

Testing methods to enhance longevity awareness

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Abstract

Many people have only a vague notion of the concept of life expectancy and the longevity risk they face at older ages, which in turn implies that they are likely to undersave for retirement. This paper employs an online experiment to investigate alternative ways to describe both life expectancy and longevity risk, with the goal of assessing whether these can raise peoples' awareness of possible retirement shortfalls. We also evaluate whether providing this information promotes interest in saving activity and demand for longevity insurance products. We find that providing longevity risk information impacts respondents' subjective survival probabilities, while simply describing average life expectancy does not. Yet providing life expectancy or longevity information significantly affects financial decisions, mostly regarding annuitization. Interestingly, we also find that merely prompting people to think about financial decisions changes their perceptions regarding subjective survival probabilities.

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1. Introduction

Understanding how individuals estimate their own survival probabilities and incorporate these estimates when making financial decisions is important for researchers as well as policymakers. This is because people need to develop an idea of how long they will survive in order to make informed decisions about how quickly to draw down their savings in retirement, when to claim their Social Security and pension benefits, and whether to purchase annuities. This is not a trivial task for many people due to low financial literacy, cognitive shortcomings, and behavioral biases.

This paper seeks to understand how individuals estimate and then use subjective survival probabilities when making long-term financial decisions. Some researchers have posited that people may be aware of publicly available survival tables reflecting population averages when they make their survival forecasts. Researchers have also suggested that people may consider their own known characteristics that could affect their survival outcomes (e.g., health, own health habits, and parents' longevity). Indeed, Hamermesh (1985) showed that Americans' estimates of their own survival probabilities were coherent, useful for prediction, and conformed to actuarial tables. McGarry (2020) demonstrated that older peoples' subjective survival probabilities also covary with known risk factors such as smoking status, sex, and health. Moreover, some individuals do devote thought to their potential longevity; for instance, Bloom et al. (2006) reported that respondents who believed they would live longer than average also saved more, using data from the U.S. Health and Retirement Study (HRS). Also using the HRS, Hurd and Smith (2004) documented that those having very low subjective probabilities of survival retired earlier and claimed their Social Security benefits earlier than those expecting to live longer.¹

Nevertheless, other researchers have shown that some people do exhibit systematic biases when predicting longevity. For instance, age plays a role in longevity

prediction; thus, Elder (2013) and Abel et al. (2020) showed that individuals overstate mortality rates at relatively young ages but understate them at older ages. Wu et al. (2015) found that subjective life expectancies differed from life table data by age cohort. Another type of bias is related to over-optimism. For instance, smokers tend to be optimistic about their own life expectancies, as reported by Hurwitz and Sade (forthcoming a, b) and Ayanian and Clearly (1999).

In addition to biases that individuals may have when they think about and evaluate their own longevity, some may avoid thinking about mortality due to what Becker (1973) and others have called 'death denial' (e.g., Dor-Ziderman et al., 2019; Greenberg et al., 1986). In one example, individuals could elect not to receive information related to their longevity such as their HIV status (Lyter et al., 1987). Such behavior could be motivated by anxiety associated with thoughts about death, leading some to repress, or deny, mortality information (Kopczuk et al., 2005). In turn, this behavior can produce an 'Ostrich effect' (Galai and Sade, 2006; Karlsson et al., 2009), where some are willing to pay a price in order to avoid thinking about and gathering information about mortality probabilities when it is unpleasant to think about death (McGarry, 2020).

This subject is important for researchers and policymakers, as well as those concerned about when and how people save for, and then withdraw from, retirement accounts. For instance, if a substantial portion of the population incorrectly estimates life expectancy when making financial decisions or ignores such information when provided, it might be feasible to promote better financial decision making by rendering this information more salient. In particular, individuals could be educated or informed about either life expectancy, or longevity risk, or both, when they make important saving and decumulation decisions.

In what follows, we use a nationally representative online survey to first measure how people assess their own

¹ A similar result using the English Longitudinal Study of Aging (ELSA) was reported by O'Donnell et al. (2008). Salm (2010) showed that consumption and saving choices varied with subjective mortality rates, while Teppa and Lafourcade (2013) confirmed a positive relation between subjective life expectancy and demand for annuities using Dutch data.

life expectancies and longevity risk, and we compare these to sex/age life tables for the general population. Second, we assess different methods to boost peoples' awareness of the risk of living a very long time. Specifically, we use vignettes to test alternative ways to frame survival probabilities in an experimental setting, permitting us to evaluate which presentation appears to enhance people's understanding of their chances of living a very long time. Accordingly, our work can inform insurers and policymakers on how to encourage people to annuitize and make other financial decisions relevant for later life. We find that merely asking participants to think about life cycle financial decisions (regardless of life expectancy and longevity interventions) significantly decreases the gap between subjective and life table survival probabilities. We further show that, while providing average *life expectancy* information has no significant effect on whether they believe they will live a long time (longevity optimism), informing individuals about the tail risk associated with *longevity* does significantly change their estimates. Finally, we show that providing information to participants changes the way people think about long-term financial decisions regarding annuitization.

The remainder of the paper proceeds as follows. Section 2 outlines our methodology and experimental design using a nationally representative sample of American respondents age 35 to 83. In Section 3, we present the data, empirical analysis, and results. In Section 4, we conclude and discuss implications.

2. Experimental design

To evaluate different ways to enhance awareness of longevity risk while controlling for all other related

variables, we use an experimental survey approach. To this end, we developed, fielded, and analyzed a nationally representative survey of Americans using the Prolific internet-based survey platform. This is an online "crowdworking platform" which recruits subjects for economic and social experiments.² It has been judged to be transparent, extremely useable, and highly valuable to researchers due to the sample diversity and the rate of honest answers compared to MTurk, a commonly used platform (Peer et al., 2017; Palan and Schitter, 2018).

Our survey participants are a representative sample of U.S. residents age 35-83 on whom we gathered a variety of demographic data, and to whom we also provided information regarding life expectancy and longevity risk.³ Overall, we conducted 12 manipulations in total: different information provided to the subjects (3 manipulations), the timing of the information provided to the subjects (2 manipulations), and two different economic tasks (2 manipulations). In six manipulations (2,902 subjects), we first elicited peoples' subjective survival probabilities, and then we provided participants with alternative messages regarding life expectancy and longevity risk. We also posed tasks to respondents regarding hypothetical saving behavior and demand for longevity insurance products. In the other six manipulations (1,478 subjects), we first posed the several tasks and the different messages, and only later elicited peoples' subjective survival probabilities.

2.1 Why use vignettes?

The use of vignettes has a long history in the medical field, and they have of late become increasingly popular in social science applications. For instance, van Soest et al. (2011) asked survey respondents

² Prolific (www.prolific.ac) is an online survey platform managed by Oxford University. It includes several demographic variables on participants, which permits researchers to screen for respondents with particular characteristics (e.g., age, sex, country of residence).

³ We conducted several screening tests to ensure the quality of response that we obtained, such as: (1) Recording and evaluating the time that each task was completed; (2) Completion of the survey—we only included in the analysis participants who completed the survey; (3) Survey duration—for only 1% of participants in our study, the survey duration was less than 287 seconds (4.7 minutes); we conducted a robustness test to make sure that this group did not influence our findings. We also included several questions to ensure attention, including: (1) We included a question about subjective survival probabilities to different target ages. We performed the main analysis both on the entire sample and a subsample of individuals who understood that the probability to live to a younger age should be larger than the probability to live to an older age; (2) We also included a question in which we instructed participants to skip it; we control for it in our regression analysis. We further implemented several validations within the survey for some of the responses (for instance, to alert that percentages should be higher than 0 and less than 100).

to provide answers regarding health and related questions; thereafter, the same respondents were presented with short written stories, or vignettes, about hypothetical persons confronting the same or similar questions. Survey respondents are also sometimes randomly assigned alternative messages about the health or related decision to determine what influences respondent decision making. Finally, survey respondents are often asked to provide advice to a hypothetical vignette person facing decisions about health, saving, or other economic decisions. The ability to randomize treatments and compare vignette responses within and across respondents allows the researcher to undertake a detailed analysis of factors associated with the difference between respondents' own responses versus their recommendations to the vignette individual.

Our approach builds on Brown et al. (2017, 2019) and Samek, Kapteyn, and Gray (2019), who displayed vignettes to survey participants by randomly assigning participants to different messages about

the consequences of longevity risk.⁴ That research suggested that the consequence messages did enhance peoples' understanding of annuities and Social Security claiming. In the present case, the use of vignettes in our experimental setting allows us to control variation that might otherwise impart noise to the analysis; for instance, we can control on the respondent's sociodemographic attributes, as well as the advice offered to the vignette person.

