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Narrow Framing and Long-Term Care Insurance

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Abstract

We propose a model of narrow framing in insurance and test it using data from a new module we designed and fielded in the Health and Retirement Study. We show that respondents subject to narrow framing are substantially less likely to buy long-term care insurance than average. This effect is much larger than the effects of risk aversion or adverse selection, and it offers a new explanation for why people underinsure their later-life care needs.

Introduction

Long-term care (LTC) expense is one of the largest financial risks confronting the nation's growing elderly population. LTC encompasses a wide range of health and personal care services including provision of medication as well as dressing, showering, eating, and toileting. Such services may be delivered either at home or in a nursing home or assisted living facility (see Brown and Finkelstein, 2011; Fang, 2016 , for recent surveys). Though people's duration and intensity of LTC needs will vary, it is anticipated that between 50 and 70 percent of Americans will require LTC at some

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point (Brown and Finkelstein, 2009; Hurd, Michaud, and Rohwedder, 2014): an average 65-year old can anticipate requiring LTC for about three years, with women needing it longer than men. LTC is also very costly in the United States: the median outlay for a private room in a nursing home was $250/day ($92,400/year) in 2016 (Genworth, 2016), or more than twice the average annual household income of seniors (Robert Wood Johnson (RWJ) Foundation, 2014). Moreover, the costs of LTC can be prohibitive for those needing extended care, with 10–20 percent of people requiring nursing home care for longer than five years (Brown and Finkelstein, 2009).

Given the inherent riskiness of LTC costs and the important potential benefits of having LTC insurance, it may be surprising for some to learn that few Americans actually purchase such coverage. Only 8 percent of the U.S. population has LTC insurance, and such private insurance pays for less than 12 percent of LTC expenditures (Robert Wood Johnson (RWJ) Foundation, 2014). Public spending, mostly via the means-tested Medicaid program, covers over 60 percent of LTC expenditures.[1] In this light, economists have proposed two main reasons why Americans do not buy LTC insurance, namely crowding-out by Medicaid (Pauly, 1990; Brown, Coe, and Finkelstein, 2007; Brown and Finkelstein, 2008), and insurers seeking to weed out those mostly likely to need the care via strict underwriting (Hendren, 2013).[2]

The present paper proposes an additional reason for why people may not buy LTC insurance, namely "narrow framing," or the tendency to make decisions in isolation. This flows from psychologists' observation that people often fail to account for other risks they also face when making decisions (c.f., Tversky and Kahneman, 1981; Kahneman and Lovallo, 1993; Read et al., 1999). While narrow framing can simplify decision-making under uncertainty, it can also be quite costly. For instance, individuals who frame their decisions narrowly may choose first-order stochastically-dominated options (Tversky and Kahneman, 1981; Rabin and Weizsäcker, 2009) and fail to diversify (Eyster and Weizsäcker, 2016).

[1]Fewer than 1 percent of American employers offer some type of group LTC insurance (Tell, 2011). Private LTC insurance is also uncommon outside of the United States. Among the OECD countries, for example, private insurance covers around 2 percent of total LTC spending. The source of expenditure varies substantially, with over 60 percent out of pocket in Switzerland to 100 percent public expenditure in France (OECD, 2010). See Colombo et al. (2011) for a discussion of the LTC market in other countries.

[2]Many other factors may also contribute to the small size of the LTC insurance market, as acknowledged in the literature. For instance, insurance loads in this arena appear to be unusually large compared with other insurance markets, although Brown and Finkelstein (2007, 2011) show that even these loads are not large enough to explain the small size of the market. Moreover, large loads may be a consequence of the small market, rather than its cause, due to the impossibility of benefiting from economies of scale. Nursing homes may crowd out the provision of care by family members (Pauly, 1990), although this observation does not explain why people without children also fail to purchase long-term insurance. Additional explanations include the possibility of using one's home equity to pay for care (Davidoff, 2010); a decrease in marginal utility following health deterioration (Finkelstein, Luttmer, and Notowidigdo, 2013; Ameriks et al., 2015); and the idea that bequests are luxury goods (Lockwood, 2018).

