

Life Expectancy Misperception and Adverse Selection

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Abstract

Adverse selection has long been discussed in annuity and life insurance markets, where individuals possess private information about their mortality and longevity risk that is unobservable to insurers. However, individuals themselves may also be imperfectly informed about their own longevity. What matters for insurance purchasing behavior is the perceived risk rather than the objective risk. Using data from the Survey of Health, Aging and Retirement in Europe (SHARE), this study aims to quantify the bias between the subjective and objective life expectancy in European countries for individuals over 50 and how this misperception is related to the likelihood of holding an annuity or life insurance products. The study expects to find that the belief heterogeneity on perceived remaining life expectancy among socioeconomic groups is also part of the lifespan inequality and generates inequalities in financial preparedness in old age.

1 Introduction

Would you choose ‘live long but run out of money’ or ‘a lot of money remains but you die early’? This dilemma captures the essential tension in retirement planning to managing the uncertainty surrounding the timing of death. Both outcomes are undesirable—the first reflects longevity risk, the possibility that individuals may outlive their assets; the second reflects mortality risk, the possibility that individuals may underconsume during their lifetime. With growing policy emphasis on the third pillar of pension systems, responsibility for retirement planning has increasingly shifted from the state to individuals. As voluntary financial behavior becomes increasingly important, people’s expectations about their own longevity play a growing role in determining their financial preparedness for later life.

Annuities and life insurance are mirror products linked to death. Based on life cycle models, standard utility theory (Yaari, 1965) predicts that risk-averse individuals should annuitize to smooth consumption against longevity risk and purchase life insurance to protect dependents. However, few retirees voluntarily annuitize or hold life insurance policies—phenomena commonly referred to as the ‘annuity puzzle’ and the ‘underinsurance

puzzle’. From the supply side, insurers face concerns about adverse selection, whereby customers possess private information about their mortality prospects. In response, insurers incorporate loadings and margins into their pricing models.

However, such model relies on the assumption that individuals are aware of their true mortality risk. In reality, people may overestimate their longevity if they are optimistic or underestimate if pessimistic. It is these perceived survival probabilities rather than the objective ones that drive insurance behavior. Therefore, this study shifts the focus from objective risks to biased beliefs.

Misperceptions can distort both individual financial decisions and the efficiency of risk pooling. Pessimistic healthy individuals may avoid annuities and go for life products, while optimistic unhealthy individuals may go for annuities but not life products. These may weaken the expected adverse-selection pattern and potentially distort insurer pricing. Moreover, this belief heterogeneity across socioeconomic groups constitutes one dimension of inequality. If lower socioeconomic status (SES) groups are systematically pessimistic, they may underinsure against longevity risk and face greater financial vulnerability in old age, thereby reproducing inequality through beliefs rather than biology. This study aims to provide insights by focusing on the gap between subjective life expectancy (SLE) and objective life expectancy (OLE) as an explicit measure of misperception, and by analysing both annuity and life insurance participation in the same framework.

2 Current literature

Empirical evidence suggests that subjective survival probabilities are predictive but biased estimates of objective survival (Hurd & McGarry, 2002). SES is one of the potential explanations to the belief heterogeneity, and it also has an impact on annuitization behavior. Higher wealth level relates to a higher degree of optimism (Hurd & McGarry, 2002), and a higher annuitization rate (Dormont et al., 2018). O’Dea and Sturrock (2023) link these beliefs to saving, consumption, and annuitization behavior, showing that pessimism contributes to the low annuitization rates observed among retirees. Demographers have increasingly studied lifespan inequality as a complement to life expectancy measures and acknowledge the importance of the uncertainty of death on people’s decision-making (Van Raalte et al., 2018), yet the existing studies are mostly based on objective life tables. One exception is Dormont et al. (2018), who examine individual subjective uncertainty measured as the standard deviation of the longevity distribution. If beliefs about survival are unequally distributed by SES, this may introduce additional inequality, leaving lower SES groups with inadequate annuity or life insurance coverage and thus poorly managing both mortality and longevity risks.

This study aims to answer three questions: How biased are beliefs about longevity among population over 50 in Europe? How does misperception of life expectancy shape participation in annuities and life insurance products? How do the belief bias and resulting insurance coverage vary across SES groups?