For our experiments, we created two vignettes. The first was about a single man (woman) age 60, without children, needing to decide how to withdraw his (her) retirement savings. The second was about a single man (woman) age 40, without children, deciding whether to increase his (her) retirement savings. Some of our survey participants received a 'baseline' version of the vignettes, while others received additional information about life expectancy and longevity. Specifically, the baseline **annuitization vignette** was as follows:

Next we will describe a financial decision facing Mr. Smith and then we will ask you what you would recommend to this person: Mr. Smith is a single, 60-year-old man with no children. He will retire and claim his Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits. Imagine that Mr. Smith asks you about how to manage his \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

1. Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
2. Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of his life.

Just as before, Mr. Smith is still a single, 60-year-old man with no children who will retire and claim Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits. But now he has a third option that he can choose from. Please indicate which one of the three options you would recommend:

1. Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
2. Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of his life.
3. Withdraw a lump sum of \$50,000 at retirement, and receive a monthly sum of \$250 (equal to \$3,000) for the rest of his life.

⁴ For example, in the control group, respondents were told that the vignette person will "almost certainly be alive at age 75 but almost certainly will not live beyond age 85." By contrast, in the *Complexity: Wide age range* treatment, respondents were told that the vignette person "has an 80% chance of being alive at age 70, a 50% chance of being alive at age 80, a 20% chance of being alive at age 90, and a 10% chance of being alive at age 95."

The baseline **savings vignette** was as follows:

Mr. Smith is a single, 40-year-old man with no children. He will retire and claim his Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits.

Please indicate which one of these options you would recommend:

1. Maintain his current saving level.
2. Slightly increase his long-term savings by spending less.
3. Significantly increase his long-term savings by spending less.
4. Don't know.

Some participants also received the following **additional information** about **life expectancy** (average survival probabilities):

Please note that American men, 65 years old, will survive 18.1 more years on average.

This informational intervention aimed to draw attention to the concept of life expectancy within a vignette focused on a financial decision. Specifically, our conjecture was that if people were capable of taking life expectancy information into consideration but were reluctant to do so due to avoid thinking about mortality, providing them with the information at the time they make different relevant decisions might lead to better financial outcomes (Bloom et al., 2006; Hurd and Smith, 2004).

In this study, we are concerned with long-term savings and withdrawal decisions, so the second informational intervention was structured to provide longevity information. Specifically, our aim was to draw attention to the possibility of living to a very old age and to the financial risk from doing so. In particular, these participants received the following additional information regarding **longevity risk**:

Please note that 22.3% of American men, 65 years old, will survive to the age of 90 or more.

2.2 Experimental design

Table 1 presents the structure of our Prolific experiment. Specifically, we randomized each participant into one of two vignettes using the Qualtrics randomizer;⁵ half of the participants were exposed to the **annuitization condition** and the other half to the **savings condition**, both described above. Moreover, all participants in both treatments were exposed to *either* the life expectancy information, the longevity information, or neither (control group). To test whether the informational intervention influenced peoples' subjective survival probabilities,

2,902 participants were asked about their survival probabilities before they saw the vignette, while 1,478 first saw the vignette and then received the additional information. We further asked each respondent several demographic questions, some financial literacy questions, a few "brain teasers" to judge their numeracy skills, time and risk preference questions, questions about their health, and questions regarding COVID-19. (The full questionnaire appears in Appendix 1.)

Table 1. Experimental design: Number of participants by treatment group and vignette presentation

	Life expectancy	Longevity	Control	Total
Savings	725	728	730	2,183
Annuitization	734	731	723	2,188
Total	1,459	1,459	1,453	4,371

Note: Participants were randomly allocated to a savings or an annuitization vignette. In each, respondents received either *life expectancy information* (condition 1), *longevity information* (condition 2), or no additional information (Control); see text.

3. Data and results

In total, 4,380 U.S. residents age 35-83 participated in our Prolific study. Respondents' mean age was 49.2, and 43.5% were male. Regarding education, 26% had some college, and 36% had a bachelor's degree. Over half (57.8%) were married, 22.53% never married, 2.5% widowed, 14.9% divorced, and 2.2% separated.⁶ Of the respondents, 85.1% believed that their health was good, very good, or excellent; on average, participants mentioned having visited the doctor 2.9 times during the last year. Average household monthly income was US\$12,600 (about US\$151,200 annually).⁷

3.1 Subjective vs. objective life expectancy

As our aim is to study methods to enhance longevity awareness, we first build on methodology presented in past studies to compare subjective versus objective survival probabilities obtained from Social Security Administration (SSA) life tables (e.g., Hurd et al., 1998, Gan et al., 2005, Ludwid and Zimper, 2013). To do so, we first measure what people know and how accurately they estimate their life expectancy by asking two questions measuring longevity perceptions. First, we measure longevity perceptions by asking participants the following question:⁸

⁵ Qualtrics is a popular survey platform widely used to conduct online experiments.

⁶ Our sample is similar to the marital status of the U.S. population. For instance, in the 40-44 age group, 60% of participants are married (66% according to 2019 U.S. Census Bureau data), 0.2% widowed (comparing to 0.8%), 10.2% divorced (comparing to 10.9%), 2.33% separated (comparing to 2.8%), and 27.43% never married (comparing to 19.5%).

⁷ In our sample, median monthly self-reported income was US\$4,700, which in annualized terms is about US\$56,400 (close to median annual household income of US\$61,937 in U.S. Census Bureau, 2018).

⁸ We used cohort life tables from the U.S. Social Security Administration to calculate the actual probability of living to each target age (by age, sex, and year of birth).

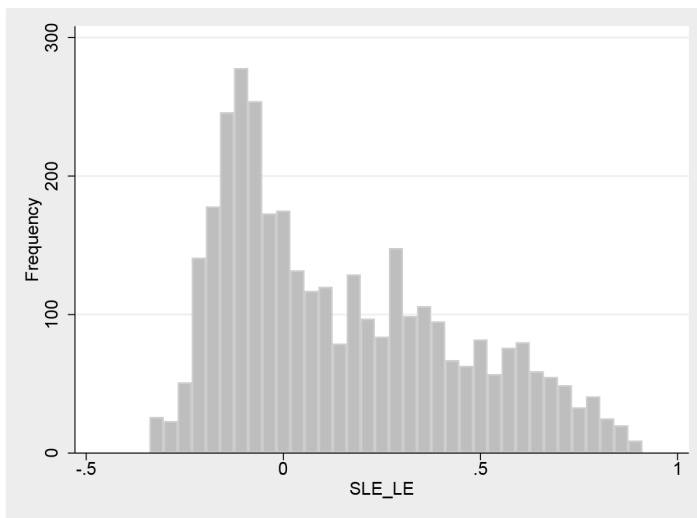
What is the percent chance [0-100] that you think you will live at least $\{e://Field/AgeDeath\}$ more years?

Here, the target age varied by the respondent's sex and age. Second, we also asked participants about their subjective probabilities of living to an age five years younger than in the question above. We also identified the group that we call *consistent participants* as those who correctly reported their probability of living to age (X-5) as higher than their probability of living to age X.

Our two main dependent variables of interest in this first analysis are (1) *SLE-LE*, the difference between the respondent's subjective versus life table survival probability; and (2) *Optimistic*, a variable taking the value of one if the participant anticipated a probability of living to the target age that exceeded the respective probability

in U.S. life tables.⁹ In our data, the mean difference between subjects' subjective and life table survival probabilities is 17% (median 10%) across all participants. If we include only the *consistent participants*, the gap is smaller (mean 14.5%, median 8%). Furthermore, the distribution of SLE-LE is skewed to the right, suggesting that our sample tends to be optimistic. These results are consistent with past studies suggesting that people tend to overestimate their survival chances at much older ages (Ludwig et al., 2013; Wu et al., 2015; Heimer et al., 2017; O'Dea and Sturrock, 2020). Figure 1 depicts the distribution of differences between subjective and objective probabilities (a) for all participants, and (b) for consistent participants as defined above.

Figure 1. Distribution of difference in subjective minus life table probability (SLE-LE) of living to age X



Note: Sample excludes participants with non-coherent life expectancy estimations, although results are similar if they are included.

⁹ Puri and Robinson (2007) were among the earliest to relate the difference between self-reported life expectancy survey responses and statistical mortality tables, to household economic behaviors including work, marriage, saving, and investment decisions. Huffman et al. (2017) and Maurer & Mitchell (2020) have also employed this variable in modeling financial decisions.