A large literature in psychology and behavioral economics documents the pervasiveness of narrow framing in the financial realm.[3] Narrow framing is also an important ingredient of theories seeking to explain risk aversion over small gambles (Rabin and Thaler, 2001; Safra and Segal, 2008).[4] Narrow framing may be especially problematic for consumers when thinking about buying insurance. The purpose of insurance is to alleviate the impact of losses, so failure to evaluate the potential benefits of avoiding the losses alongside the costs of insurance can make buying an insurance product seem undesirable. Indeed, our theoretical model shows that individuals who frame their insurance narrowly are less likely to purchase coverage. Consistent with this view, Kunreuther and Pauly (2012) argued that "there is a tendency to view insurance as a bad investment when you have not collected on the premium you paid the insurer. It is difficult to convince people that the best return on an insurance policy is no return at all." Yet there is little empirical evidence regarding the impact of narrow framing in an insurance setting. One exception is Brown et al. (2008) who suggested that many people perceive life annuities as "risky investments." That study found that 72 percent of survey respondents elected an annuity when it was described in terms of consumption flows, but only 21 percent chose it when annuity payments were described in isolation.[5]

[3]For instance, Benartzi and Thaler (1995) and Barberis and Huang (2008) argue that narrow framing and loss aversion explains the large difference between returns on stocks and bonds, known as the equity premium puzzle. Many lab experiments have also found that, because of narrow framing, people are more likely to accept investments when returns are aggregated in terms of a portfolio than when they are shown individual asset returns separately (Redelmeier and Tversky, 1992; Langer and Weber, 2001). Likewise, people take less risk when they are shown returns more, versus less, frequently (Gneezy and Potters, 1997; Benartzi and Thaler, 1999; Haigh and List, 2005; Berkelaar et al., 2004; Kumar and Lim, 2008; Looney and Hardin, 2009). More recently, however, Beshears et al. (2017) find that, under more realistic asset distributions, different levels of aggregation do not lead to different risk-taking behavior (although they replicate findings from this literature for distributions used in previous studies). Therefore, the circumstances in which narrow framing and loss aversion generate meaningful behavioral differences remain to be explored.

[4]Behaghel and Blau (2012) argue that narrow framing and loss aversion can account for the spike in social security claims at age 65. Engström et al. (2013) and Rees-Jones (2017) find that loss aversion (coupled with a reference point at zero) can account for common manipulations in annual tax returns. Rizzo and Zeckhauser (2003) argue that loss aversion explains how reference points affect the labor supply of physicians. Kahneman, Knetsch, and Thaler (1991) argue that narrow framing and loss aversion explain the observed tendency to stick to one's original situation, known as the *status quo* bias. Narrow framing is also a key ingredient of the idea of mental accounting, which states that people categorize and evaluate outcomes in separate non-fungible accounts (Thaler, 1980, 1999). Card and Ransom (2011) find that, consistently with mental accounting, individuals tend to be more sensitive to employee contributions than to employer contributions to pensions. See Read et al. (1999) for a survey.

[5]Beshears et al. (2013) and Brown et al. (2017) also find that framing affects people's hypothetical annuitization decisions. Using a laboratory experiment, Knoller (2016) finds evidence for narrow framing and loss aversion in choices that resemble annuitization decisions. Braun and Muermann (2004) theoretically study how regret affects the demand for

To test our theory, we have developed and fielded a new module for the Health and Retirement Study (HRS) allowing us to classify people according to how likely they are to narrow frame. We find that, all else equal, individuals who are subject to narrow framing are between 25 and 66 percent less likely to buy LTC insurance than average. Our estimates are statistically significant and economically large, and they imply that the narrow framing effect is an order of magnitude larger than the effect of adverse selection and risk aversion.[6]

Our paper proceeds as follows: Second section presents a simple model to motivate our empirical analysis. Third section discusses the data, fourth section presents our main empirical findings, and the final section concludes.