3 Data and Methods

3.1 Data sources

The analysis will use the Survey of Health, Ageing and Retirement in Europe (SHARE), wave 1 to 9. From wave 1, respondents under age 65 are asked: “What are the chances that you will live to age 75 or more?” Older respondents are asked the same question for a higher target age (e.g., 85 or 90). This probability, scaled from 0 to 100, is used to estimate subjective survival curves. Objective survival probabilities are from the Human Mortality Database (HMD) for corresponding countries, years, sex, and ages.

3.2 Subjective and objective life expectancy

For each valid observation, subjective survival probabilities are translated into conditional survival curves using the Gompertz-Makeham model, similar to (Palloni & Novak, 2017). SLE is calculated from the conditional survival curves. OLE is computed from HMD life tables. For each individual i , misperception is defined as:

$$M_i = SLE_i - OLE_i \tag{1}$$

3.3 Linear regression on belief bias and insurance purchasing behavior

3.3.1 Determinants of Misperception

$$M_i = \alpha + \beta X_i + \varepsilon_i \tag{2}$$

where X_i is a vector of explanatory variables including age, sex, education, wealth, and self-rated health.

3.3.2 Insurance Purchasing Behavior

$$H_i^A = \gamma_0 + \gamma_1 M_i + \gamma_2 OLE_i + \gamma_3 X_i + \varepsilon_i, \quad (3)$$

$$H_i^L = \delta_0 + \delta_1 M_i + \delta_2 OLE_i + \delta_3 X_i + \varepsilon_i. \quad (4)$$

Here, H_i^A and H_i^L are binary indicators for annuity and life insurance holdings, respectively. The explanatory variables include the misperception of life expectancy (M_i) and objective life expectancy (OLE_i), controlling for age, sex, education, wealth, and self-rated health.

4 Expected Findings

The study is expected to test the hypothesis that: 1. Pessimistic is common when it comes to longevity. The mean SLE is expected to be lower than the population OLE, especially among lower-SES groups. 2. Education and wealth are positively correlated with an accurate perception and a higher level of optimism. 3. The perceived lifespan inequality among SES is larger than the true lifespan inequality. 4. Controlling for OLE, the pessimists are expected to hold fewer annuities and more life insurance, while the optimists are expected to behave the opposite. In this way, the misperception weakens the adverse selection expectation.

This study seeks to shed light on the behavioral mechanisms linking belief heterogeneity to insurance decisions. A better understanding of this mechanism may benefit individuals, insurers, and policymakers alike. By narrowing the perception gap regarding longevity, improving financial literacy, or incorporating behavioral insights into product communication, individuals may make choices that align more closely with their actual longevity risk. Insurers could, in turn, design and price products more efficiently by distinguishing behavioral effects from true adverse selection. For policymakers, recognizing how misperceptions shape financial behavior may help refine public communication and policy design around retirement preparedness and longevity risk.

From a broader demographic perspective, this study may suggest that subjective lifespan inequality may reinforce existing socioeconomic disparities in later-life wellbeing. If disadvantaged groups hold more pessimistic longevity beliefs, they may exhibit lower participation in longevity products and higher in mortality product, resulting in suboptimal management of both longevity and mortality risks.. Over time, insurance behaviors resulting from misperceptions may deepen financial vulnerability at older ages. Understanding the extent of this belief heterogeneity could therefore inform both social policy and efforts to promote more equitable aging outcomes.

References

- Dormont, B., Samson, A.-L., Fleurbaey, M., Luchini, S., & Schokkaert, E. (2018). Individual uncertainty about longevity. *Demography*, *55*(5), 1829–1854. <https://doi.org/10.1007/s13524-018-0713-4>
- Hurd, M. D., & McGarry, K. (2002). The predictive validity of subjective probabilities of survival. *The Economic Journal*, *112*(482), 966–985. <https://doi.org/10.1111/1468-0297.00065>
- O’Dea, C., & Sturrock, D. (2023). Survival pessimism and the demand for annuities. *The Review of Economics and Statistics*, *105*(2), 442–457. https://doi.org/10.1162/rest_a_01048
- Palloni, A., & Novak, B. (2017). Subjective survival expectations and observed survival: How consistent are they? *Vienna Yearbook of Population Research*, *1*, 187–228. <https://doi.org/10.1553/populationyearbook2016s187>
- Van Raalte, A. A., Sasson, I., & Martikainen, P. (2018). The case for monitoring life-span inequality. *Science*, *362*(6418), 1002–1004. <https://doi.org/10.1126/science.aau5811>
- Yaari, M. E. (1965). Uncertain lifetime, life insurance, and the theory of the consumer. *The Review of Economic Studies*, *32*(2), 137. <https://doi.org/10.2307/2296058>