Next, we explore the characteristics of respondents who over- or underestimated their survival probabilities using the two variables *Optimistic* and *SLE-LE*. To this end, we present in Table 2 logistic regression estimates where the first outcome variable is *Optimistic*, and the second outcome is *SLE-LE*. The multivariate model we estimate is as follows:

$$(1) \text{ DepVar}_i = \alpha + \beta_1 \text{Vignette first}_i + \beta_2 \text{age}_i + \beta_3 \text{male} + \beta_4 \text{Coll} + \beta_5 \text{Marital Status} + \beta_6 \text{Good Health} + \beta_7 \text{FinLit} + \beta_8 \text{Numeracy}_i + \beta_9 \text{Present Pref} + \beta_{10} \text{Income}_i + \beta_{11} \# \text{ in HH} + \beta_{12} \text{SurveyAttn} + \beta_{13} \text{Covid}.$$

Here, **Vignette first** indicates that the vignette was presented prior to asking the respondent the subjective survival probability questions.¹⁰ *Male* is equal to 1 if respondent was male (else 0); *Coll* is equal to 1 if the respondent had completed at least college (else 0); and *Good health* is equal to 1 if self-reported health was good/very good/excellent (else 0).¹¹ *FinLit* refers to the

total number of questions the respondent answered correctly based on Lusardi and Mitchell's (2008, 2011, 2014) Big Three questions.¹² We measure *Numeracy* as the sum of correct answers to a three-item numeracy measure derived from Lipkus et al. (2001).¹³ *Present preferences* are calculated using four questions about preferences for winning versus losing various sums of money immediately versus a year later taken from Khwaja et al. (2007) (i.e., win \$20 vs. \$30, lose \$20 vs. \$30, win \$1,000 vs. \$1,500, lose \$1,000 vs. \$1,500). Individuals who reported they would rather win less money now and lose more money later were considered to have higher present preferences and received higher scores on a 0–4 scale.¹⁴ To verify that participants were paying *attention* to the survey, we included a request that they skip one of the questions.¹⁵ Finally, since we fielded this study in February-March 2020 during the early part of the COVID-19 outbreak, we also included a question asking people's percentage chances of facing negative financial consequences from the outbreak.¹⁶

¹⁰ 33% of participants saw the vignette before the subjective survival questions.

¹¹ 49% are male; 60% of participants completed at least college education; and good health was reported by 85% of participants.

¹² Participants were asked the following financial literacy questions: (1) Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: More than \$102; Exactly \$102; Less than \$102; Don't know; Refuse; (2) Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account, would you be able to buy: More than today; Exactly the same as today; Less than today; Don't know; Refuse; (3) Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund." True; False; Don't know; Refuse. On average, our respondents answered 2.4 questions correctly.

¹³ Participants answered three questions pertaining to basic probability calculations ((1) Imagine that we rolled a fair six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die will come up even (2, 4, or 6)?; (2) Imagine that we rolled a five-sided die 50 times. On average, out of these 50 throws, how many times will this five-sided die show an odd number (1, 3, or 5)? (3) In BIG BUCK LOTTERY, the chance of winning a \$10 prize is 1%. What is your best guess about how many people would win a \$10 prize if 1,000 people each bought a single ticket from BIG BUCKS?). On average, they correctly answered 1.8 questions.

¹⁴ The average present preferences score was 1.77.

¹⁵ 57% skipped the question as requested; we control for this in our regressions.

¹⁶ Specifically, we asked, "The coronavirus may cause economic challenges for some people regardless of whether they are actually infected. What is the percent chance you will run out of money because of the coronavirus in the next three months?" On average, our respondents believe that there was a 20% chance they will run out of money.

Table 2. Understanding self-reported life expectancy: Logit (average marginal effects) and linear models

	Optimistic (Logit)	SLE-LE (OLS)
Vignette first	-0.056*** (0.017)	-0.051*** (0.011)
Age	-0.004*** (0.001)	-0.003*** (0.001)
Male	0.007 (0.017)	-0.030*** (0.011)
Coll	0.052*** (0.018)	0.028** (0.011)
Married	0.037 (0.024)	0.020 (0.015)
Widowed	0.090 (0.055)	0.057 (0.034)
Never Married	-0.002 (0.027)	-0.005 (0.017)
Good Health	0.258*** (0.022)	0.176*** (0.015)
FinLit	-0.023 (0.012)	-0.021*** (0.008)
Numeracy	-0.037*** (0.009)	-0.025*** (0.006)
Present Prefs	0.001 (0.006)	0.002 (0.004)
Income/10000	0.003 (0.003)	0.001 (0.002)
# in household	0.008 (0.007)	0.005 (0.004)
SurveyAttention	0.036** (0.016)	0.015 (0.010)
Covid	0.001 (0.000)	0.000 (0.000)
Constant		-0.051*** (0.011)
Observations	3378	3377
Pseudo R-sq/R-sq	0.053	0.085
Dep. Var. Mean	0.61	0.171
Dep. Var. St. Dev.	0.488	0.303

Note: Optimistic is equal to 1 if the respondent's self-reported life expectancy exceeded the respondent's objective life expectancy from the relevant age/sex life table. SEL-LE measures the difference between each respondent's subjective versus objective survival probabilities. Explanatory variables include an indicator of having received the vignette before the survival probability questions, treatment condition (life expectancy vs. longevity), age, male, college +, marital status dummy variables, self-reported health good/very good/excellent, financial literacy score, numeracy score, present preference score, income, number of people living in household, attention to survey, COVID financial vulnerability. Standard errors in parentheses. (N = 3,378). *** p < 0.01. ** p < 0.05

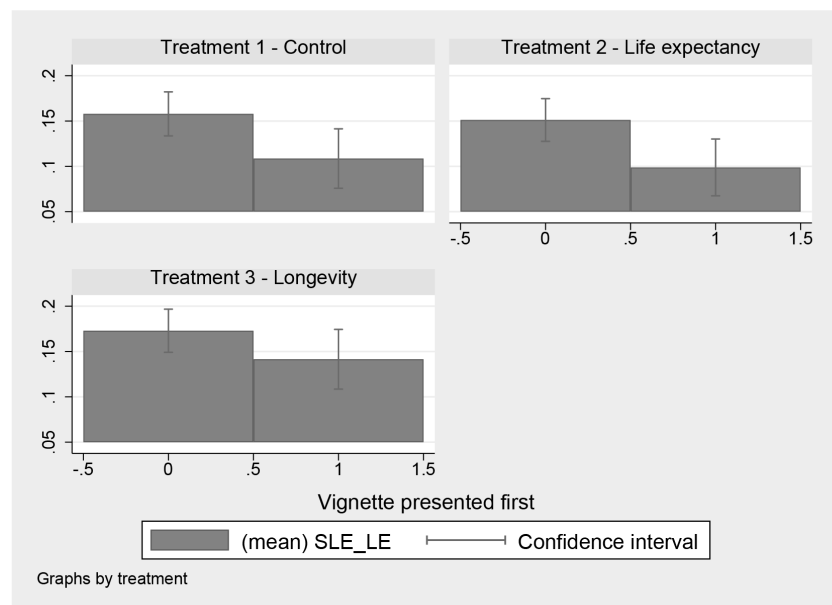
3.2 Impact of the vignette

The first row of Table 2 confirms that respondents who saw the vignette *before* being asked about survival probabilities were less likely to be optimistic about their anticipated life expectancy. In fact, seeing the vignette first decreased respondents' optimism gap by about eight percentage points. This suggests that simply prompting people to think about a financial decision related to longevity risk can narrow over-optimism regarding longevity expectations. This is an encouraging result, as it may imply that reducing the over-optimism gap documented in the literature can be mitigated when people must make important financial decisions based on longevity expectations.

As discussed above, we also implemented three treatments in the vignettes: (1) A *control condition* where

no further information was provided; (2) A *life expectancy condition* where participants received information on the life expectancy of either a 65-year-old male or female; and (3) A *longevity condition* where participants were told of the probability of survival to age 90 of either a 65-year-old male or female. Figure 2 shows that, regardless of the intervention, mean SLE-LE was lower when the vignette was seen before people had to estimate their survival probabilities (left bar), versus afterwards (right bar).¹⁷ The fact that this result is also true for the control group (condition 1) suggests that it is not attributable to our providing life expectancy information (condition 2) or longevity information (condition 3). Rather, it implies that prompting people to think about financial decision *per se* reduces optimism regarding life expectancy.

Figure 2. Mean difference between respondents' subjective minus life table probability (SLE-LE) of living to age X: By treatment and question order



Note: The right (left) that the vignette was seen before (after) people had to estimate their survival probabilities.

Half of the participants were exposed to the annuitization condition and the other half to the saving condition (see text). All participants were exposed to the life expectancy information, the longevity information, or neither (control group). Sample excludes participants with non-coherent life expectancy estimations.

¹⁷ This figure reports only on consistent participants (as defined above); results for all participants are similar.