MODEL

To describe the phenomenon we study, it is helpful to consider a simple model of insurance with narrow framing. We consider individuals with initial wealth W who are subject to a financial loss of L with probability p. Insurance policies are available with a proportional loading factor $l \in [0, 1-p)$, meaning that each dollar of coverage costs $p + l$. Insurance is actuarially fair if the loading factor is zero. There are two types of individuals: those described by expected utility theory ("broad framers") and those described by prospect theory ("narrow framers").

The preferences of expected utility consumers are described by a (Bernoulli) *consumption utility function* $U: \mathbb{R}_{++} \to \mathbb{R}$, which is strictly increasing, strictly concave, and differentiable.[7] Let I denote the insurance coverage purchased (i.e., the "indemnity"). An expected utility consumer picks coverage I to maximize

$$pU(W - L + (1 - p - l)I) + (1 - p)U(W - (p + l)I). \tag{1}$$

Evaluating the derivative of this expression at zero coverage ($I = 0$) and at full coverage ($I = L$), we obtain the following result, originally due to Mossin (1968):

Proposition 1 (Expected Utility): *An* expected utility consumer buys full coverage if and only if insurance is actuarially fair. Moreover, there exists $\bar{l} > 0$ such that an expected utility consumer buys positive coverage if and only if the loading factor is less than $\bar{l}$.

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insurance. As Loomes and Sugden (1982) argue, regret aversion shares many of its predictions with prospect theory.

[6]We focus on LTC insurance because it is probably the most relevant insurance for the majority of HRS respondents. Since many respondents are covered by Medicare, private health insurance is unlikely to be a major concern for them. Moreover, many have children who are old enough to support themselves, with life insurance serving mostly as an estate planning tool.

[7]The assumption that consumption utility is state independent is for notational simplicity only. Our results generalize to state-dependent consumption utility, as long as it remains concave.

Proof: See Appendix A. □

Prospect theory individuals take into account both consumption utility (1) and gain–loss utility.[8] The *gain–loss utility function* is

$$\mathcal{V}(X) = \begin{cases} v(X) & \text{if } X \geq 0 \\ -\lambda v(-X) & \text{if } X < 0' \end{cases} \tag{2}$$

where $v : \mathbb{R}_+ \to \mathbb{R}$ is a weakly concave, differentiable function satisfying $v(0) = 0$, and $\lambda > 1$ captures the individual's loss aversion.[9] Formally, because we abstract from probability weighting, a prospect theory individual corresponds to an expected utility individual with Bernoulli utility $u(W + x) + \mathcal{V}(x)$ from payment x.[10]

Our key assumption is that prospect theory individuals evaluate their insurance policies in isolation, so the reference point corresponds to the outcomes under zero insurance (*status quo*). Therefore, buying insurance coverage I corresponds to participating in a lottery that pays $[1 - (p + l)]I$ with probability p and $-(p + l)I$ with probability $1 - p$. The expected gain–loss utility from insurance is then

$$p\mathcal{V}((1 - p - l)I) + (1 - p)\mathcal{V}(-(p + l)I) = pv((1 - p - l)I) - (1 - p)\lambda v((p + l)I). \tag{3}$$

Therefore, a prospect theory individual views insurance as a risky investment which is profitable if the indemnity received from the insurance company exceeds the premium paid.

Let Θ^{EU} and Θ^{PT} denote the levels of wealth, loss amounts, loss probabilities, and loading factors (W, L, p, l) for which zero insurance is optimal. Proposition 2 presents the main testable prediction from our model: controlling for other characteristics, individuals who narrow frame (PT) are less likely to buy insurance than those who broadly frame (EU).

Proposition 2 (Narrow Framing): Let $p \leq 1/2$. $\Theta^{EU} \subset \Theta^{PT}$ and the inclusion is strict.

