heimer, Liu, and Zhang (2020) show that overconfidence is an important driver of peoples’ perceptions of the risks of transmitting COVID-19. People that are overconfident are less likely to believe that they will get sick, which in turn might affect their forecasts of survival.

Finally, are these misguided beliefs hardwired or can information interventions help correct peoples’ biases? Heimer, Myrseth, and Schoenle (2019) did not find evidence that presenting people with actuarial statistics about survival probabilities affects peoples’ expectations of their own survival. On the other hand, Hurwitz, Mitchell, and Sade (2022) find that prompting people to think about financial decisions can change perceptions toward their own survival. Given these

opposing findings, much more research is needed on methods to help guide people towards holding accurate beliefs.

### **Subjective beliefs about other economic variables**

This article addresses just one component of people's financial decision making over the life cycle with respect to the beliefs they have about future events. As we described in the example of pursuing a college degree, several of the inputs into the decision are forecasts of economic variables. This section describes some academic findings on other forecasted variables in which individual beliefs can diverge from expected outcomes. The survey paper by O'Dea and Gizem (2013) is an excellent reference for readers interested in incorporated subjective beliefs into economic models.

When preparing for retirement, people need to have a target age in mind for when they plan to retire. You often hear people say that they "delayed" retirement. This statement implies that such people incorrectly estimated their future retirement age. Some papers study expectations about working life and retirement ages and their effects on financial decisions and welfare over the life cycle. Caliendo et al (2023) shows that underestimating lifetime labor participation can cost people tens of thousands of dollars upon retirement. An and Sachdeva (2024) studies the uncertainty in expectations about retirement and find that people might insure against this risk.

People often plan to leave an inheritance to their offspring and other charitable causes. Heimer and Li (2024) show that many people overestimate the value of the inheritances that they actually do bequeath. Using a similar life cycle modeling framework, that study shows that economists should assign a larger utility to bequests to calibrate these lifelong financial plans. This would result in higher savings rates at all ages.

People are also tasked with developing forecasts of key economic variables when they make life cycle financial decisions. Das, Kuhnen, and Nagel (2020) shows that peoples' socioeconomic status affects their forecasts about business conditions, employment rates, and stock market returns. Kuchler and Zafar (2019) finds that people overweight their own experiences when developing forecasts of housing prices and employment. Armona, Fuster, and Zafar (2019) and Botton and Perez-Truglia (2020) provide evidence that such beliefs about housing affect decisions in the housing market.

Overall, subjective beliefs, whether about a person's own mortality, or about certain economic variables can play an important role in peoples' saving and spending, before and after retirement.

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