We also find that older persons were less optimistic, consistent with prior research (e.g., Elder, 2013). By contrast, men, the college-educated, and those in good health were significantly more likely to expect to outlive the life tables. Interestingly, people who answered more of the financial literacy and numeracy questions were also less likely to overestimate their longevity.¹⁸

3.3 Impact of additional information

To estimate the effect of the different frames on participants' subjective survival probabilities, we include an indicator for having received either the life expectancy or the longevity information condition:

$$(2) DepVar_i = \alpha + \beta_1 Vignette\ first_i + \beta_2 \mathbf{life\ expectancy\ intervention}_i + \beta_3 \mathbf{longevity\ intervention}_i + \beta_4 age_i + \beta_5 male + \beta_6 Coll + \beta_7 Marital\ Status + \beta_8 Good\ Health + \beta_9 FinLit + \beta_{10} Numeracy_i + \beta_{11} Present\ Pref + \beta_{12} Income_i + \beta_{13} \# in\ HH + \beta_{14} SurveyAttn + \beta_{15} Covid.$$

Table 3 shows that being exposed to the vignette did narrow respondent optimism regarding longevity, as before. Nevertheless, the information provided about either life expectancy or longevity risk had no significant effect on peoples' subjective survival probabilities. One reason is that people do have some understanding about survival information (Hamermesh, 1985), so the information we provided may have already been known to them. Second, some people may have based their estimates on private information about their own personal health situations, so that providing them with information on the general population was not seen as informative. Third, some individuals may find it challenging to grasp probability-related information.

¹⁸ Brown et al. (2019) similarly reported that more financially literate individuals were more likely to correctly value life annuities.

Table 3. Framing life expectancy: Logit (average marginal effects) and linear models

	Optimistic	SLE-LE (OLS)	Optimistic: consistent	SLE-LE: (OLS) consistent
Vignette first	-0.055*** (0.017)	-0.051*** (0.011)	-0.071*** (0.022)	-0.052*** (0.012)
Life expec. grp	0.022 (0.020)	0.008 (0.012)	0.004 (0.025)	0.001 (0.014)
Longevity grp	0.036 (0.020)	0.020 (0.012)	0.054** (0.025)	0.030** (0.014)
Age	-0.004*** (0.001)	-0.003*** (0.001)	-0.001 (0.001)	-0.000 (0.001)
Male	0.008 (0.017)	-0.030*** (0.011)	0.024 (0.021)	-0.025** (0.012)
Coll	0.052*** (0.018)	0.028** (0.011)	0.060*** (0.022)	0.037*** (0.013)
Married	0.036 (0.024)	0.019 (0.015)	0.036 (0.031)	0.018 (0.017)
Widowed	0.088 (0.055)	0.057 (0.034)	0.100 (0.071)	0.028 (0.040)
Never Married	-0.003 (0.027)	-0.006 (0.017)	-0.025 (0.035)	-0.014 (0.020)
Good Health	0.259*** (0.022)	0.176*** (0.015)	0.267*** (0.031)	0.163*** (0.018)
FinLit	-0.023 (0.012)	-0.020*** (0.008)	-0.023 (0.018)	-0.017 (0.010)
Numeracy	-0.037*** (0.009)	-0.025*** (0.006)	-0.040*** (0.012)	-0.023*** (0.007)
Present Prefs	0.001 (0.006)	0.003 (0.004)	0.004 (0.008)	0.006 (0.004)
Income/10000	0.003 (0.003)	0.001 (0.002)	0.017*** (0.005)	0.006** (0.002)
# in household	0.009 (0.007)	0.006 (0.004)	-0.001 (0.008)	0.002 (0.005)
SurveyAttention	0.037** (0.016)	0.016 (0.010)	0.016 (0.021)	0.002 (0.012)
Covid	0.001 (0.000)	0.000 (0.000)	0.001** (0.000)	0.000 (0.000)
Constant		0.246*** (0.045)		0.057 (0.053)
Observations	3378	3377	2161	2161
Pseudo R-sq/R-sq	0.054	0.086	0.053	0.078
Dep. Var. Mean	0.61	0.171	0.6	0.143
Dep. Var. St. Dev.	0.488	0.303	0.490	0.276

Note: Optimistic is equal to 1 if the respondent's self-reported life expectancy exceeded the respondent's objective life expectancy from the relevant age/sex life table. SEL-LE measures the difference between each respondent's subjective versus objective survival probabilities. Explanatory variables include an indicator of having received the vignette before the survival probability questions, treatment condition (life expectancy vs. longevity), age, male, college +, marital status dummy variables, self-reported health good/very good/excellent, financial literacy score, numeracy score, present preference score, income, number of people living in household, attention to survey, COVID financial vulnerability. Results for consistent participants (those who understood the survival probability questions) appear in columns (3)-(4). (N = 3,378; Nconsistent=2,161). Standard errors in parentheses. *** p < 0.01. ** p < 0.05

The final two columns of Table 3 include only participants whom we defined as “consistent;” that is, they correctly reported that their chance of living to a younger age was higher than to an older age. Among this group, receiving the longevity treatment significantly increased the optimism gap between subjective and objective survival probabilities. Specifically, those in the group receiving the longevity information had a significantly higher three percentage point gap between their subjective and objective survival probabilities, or 21% (=0.3/0.143). Accordingly, though some people may have been familiar with the concept of longevity, those who understand probabilities can still benefit from receiving additional information about the tail risk. In other words, merely providing information about the probability of living to a very old age does influence peoples’ subjective survival probabilities, suggesting that in the normal course of affairs, people may give little thought to these facts.

3.4 Impact of information on financial decision making

Next, we evaluate whether alternative forms of information about longevity risks influence financial outcomes. To this end, we presented participants with either the savings or annuitization vignette. The savings vignette introduced participants to a 40-year-old single person with no children, needing to decide about his or her long-term savings. There is growing evidence that individuals perceive themselves as saving too little compared with what they should (Choi et al., 2002,

and Benartzi and Thaler, 2007, among others). Our vignette results indicate that they also think about it when it comes to providing financial recommendations to others. In total, only 14.6% of participants recommended that the vignette individual maintain his/her saving level, while 30.69% recommended slight increases, and 52.27% proposed significant increases in savings (2.43% said they did not know).

Table 4 presents the results of a logistic regression examining which participants receiving the savings vignette recommended that the vignette individual should “significantly increase long-term savings by spending less.” Below we discuss participants’ propensity to recommend annuitizing (versus choosing a lump-sum option at retirement) after seeing the annuitization vignette. Our multivariate model was as follows:

$$\begin{aligned}
 (3) \text{ Significantly increase savings}_i &= \alpha + \beta_1 \text{Vignette first}_i + \beta_2 \text{life expectancy intervention}_i \\
 &+ \beta_3 \text{longevity intervention}_i + \beta_4 \text{age}_i + \beta_5 \text{male} + \beta_6 \text{Coll} \\
 &+ \beta_7 \text{Marital Status} + \beta_8 \text{Good Health} + \beta_9 \text{FinLit} + \\
 &\beta_{10} \text{Numeracy}_i \\
 &+ \beta_{11} \text{Present Pref} + \beta_{12} \text{Income}_i + \beta_{13} \# \text{ in HH} + \\
 &\beta_{14} \text{SurveyAttn} \\
 &+ \beta_{15} \text{Covid}
 \end{aligned}$$

Table 4. Framing life expectancy and interest in savings: Logit models

	Logit Average Marginal Effects	Logit Average Marginal Effects: Pessimistic
Vignette first	-0.005 (0.023)	0.038 (0.040)
Life exp. grp	-0.025 (0.027)	0.018 (0.044)
Longevity grp	-0.015 (0.027)	-0.006 (0.045)
Age	0.001 (0.001)	0.002 (0.002)
Male	-0.045** (0.023)	-0.041 (0.038)
Coll	0.087*** (0.023)	0.087** (0.038)
Married	0.033 (0.032)	0.073 (0.051)
Widowed	0.048 (0.076)	0.117 (0.113)
Never Married	-0.014 (0.036)	0.058 (0.056)
Good Health	0.014 (0.032)	-0.008 (0.044)
FinLit	0.129*** (0.016)	0.140*** (0.027)
Numeracy	0.016 (0.012)	-0.005 (0.020)
Present Prefs	-0.036*** (0.008)	-0.037*** (0.014)
Income/10000	-0.003 (0.004)	-0.014 (0.008)
# in household	-0.016 (0.010)	0.005 (0.016)
Survey Attention	-0.001 (0.022)	0.038 (0.037)
Covid	-0.002*** (0.000)	-0.001** (0.001)
Observations	1,848	670
Pseudo R-sq/R-sq	0.097	0.092
Dep. Var. Mean	0.536	0.560
Dep. Var. St. Dev.	0.499	0.497

Note: The dependent variable is an indicator variable for recommending to significantly increase savings. Explanatory variables include an indicator of having received the vignette before the survival probability questions, treatment condition (life expectancy vs. longevity), age, male, college +, marital status dummy variables, self-reported health good/very good/excellent, financial literacy score, numeracy score, present preference score, income, number of people living in household, attention to survey, COVID financial vulnerability. Pessimistic group expected to live less long than their age/sex life table probability. Standard errors in parentheses. *** p < 0.01. ** p < 0.05

We find that it does not matter for the savings decisions whether people saw the vignettes before or after we asked about their subjective life expectancies. We also show that the informational intervention had no significant effect on savings recommendation.