Proof: See Appendix A. □

[8]This global-plus-local formulation follows, among others, Barberis and Huang (2001); Barberis, Huang, and Santosn (2001); Kőszegi and Rabin (2006, 2007); Heidhues and Kőszegi (2008); Rabin and Weizsäcker (2009); and Barberis and Xiong (2012). As is standard in this literature, we abstract from probability weighting for simplicity. As we show in Appendix A, however, our qualitative results do not significantly change if we allow for standard probability weighting functions.

[9]Tversky and Kahneman (1992) suggested a power utility with functional form $v(X) = X^\alpha,\ \alpha \in (0, 1]$. The use of the same value function for gains and losses avoids unnecessary notation but is not important for our results.

[10]Notice that, when v is not linear, this function is neither concave nor convex. Therefore such an individual is neither risk averse nor risk seeking. This is important to explain the finding that individuals are usually risk seeking over small losses (Kahneman and Tversky, 1979).

Proposition 1 holds for any loss aversion coefficient $\lambda > 1$ and any concave value function v. If one is willing to impose stronger restrictions, the result from Proposition 1 can be substantially strengthened to higher loss probabilities p. Nevertheless, since the important losses covered by most insurance policies happen with probability well below 50 percent, we do not pursue such an approach here, except for the following example:[11]

Example 1: Let $v(x) = x^\theta$. The expected gain–loss utility with actuarially fair policies is

$$p((1-p)I)^\theta - (1-p)\lambda(pI)^\theta = p(1-p)\left[\frac{1}{(1-p)^{1-\theta}} - \frac{\lambda}{p^{1-\theta}}\right]I^\theta.$$

Thus, zero coverage maximizes gain–loss utility if $\lambda > (p/(1-p))^{1-\theta}$ (if this inequality is reversed, full coverage maximizes gain–loss utility). Tversky and Kahneman (1992) estimated $\theta = 0.88$ and $\lambda = 2.25$. Under those parameters, the conclusion from Proposition 2 holds for any probability of losses satisfying $p < 0.99884$.

It is instructive to contrast Propositions 1 and 2. The celebrated theorem of Mossin (1968), described in Proposition 1, shows that individuals who maximize expected utility will buy full insurance when the (proportional) load l is zero and partial insurance when the load is positive. Typically, nonexpected utility theories have indifference curves that are either smooth or have a kink at the point of full insurance. Accordingly, the latter predicts that consumers will demand either just as much or *more* insurance than does expected utility theory (c.f., Segal and Spivak, 1990). By contrast, when individuals frame their insurance purchases narrowly, they will buy *less* insurance than under expected utility. Hence, our model departs from Mossin's theorem in the opposite direction, relative to standard first-order risk aversion models. In particular, when $p \leq 1/2$, individuals would not buy insurance even when the policies are actuarially fair ($l = 0$) if

$$(\lambda - 1)v'(0) \geq U'(W - L) - U'(W).$$

Therefore they would choose zero coverage if consumption utility is sufficiently concave or they are sufficiently loss averse.

Importantly, individuals in our model view insurance as a risky investment which is profitable if the total amount received from the insurance company exceeds the premium. Hence the gain–loss utility takes the counterfactuals under zero insurance (*status quo*) as the reference point against which outcomes are compared. While this is consistent with the evidence described in the introduction, our results would change under different reference points.[12] For example, individuals who evaluate

[11]For probability of losses arbitrarily close to 1, the effect from being risk seeking in the domain of losses dominates and the consumer may prefer to buy as much insurance as possible.

outcomes relative to full insurance have standard nonexpected utility preferences, and therefore they buy more insurance than under expected utility.

As we show in Appendix A, our theory is consistent with a recent literature that views reference points as determined by expectations (Kőszegi and Rabin, 2007). Since the vast majority of individuals do not purchase LTC insurance, it is plausible that they expect not to purchase insurance, making zero insurance their reference point as in our model. In markets where insurance is more common, buying insurance may be a more appropriate reference point. In fact, expectations-based reference points may explain why consumers are reluctant to buy insurance in some domains, while simultaneously seeming "too eager" to buy insurance in other domains. We return to the discussion of different reference points in the conclusion.

DATA

To test the hypothesis that narrow framers fail to insure, we devised and fielded a special module for the HRS, a nationally representative and in-depth panel study of about 19,000 age-eligible Americans over the age of 50 who are interviewed every other year for life (National Institute on Aging (NIA), 2014). At baseline, every respondent is resident in the community; thereafter, the HRS continues to follow respondents even if they move into assisted living or some other arrangement. Each wave, the HRS also includes several experimental modules which are randomly assigned to a subset of respondents. The purpose of these modules is to evaluate new questions and examine alternative ways to get at concepts of interest to researchers. Responses to each module can be linked to respondent variables in the Core surveys as well.

We designed a short survey which was included as one of 10 experimental modules assigned randomly to the HRS sample and administered to about 1,900 HRS respondents in 2012 (see Appendix B). Response rates averaged 85 percent for about 1,700 completed surveys per module. While the main body or the Core of the survey takes more than an hour to complete, modules are limited to an average length of two to three minutes per person. Our module focused on the central question of whether people are sensitive to framing, and if so, how this influences the outcome of most interest here, namely whether they had LTC insurance.[13] Following Hendren (2013), we dropped respondents living in a nursing home at the time of the survey, as they probably would not have qualified for LTC insurance. We obtain essentially the same estimates when we include them.

[12]See Thaler and Johnson (1990) and Kahneman, Knetsch, and Thaler (1991) for discussions of how the *status quo* works as a reference point. More recently, Imas (2016) and Imas, Sadoff, and Samek (2016) find support for this assumption. Schmidt (2016) also studies a similar model of demand for insurance with a reference point at the *status quo*. The key difference between his model and ours is that he follows Kahneman and Tversky (1979) in assuming that choices are evaluated solely in terms of gains and losses, whereas, as described in footnote 9, we consider the global-versus-local formulation, which introduces a consumption smoothing aspect to the decision.

[13]For variable definitions see Appendix B.

Narrow Framing of Losses

To explore whether people narrowly frame losses, our HRS module presented respondents with questions about choices involving risk. Our particular interest focuses on two hypothetical questions exposing respondents to narrow framing and loss aversion in a public policy context, based on the classic experiments from Tversky and Kahneman (1981).

In the first presentation, the following policy-type risk question was asked:[14]

Imagine that the United States is preparing for the outbreak of an epidemic expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Scientists estimate that the outcome of each program is as follows:

- *If Program A is adopted, 300 people will be saved.*
- *If Program B is adopted, there is a 50–50 chance that either 600 people will be saved or none will be saved.*

Which program would you favor: Program A or Program B?

In an alternative presentation, the following question was posed:

Imagine that the United States is preparing for the outbreak of an epidemic expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Scientists estimate that the outcome of each program is as follows:

- *If Program A is adopted, 300 people will die.*
- *If Program B is adopted, there is a 50–50 chance that either none will die or 600 people will die.*

Which program would you favor: Program A or Program B?

All participants answered both questions with many other questions in between (unlike in Tversky and Kahneman, 1981). This is important because we need an individual measure of narrow framing, rather than just measuring the proportion of narrow framers in our sample. We randomly assigned participants in terms of who saw each question first, but answers were uncorrelated with the order in which the questions were asked.