Other results in Table 4 are as expected. That is, the better educated are more likely to advise saving more (Solmon, 1975), as is financial literacy (Lusardi, 2008; Lusardi & Mitchell, 2014; Boisclair et al., 2017). Respondents who are present biased tend not to advise saving more, similar to others' findings on how advisors' preferences influence the advice they give (Laibson, 1997, 1998; Linnainmaa et al., forthcoming). Interestingly, men were significantly less likely to recommend increasing savings, as were those who believed that the COVID-19 outbreak would cause them severe financial damage. Results were similar for a subgroup of participants who were pessimistic regarding their survival chances, despite the possibility that information regarding life expectancy and longevity might be expected to affect them more.

Table 5 presents results from a logistic regression examining participants' propensity to recommend annuitizing (versus choosing a lump-sum option at retirement) after seeing the annuitization vignette. First, we note that it did not matter whether we asked about subjective life expectancy before or after the vignettes, since respondents' recommendations about annuitization were unaffected. Second, in the full sample, giving people the life expectancy information did have a positive significant effect, while the longevity intervention did not increase annuity advisement preferences. Holding other variables at their means, those receiving life expectancy information had a 6.7% ($=0.05/0.744$) higher probability of recommending annuitization.

Table 5. Framing longevity and recommending annuitization: Logit results

	Logit Average Marginal Effects	Marginal effects for seeing vignette first (=1), longevity treatment (=1), life expectancy treatment (=0)	Logit Average Marginal Effects: Pessimistic	Logit Average Marginal Effects: Pessimistic & consistent	Logit Average Marginal Effects: Optimistic
Vignette first	0.000 (0.022)	0.000 (0.023)	0.009 (0.036)	0.047 (0.045)	-0.019 (0.029)
Life exp. grp	0.051** (0.025)	0.053** (0.026)	0.118*** (0.040)	0.150*** (0.050)	-0.018 (0.033)
Longevity grp	0.012 (0.024)	0.012 (0.025)	0.090** (0.039)	0.084 (0.049)	-0.031 (0.033)
Age	0.002 (0.001)	0.002 (0.001)	0.003 (0.002)	0.003 (0.002)	0.004** (0.002)
Male	-0.039 (0.021)	-0.041 (0.023)	0.018 (0.036)	-0.021 (0.044)	-0.058** (0.029)
Coll	0.025 (0.022)	0.026 (0.023)	0.013 (0.036)	0.050 (0.044)	0.041 (0.030)
Married	-0.034 (0.032)	-0.035 (0.033)	-0.111** (0.053)	-0.076 (0.070)	-0.005 (0.043)
Widowed	-0.072 (0.066)	-0.076 (0.070)	-0.193 (0.112)	-0.175 (0.150)	-0.045 (0.089)
Never Married	0.009 (0.036)	0.009 (0.037)	-0.052 (0.061)	0.030 (0.083)	0.034 (0.048)
Good Health	-0.028 (0.029)	-0.030 (0.031)	0.013 (0.040)	0.056 (0.054)	-0.097 (0.051)
FinLit	0.057*** (0.014)	0.059*** (0.015)	0.063*** (0.024)	0.039 (0.036)	0.054*** (0.018)
Numeracy	-0.005 (0.011)	-0.006 (0.012)	0.002 (0.019)	0.010 (0.025)	-0.006 (0.015)
Present Prefs	-0.028*** (0.007)	-0.029*** (0.008)	-0.020 (0.013)	-0.020 (0.016)	-0.031*** (0.010)
Income/10000	-0.006 (0.003)	-0.006 (0.004)	0.009 (0.008)	0.009 (0.014)	-0.012*** (0.004)
# in household	0.001 (0.008)	0.001 (0.008)	0.000 (0.012)	-0.007 (0.013)	0.004 (0.010)
Survey Attention	0.041** (0.020)	0.043** (0.021)	0.067** (0.033)	0.047 (0.042)	0.014 (0.027)
Covid	-0.001** (0.000)	-0.001** (0.000)	0.000 (0.001)	-0.000 (0.001)	-0.001*** (0.000)
Observations	1,833	1,833	645	399	1,017
Pseudo R-sq/R-sq	0.041	0.041	0.053	0.066	0.061
Dep. Var. Mean	0.744	0.744	0.757	0.762	0.740
Dep. Var. St. Dev.	0.436	0.436	0.429	0.426	0.439

Note: The dependent variable is an indicator variable for recommending to annuitize. Explanatory variables include an indicator of having received the vignette before the survival probability questions, treatment condition (life expectancy vs. longevity), age, male, college +, marital status dummy variables, self-reported health good/very good/excellent, financial literacy score, numeracy score, present preference score, income, number of people living in household, attention to survey, COVID financial vulnerability (N=1,833). Results for a subgroup pessimistic appear in column (3) (N=645); Pessimistic & consistent in column (4) (N=399); and Optimistic in column (5) (N=1,017). See also Table 4. Standard errors in parentheses. *** p < 0.01. ** p < 0.05

Next, we split the sample into participants who were pessimistic regarding their life expectancy (subjective survival probabilities below those in the life tables), for whom our intervention could be the most influential (Columns 3-4), and participants who were optimistic regarding their survival chances.¹⁹ Interestingly, the pessimistic group was most strongly affected by our intervention. Specifically, holding other variables at their means, pessimistic participants receiving life expectancy information had a 15.5% ($=0.118/0.757$) higher probability of recommending annuitization, while pessimistic participants receiving longevity information had an 11.8% ($=0.09/0.757$) higher probability of recommending annuitization. Column 4 shows that this result regarding life expectancy continues to hold when we exclude inconsistent participants. While one might think that such policy could harm those who are optimistic to begin with, Column 6 reassuringly shows that the information provided to optimistic individuals did not decrease their annuitization recommendations.

We also see that more financially literate respondents were more interested in recommending annuities, as were people who devoted closer attention to the survey. By contrast, people with a strong preference for present over future consumption were less likely to recommend annuitization. Finally, respondents who feared negative financial outcomes from COVID-19 were unlikely to favor annuity recommendations (regardless of their optimism about life expectancy).

4. Conclusions and implications

Good consumer financial decision making requires people to have a clear idea of their life expectancy and longevity risk so as to save, invest, and decumulate thoughtfully and avoid running out of money in old age. Nevertheless, there are still many open questions regarding how much people understand about these important estimates, and whether providing information about the facts can make a difference in the decision-making process. Additionally, given the asymmetry of the

longevity distribution, little is known about what type of information should be provided regarding life expectancy or the size of the longevity tail. This paper has employed an online survey and vignettes to determine not only whether individuals correctly estimate their own survival probabilities, but also whether more information about life expectancy and the longevity tail can improve these estimates. We also show how respondents incorporate these estimates into advice regarding financial decisions.

As expected, age, sex, health status, and financial literacy prove to be correlated with subjective survival probabilities. More uniquely, we show that providing people information about their likely longevity *does* change peoples' perceptions, while giving them life expectancy information has no effect. This suggests that individuals are already aware of their mean survival expectation, but they are less informed about the tails of the survival distribution. We also provide novel evidence that merely getting people to think about a long-term financial decision can alter their optimism regarding survival probabilities. Accordingly, we conclude that research on peoples' longevity perceptions should be linked to making an economic decision. We also document that providing pessimistic people with either life expectancy or longevity information significantly influences their financial recommendations regarding annuitization.

Our work contributes to the academic literature about life expectancy, saving, annuitization decisions, and experimental household finance. Moreover, our results can also inform insurers and policymakers on how to encourage people to make better financial decisions relevant for later life. Finally, we have found an indication that peoples' perceptions of survival probabilities are being altered by the COVID-19 pandemic, and in turn this is decreasing their interest in saving and annuitizing. We leave for further research an investigation of whether perceptions and behavior revert when the pandemic is over.

¹⁹ Participants who provide no subjective survival probabilities were excluded from this analysis.

References

- Aberl, M., Byker, T., & Carpenter, J. (2020). Socially optimal mistakes? Debiasing COVID-19 mortality risk perceptions and prosocial behavior. IZA Working paper No. 13560.
- Ayanian, J.Z., & Cleary, P.D. (1999). Perceived risks of heart disease and cancer among cigarette smokers. *JAMA* 281(11): 1019-1021.
- Becker, E. (1973). *The Denial of Death*. New York: Free Press.
- Benartzi, S. & R. H. Thaler, (2007). "Heuristics and Biases in Retirement Savings Behavior." *Journal of Economic Perspectives* 21(3): 81–104.
- Bloom, D. E., Canning, D., Moore, M., & Song, Y. (2007). The effect of subjective survival probabilities on retirement and wealth in the United States. In Clark, R., Ogawa, N., & Mason, A. (eds.), *Population Aging, Intergenerational Transfers and the Macroeconomy*. Cheltenham, U.K., and Northampton, MA: Elgar, pp. 67-100.
- Boisclair, D., Lusardi, A., & Michaud, P. C. (2017). Financial literacy and retirement planning in Canada. *Journal of Pension Economics & Finance* 16: 277-296.
- Brown, J.R., Kapteyn, A., Luttmer, E.F.P., & Mitchell, O.S. (2017). Cognitive constraints on valuing annuities. *Journal of the European Economic Association* 15, (2): 429-462.
- Brown, J. R., Kapteyn, A., Luttmer, E. F., Mitchell, O. S., & Samek, A. (2019). Behavioral impediments to valuing annuities: complexity and choice bracketing. *Review of Economics and Statistics*, 1-45.
- Choi, James J., David Laibson, Brigitte C. Madrian, & Andrew Metrick. 2002. Defined contribution pensions: Plan rules, participant decisions, and the path of least resistance. In Poterba, J. (ed.), *Tax Policy and the Economy*. Vol. 16, Cambridge, Mass.: MIT Press, pp. 67–113.
- Dor-Ziderman, Y., Lutz, A., & Goldstein, A. (2019). Prediction-based neural mechanisms for shielding the self from existential threat. *NeuroImage*, 202: 116080.
- Elder, T. E. (2013). "The predictive validity of subjective mortality expectations: Evidence from the health and retirement study." *Demography* 50(2): 569-589.
- Foerster, S., Linnainmaa, J. T., Melzer, B. T., & Previtro, A. (2017). Retail financial advice: Does one size fit all? *Journal of Finance* 72 (4): 1441–1482.
- Galai, D., & Sade, O. (2006). The "ostrich effect" and the relationship between the liquidity and the yields of financial assets. *The Journal of Business*, 79(5): 2741-2759.
- Gan, L., Hurd, M. D., & McFadden, D. L. (2005). Individual subjective survival curves. In Wise, E. (ed)., *Analyses in the Economics of Aging*. University of Chicago Press: 377-412.
- Greenberg, J., Pyszczynski, T., & Solomon, S. (1986). The causes and consequences of a need for self-esteem: A terror management theory. In *Public self and private self*. New York: Springer, 189-212.
- Hamermesh, D. S. (1985). "Expectations, Life Expectancy, and Economic Behavior." *The Quarterly Journal of Economics* 100(2): 389-408.
- Heimer, R. Z., Myrseth, K. O. R., & Schoenle, R. S. (2019). YOLO: Mortality beliefs and household finance puzzles. *The Journal of Finance*, 74(6): 2957-2996.

- Huffman, D., Mitchell, O.S., & Maurer, R. (2017). Time discounting and economic decision making among the elderly. *Journal of the Economics of Aging*, 14(19): 100-121.
- Hurd, M. D., McFadden, D. L., & Gan, L. (1998). Subjective survival curves and life cycle behavior. In Wise, D. (ed.), *Inquiries in the Economics of Aging*. Chicago: University of Chicago Press, 259-309.
- Hurd, M.D., Smith, J.P. & Zissimopoulos, J.M. (2004). The effects of subjective survival on retirement and Social Security claiming. *Journal of Applied Econometrics* 19(6): 761-775.
- Hurwitz, A., & Sade, O. (forthcoming a). An investigation of time preferences, life expectancy, and annuity versus lump-sum choices: Can smoking harm long-term saving decisions? *Journal of Economic Behavior & Organization*.
- Hurwitz, A., & Sade, O. (forthcoming b). Smokers' life expectancy and annuitization decisions. In Itzhak, Venezia. *Behavioral Finance: A Novel Approach*. 349-364. World Scientific Publishers, London
- Karlsson, N., Loewenstein, G., & Seppi, D. (2009). The ostrich effect: Selective attention to information. *Journal of Risk and Uncertainty*, 38(2): 95-115.
- Khwaja, A., Silverman, D., & Sloan, F. (2007). Time preference, time discounting, and smoking decisions. *Journal of Health Economics*, 26(5):927-949.
- Kopczuk, W., & Slemrod, J. (2005). Denial of death and economic behavior. *The BE Journal of Theoretical Economics*, 5(1): 1207-1207.
- Laibson, D. (1997). Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics*, 112(2): 443-478.
- Laibson, D. (1998). Life-cycle consumption and hyperbolic discount functions. *European Economic Review*, 42(3-5): 861-871.
- Linnainmaa, J., Melzer, B., & Previtro, A. (forthcoming). The misguided beliefs of financial advisors. *Journal of Finance*.
- Lipkus, I. M., Samsa, G., & Rimer, B. K. (2001). General performance on a numeracy scale among highly educated samples. *Medical Decision Making*, 21: 37-44.
- Ludwig, A., & Zimmer, A. (2013). A parsimonious model of subjective life expectancy. *Theory and Decision*, 75(4): 519-541.
- Lusardi, A. (2008). Household saving behavior: The role of financial literacy, information, and financial education programs. NBER WP 13824.
- Lusardi, A. (2004). "Savings and the effectiveness of financial education." In Mitchell, O. S. & Utkus, S. (eds.), *Pension Design and Structure: New Lessons from Behavioral Finance*. Oxford: Oxford University Press, pp. 157-184.
- Lusardi, A. & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1): 5-44.
- Lusardi, A., & Mitchell, O. S. (2008). Planning and financial literacy: How do women fare? *American Economic Review*, 98(2): 413-17.
- Lusardi, A., & Mitchell, O. S. (2011). Financial literacy and planning: Implications for retirement well-being. In Mitchell, O.S. & Lusardi, A. (eds) *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*. Oxford: Oxford University Press: 17-39.
- Lyter, D. W., Valdiserri, R. O., Kingsley, L. A., Amoroso, W. P., & Rinaldo Jr., C. R. (1987). The HIV antibody test: Why gay and bisexual men want or do not want to know their results. *Public Health Reports*, 102(5): 468.

- Maurer, R. & Mitchell, O. S. (2020). Older peoples' willingness to delay Social Security claiming. *Journal of Pension Economics and Finance*. January 2020: doi: 10.1017/S1474747219000404.
- McGarry, K. M. (2020). Perceptions of mortality: Individual assessments of longevity risk. Wharton PRC Working Paper No. 2020-09.
- O'Dea, C., & Sturrock, D. (2020). Survival pessimism and the demand for annuities. IFS Working Paper No. 19/02.
- O'Donnell, O., Teppa, F. & Van Doorslaer, E. (2008). "Can subjective survival expectations explain retirement behaviour?" De Nederlandsche Bank working paper No. 188.
- Peer, E., Brandimarte, L., Samat, S., & Acquisti, A. (2017). Beyond the Turk: Alternative platforms for crowdsourcing behavioral research. *Journal of Experimental Social Psychology*, 70: 153-163.
- Puri, M., & Robinson, D. T. (2007). Optimism and economic choice. *Journal of Financial Economics*. 86(1): 71-99.
- Salm, M. (2010). Subjective mortality, expectations and consumption, and saving behaviours among the elderly. *Canadian Journal of Economics/Revue canadienne d'économie* 43(3): 1040-1057.
- Samek, A., Kapteyn, A., & Gray, A. (2019). Using vignettes to improve understanding of Social Security and annuities. NBER WP 26176.
- Solmon, L. C. (1975). The relation between schooling and savings behavior: An example of the indirect effects of education. In Juster, T.J. (ed). *Education, Income, and Human Behavior*. Chicago: University of Chicago Press, pp. 253-294.
- Teppa, F., & Lafourcade, P. (2014). Can longevity risk alleviate the annuitization puzzle? Empirical evidence from survey data. De Nederlandsche Bank (DNB) Working Paper 302. <https://archivo.alde.es/encuentros.alde.es/antiores/xviieea/trabajos/t/pdf/85.pdf>.
- United States Social Security Administration, *2013 Cohort Life Tables*. <https://www.ssa.gov/OACT/NOTES/as116/as116LOT.html>.
- United States Census Bureau. (2020). *2018-2019, Population and Housing Unit Estimates*. <https://www.census.gov/programs-surveys/popest.html>.
- Van Soest, A., Delaney L., Harmon, C., Kapteyn, A., & Smith, J. (2011). Validating the use of vignettes for subjective threshold scales. *Journal of the Royal Statistical Society: Series A*. 174(3).
- Wu, S., Stevens, R., & Thorp, S. (2015). Cohort and target age effects on subjective survival probabilities: Implications for models of the retirement phase. *Journal of Economic Dynamics and Control*, 55: 39-56.

Online Appendix 1

Prolific Survey of Financial Decision making

Q1 Welcome to the research study!

This survey asks you some questions about how you think about your financial matters, including retirement planning and financial risks. The survey is aimed at people age 50 and over.

If you choose to participate in this study you will be asked to answer questions about financial terms, planning, risk, and related topics. You do not need any special financial information to take part in this study. We will also ask you a few general questions. You will not be asked to provide any identifying information about yourself. The survey will take approximately 20 minutes for which you will receive GBP 2.5 for participating.

Participation is voluntary and you have the right to withdraw from the study at any time without penalty. If you withdraw, you have the right to request that any information you supplied be erased. Once you have completed the survey, your data cannot be destroyed, as we store no personally identifiable information to ensure complete anonymity and confidentiality.

If you have any questions regarding the study, please contact the research staff:

Dr. Abigail Hurwitz

abigail.mimun@gmail.com

By selecting the checkbox you are giving your consent to participate in this study.

I consent, begin the study

I do not consent, I do not wish to participate

Q58 Please tell us a little about yourself:

Q4 What is your current age?

Q6 What is your gender?

- Male
- Female
- Prefer not to say

Q8 What is the HIGHEST level of education that you have completed?

- Less than high school
- High school or GED
- some college (including Associate degree)
- Vocational or technical school
- Completed College (Bachelor's degree)
- Graduate school

Q9 Is English the main language that you speak at home?

- Yes
- Maybe
- No

Q10 What is your marital status?

- Married
- Widowed
- Divorced
- Separated
- Never married

Q7 Which of the following terms would you use to describe yourself?

- White, Non-Hispanic
- Hispanic or Latino
- African American
- Asian or Pacific Islander
- Other (please specify) _____

Q11 The following questions relate to your health and expected longevity. Please answer them as best you can:

Q59 In general, would you say your health is:

- Excellent
- Very Good
- Good
- Fair
- Poor

Q12 What is the percent chance [0-100] that you think you will live at least $\{e://Field/AgeDeath\}$ more years?

- Percent chance _____
- Don't know
- Refuse

Q14 And what is the percent chance [0-100] that you think you will live at least $\{e://Field/AgeDeath2\}$ more years?

- Percent chance _____
- Don't know
- Refuse

Q15 The next few questions are about your health care visits in the last 12 months:

Q60 (Not counting overnight hospital or nursing home stays) During the last 12 months, since January of 2019, how many times have you seen or talked to a medical doctor about your health, including emergency room or clinic visits?

- 0
- 1
- 2-3
- 4-5
- 6-9
- 10+

Q16 Did you take any prescription medications in the past 12 months, since January of 2019?

- Yes
- No
- Don't know
- Refuse

Q17 Over the last year, about how many different prescription medications did you take per month on average?

- Prescriptions _____
- Don't know
- Refuse

Q18 Over the last year, about how much money did you spend on prescription medication per month on average?

- \$ on prescription medications per month over the last year:
- Don't know
- Refuse

Q38 Next we will describe a financial decision facing Mrs. Smith and then we will ask you what you would recommend to this person:

Q62 Mrs. Smith is a single, 60-year-old woman with no children. She will retire and claim her Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits. Imagine that Mrs. Smith asks you about how to manage her \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as she needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of her life.

Q39 Just as before, Mrs. Smith is still a single, 60-year-old woman with no children who will retire and claim Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

But now she has a third option that she can choose from. Please indicate which one of the three options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as she needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of her life.
- Withdraw a lump sum of \$50,000 at retirement, and receive a regular monthly sum of \$250 (equals to \$3,000 yearly) for the rest of her life.

Q46 Next we will describe a financial decision facing Mr. Smith and then we will ask you what you would recommend to this person:

Q70 Mr. Smith is a single, 60-year-old man with no children. He will retire and claim his Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits. Imagine that Mr. Smith asks you about how to manage his \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of his life.

Q47 Just as before, Mr. Smith is still a single, 60-year-old man with no children who will retire and claim Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits.

But now he has a third option that he can choose from. Please indicate which one of the three options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
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- Withdraw a lump sum of \$50,000 at retirement, and receive a monthly sum of \$250 (equal to \$3,000) for the rest of his life.

Q64 Next we will describe a financial decision facing Mrs. Smith and then we will ask you ask what you would recommend to this person:

Q48 Mrs. Smith is a single, 60-year-old woman with no children. She will retire and claim her Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please note that an American woman, 65 years old, will survive 20.6 more years on average. Imagine that Mrs. Smith asks you about how to manage her \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as she needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of her life.

Q49 Just as before, Mrs. Smith is still a single, 60-year-old woman with no children who will retire and claim Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please note that an American woman, 65 years old, will survive 20.6 more years on average.

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Q61 Next we will describe a financial decision facing Mr. Smith and then we will ask you ask what you would recommend to this person:

Q71 Mr. Smith is a single, 40-year-old man with no children. He will retire and claim his Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits.

Please note that 22.3% of American men, 65 years old, will survive to the age of 90 or more.

Please indicate which one of these options you would recommend:

- Maintain his current saving level.
- Slightly increase his long-term savings by spending less.
- Significantly increase his long-term savings by spending less.
- Don't know

Q65 Next we will describe a financial decision facing Mrs. Smith and then we will ask you ask what you would recommend to this person:

Q52 Mrs. Smith is a single, 60-year-old woman with no children. She will retire and claim her Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please note that 33.2% of American women, 65 years old, will survive to the age of 90 or more. Imagine that Mrs. Smith asks you about how to manage her \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as she needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of her life.

Q53 Just as before, Mrs. Smith is still a single, 60-year-old woman with no children who will retire and claim Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please note that 33.2% of American women, 65 years old, will survive to the age of 90 or more.

But now she has a third option that she can choose from. Please indicate which one of the three options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as she needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of her life.
- Withdraw a lump sum of \$50,000 at retirement, and receive a regular monthly sum of \$250 (equals to \$3,000 yearly) for the rest of her life.

Q59 Next we will describe a financial decision facing Mr. Smith and then we will ask you ask what you would recommend to this person:

Q72 Mr. Smith is a single, 40-year-old man with no children. He will retire and claim his Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits.

Please note that an American man, 65 years old, will survive 18.1 more years on average.

Please indicate which one of these options you would recommend:

- Maintain his current saving level.
- Slightly increase his long-term savings by spending less.
- Significantly increase his long-term savings by spending less.
- Don't know.

Q50 Next we will describe a financial decision facing Mr. Smith and then we will ask you ask what you would recommend to this person:

Q73 Mr. Smith is a single, 60-year-old man with no children. He will retire and claim his Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits.

Please note that an American man, 65 years old, will survive 18.1 more years on average. Imagine that Mr. Smith asks you about how to manage his \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of his life.

Q51 Just as before, Mr. Smith is still a single, 60-year-old man with no children who will retire and claim Social Security benefits at 65. When he retires, he will have \$100,000 saved for his retirement, and he will receive \$1,400 in monthly Social Security benefits.

Please note that an American man, 65 years old, will survive 18.1 more years on average.

But now he has a third option that he can choose from. Please indicate which one of the three options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
- Receive a regular monthly sum of \$500 (equal to \$6,000 yearly) for the rest of his life.
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Please note that 22.3% of American men, 65 years old, will survive to the age of 90 or more. Imagine that Mr. Smith asks you about how to manage his \$100,000 retirement savings. Please indicate which one of the two options you would recommend:

- Withdraw the entire \$100,000 all at once from the retirement account, to use as he needs.
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Please indicate which one of these options you would recommend:

- Maintain his current saving level.
- Slightly increase his long-term savings by spending less.
- Significantly increase his long-term savings by spending less.
- Don't know.

Q50 Next we will describe a financial decision facing Mrs. Smith and then we will ask you ask what you would recommend to this person:

Q67 Mrs. Smith is a single, 40-year-old woman with no children. She will retire and claim her Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please indicate which one of these options you would recommend:

- Maintain her current saving level.
- Slightly increase her long-term savings by spending less.
- Significantly increase her long-term savings by spending less.
- Don't know.

Q58 Next we will describe a financial decision facing Mrs. Smith and then we will ask you ask what you would recommend to this person:

Q68 Mrs. Smith is a single, 40-year-old woman with no children. She will retire and claim her Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please note that an American woman, 65 years old, will survive 20.6 more years on average.

Please indicate which one of these options you would recommend:

- Maintain her current saving level.
- Slightly increase her long-term savings by spending less.
- Significantly increase her long-term savings by spending less.
- Don't know.

Q60 Next we will describe a financial decision facing Mrs. Smith and then we will ask you ask what you would recommend to this person:

Q69 Mrs. Smith is a single, 40-year-old woman with no children. She will retire and claim her Social Security benefits at 65. When she retires, she will have \$100,000 saved for her retirement, and she will receive \$1,400 in monthly Social Security benefits.

Please note that 33.2% of American women, 65 years old, will survive to the age of 90 or more.

Please indicate which one of these options you would recommend:

- Maintain her current saving level.
- Slightly increase her long-term savings by spending less.
- Significantly increase her long-term savings by spending less.
- Don't know.

Q61 Now we will ask you some questions about chances and probabilities. Please answer the following questions to the best of your ability and type your answer in numerals, not words (i.e., 12, not "twelve"):

Q66 Imagine that we rolled a fair six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die will come up even (2, 4, or 6)?

- Number of times: _____
- Don't know
- Refuse

Q20 Imagine that we rolled a five-sided die 50 times. On average, out of these 50 throws how many times will this five-sided die show an odd number (1, 3, or 5)?

- Number of times: _____
- Don't know
- Refuse

Q21 In BIG BUCK LOTTERY, the chance of winning a \$10 prize is 1%. What is your best guess about how many people would win a \$10 prize if 1,000 people each bought a single ticket from BIG BUCKS?

- Number of people: _____
- Don't know
- Refuse

Q22 In the ACME PUBLISHING SWEEPSTAKES, the chances of winning a car are 1 in 1,000. What percent of ACME PUBLISHING SWEEPSTAKES tickets win a car?

- Percent of tickets: _____
- Don't know
- Refuse

Q23 Please tell us a little more about yourself:

Q76 Are you currently working for pay?

- Yes
- No

Q24 Do you currently have a bank saving or checking account?

- Yes
- No
- Don't know
- Refuse

Q24 What is your best estimate of your household total monthly income?

- \$ per month: _____
- Don't know
- Refuse

Q25 Including yourself, how many people living in your household are supported by this income?

- Number of people: _____
- Don't know
- Refuse

Q26 The next few questions ask you about your feelings about money now versus later

Q77 Would you rather win \$20 now or \$30 a year from now?

- Win \$20 now
- Win \$30 a year from now

Q27 Would you rather lose \$20 now or \$30 a year from now?

- Lose \$20 now
- Lose \$30 a year from now

Q28 Would you rather win \$1,000 now or \$1,500 a year from now?

- Win \$1,000 now
- Win \$1,500 a year from now

Q29 Would you rather lose \$1,000 now or \$1,500 a year from now?

- Lose \$1,000 now
- Lose \$1,500 a year from now

Q30 In the next few questions we ask you a few brain teasers and some factual questions. Please answer them to the best of your ability:

Q78 Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow:

- More than \$102
- Exactly \$102
- Less than \$102
- Don't know
- Refuse

Q31 Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account, would you be able to buy:

- More than today
- Exactly the same as today
- Less than today
- Don't know
- Refuse

Q32 Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund."

- True
- False
- Don't know
- Refuse

Q111 Which of the following statements comes closest to describing the amount of financial risk that you are willing to take when you save or make investments? **Please skip this question.**

- I am willing to take substantial financial risks expecting to earn substantial returns
- I am willing to take above average financial risks expecting to earn above-average returns
- I am willing to take average financial risks expecting to earn average returns
- I am willing to take below average financial risks expecting to earn below-average returns
- I am not willing to take any risk, knowing I will earn a small but certain return

Q33 A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?

- \$: _____
- Don't know
- Refuse

Q34 If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

- Minute(s): _____
- Don't know
- Refuse

Q37 **Using the scale below, mark the box to the right that best describes how likely you would do the activities in the following statements:**

	Very likely	Somewhat likely	Not sure	Somewhat unlikely	Very unlikely
Eating 'expired' food products that still 'look okay'	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frequent binge drinking (more than two drinks per day)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ignoring a persistent physical pain by not going	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taking a prescription drug that has a high likelihood of negative side effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engaging in unprotected sex	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Never wearing a seatbelt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not having a smoke alarm in or outside of your bedroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regularly riding your bicycle without a helmet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smoking a pack or more of cigarettes per day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q108 Using the scale below, mark the box to the right that best describes how likely you would do the activities in the following statements:

	Very likely	Somewhat likely	Not sure	Somewhat unlikely	Very unlikely
Investing 10% of your annual income in a moderate growth mutual fund (like a 401(k) or other retirement plan)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Betting a day's income at a high-stakes poker game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Investing 5% of your annual income in a very speculative stock (like a stock with high risk relative to any potential positive returns)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Betting a day's income on the outcome of a sporting event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Betting a day's income at the horse races	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Investing 10% of your annual income in a new business venture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q114 The coronavirus (COVID-19) is a new disease with flu-like symptoms that is spreading across the world. Have you heard of the coronavirus (COVID-19)?

- Yes
- No
- Don't know

Q115 The coronavirus may cause economic challenges for some people regardless of whether they are actually infected. What is the percent chance you will run out of money because of the coronavirus in the next three months?

- Percent chance: _____
- Don't know
- Refuse

Q119 On a scale of 0 to 100 percent, what is the chance that you will get the coronavirus in the next three months? If you're not sure, please give your best guess.

- Percent chance: _____
- Don't know
- Refuse

Q116 If you do get the coronavirus, what is the percent chance you will die from it? If you're not sure, please give your best guess.

- Percent chance: _____
- Don't know
- Refuse

Q36 Could you tell us how interesting or uninteresting you found the questions in this interview?

- Very interesting
- Interesting
- Neither interesting nor uninteresting
- Uninteresting
- Very uninteresting

FILLS AgeDeath and AgeDeath2 AGE AND GENDER				
	Male		Female	
Age	AgeDeath	AgeDeath2	AgeDeath	AgeDeath2
35-39	55	50	60	55
40-44	50	45	55	50
45-49	45	40	50	45
50-54	40	35	45	40
55-59	35	30	40	35
60-64	30	25	35	30
65-69	25	20	30	25
70-74	20	15	25	20
75-79	15	10	20	15
80-84	15	10	15	10
85-90	10	5	10	5

About the authors

Abigail Hurwitz is an Assistant Professor at the Hebrew University of Jerusalem. Her research is dedicated to long term saving, consumption and annuity choices. She seeks to better understand financial behavior in order to influence policy as well as to develop and promote savings products and to increase the demand for annuities. Hurwitz holds a Ph.D. in Finance as well as an M.A. and B.A. in Business and Economics from the Hebrew University of Jerusalem. She was previously a Post-doctorate visiting scholar at the Wharton school of the University of Pennsylvania.

Olivia S. Mitchell is the International Foundation of Employee Benefit Plans Professor; professor of insurance/risk management and business economics/public policy; Executive Director of the Pension Research Council; and Director of the Boettner Center for Pensions and Retirement Research; all at the Wharton School of the University of Pennsylvania.

The author or coauthor of over 230 books and articles, Mitchell serves as independent trustee on the Wells Fargo Fund Boards; co-investigator for the Health and Retirement Study at the University of Michigan; and executive board member of the Michigan Retirement Research Center. She earned her B.A. in economics from Harvard University and Ph.D. in economics from the University of Wisconsin – Madison.

Orly Sade is Associate Professor of Finance at the Department of Finance, School of Business Administration, Hebrew University of Jerusalem. She is also a Visiting Associate Professor at the Stern School of Business, NYU, and she previously visited NYU Shanghai, IE Madrid, and NES, Moscow. Dr. Sade directed the BA program at The Hebrew University and received the Abe Gray award from the President of the Hebrew University. Previously Dr. Sade served on the advisory board of the Israeli Ministry of Finance's capital market division and the board of directors of the Israeli Securities Authority. She also served on the investment committee for the "Hadassah" pension fund, the provident fund for Hebrew University employees, the welfare fund for Hebrew University employees, the investment committee responsible for investing funds of the academic staff union of Hebrew University, and "responsibility" mutual funds. She has also served as an outside director at Sigma Mutual Funds, and she worked in the Banking Supervision Department of the Bank of Israel.