Individuals who do not narrow frame should pick the same program in both questions. By contrast, and as noted by Tversky and Kahneman (1981), those who narrow frame and have a gain–loss utility function that is concave over gains and convex over losses (as in Equation (2)) may choose the *safe* program when outcomes are described as gains (first question), and the *risky* program when described as

[14]By departing from questions involving money lotteries, these questions permit us to measure loss aversion in individuals who are otherwise averse to gambling for reasons unrelated to risk preferences (e.g., for religious reasons). The original epidemic question is possibly the most famous experiment demonstrating framing effects. Kahneman (2003, pp. 1458–1460) uses it to describe framing in his Nobel Prize lecture.

losses (second question).[15] Accordingly, we use the subjects' responses to construct a narrow framing variable, Narrow Framing, which takes a value of 1 if the respondent selected the safe option in the "300 will be saved" condition and the risky option in the "300 will die" condition, and 0 otherwise.[16] In our analysis sample, about 23 percent of respondents chose the safe option in the first question and the risky option in the second one, so they are categorized as subject to narrow framing.

To verify whether this pattern reflects narrow framing of losses rather than random mistakes, we also checked the other possible violation of transitivity, namely, whether people picked the risky program when shown the first question and the safe program when shown the second one. This pattern was chosen by about 5 percent of respondents. We construct the variable Inverse Violation, which takes a value of 1 if the respondent selected the risky option in the "300 will be saved" condition and the safe option in the "300 will die" condition, and 0 otherwise.[17]

Other Controls

To control for other potential explanations for our results in multivariate regression models, we also control on several additional factors (see Appendix B for details). Included in the set are measures of cautiousness, private information, risk aversion over large stakes, loss aversion (risk aversion over small stakes), household net wealth, household nonhousing net wealth, and the self-reported probability of leaving bequests.

To measure cautiousness, we create a variable from the 2012 HRS Core indicating the percent of sex-appropriate annual medical exams each individual undertook (as in Finkelstein and McGarry, 2006). Thus if the respondent was female, she received a score based on whether she had a flu shot, a mammogram, a pap smear, and a cholesterol test. Men received scores based on whether they had a flu shot, a prostate test, and a cholesterol test.

To account for the possibility that a respondent might have private information regarding his need for LTC, as well as to account for possible noninsurability, we control for respondents' subjective probability of needing LTC (as in Finkelstein and McGarry, 2006; Hendren, 2013). This is measured by their answers to the question:

[15]As Tversky and Kahneman (1981, p. 453) explained: "The only difference between them is that the outcomes are described in problem 1 by the number of lives saved and in problem 2 by the number of lives lost. The change is accompanied by a pronounced shift from risk aversion to risk taking. We have observed this reversal in several groups of respondents, including university faculty and physicians. Inconsistent responses to problems 1 and 2 arise from the conjunction of a framing effect with contradictory attitudes toward risks involving gains and losses."

[16]Details on variable coding appear in Appendix C.

[17]This "inverse violation" of transitivity is consistent with people who make random mistakes, or with people who narrow frame and are "loss seeking" ($\lambda < 1$).

"What is the percent chance (0–100) that you will move to a nursing home in the next five years?"

The HRS risk aversion measure is derived based on responses to questions about lotteries with large stakes. The metric we derive ranges from 1 to 4, indicating coefficients of relative risk aversion implied by respondents' answers (Barsky et al. 1997). Since the HRS discontinued these questions post-2006, we only have risk aversion measures for the one-third of our respondents who entered the survey prior to that year.[18] This sample restriction is not endogenous, however, and our results are qualitatively unchanged if we drop the risk aversion question and re-estimate results using the entire sample, as we demonstrate below.

Loss aversion (or, more precisely, first-order risk aversion) is captured with several questions about possible small investments. We translate respondents' answers into a loss aversion scale ranging from 1 to 8, with the higher values indicating higher levels of loss aversion.[19]

Key socio-economic control variables are also included such as the respondent's sex, age, marital status, number of children, educational attainment, and race/ethnicity. Additionally, we control for several health indicators including a count of physical functioning limitations, a self-reported health variable, and indicators of whether the respondent smoked, had drinking problems, or a variety of diseases (diabetes, heart/lung problems, high blood pressure, stroke, cancer, or arthritis). We also control on the respondent's cognition score, which is a summary measure of word recall and mental status (see Appendix C for details). To account for nonlinearities, we include the squares of age, cognition, and risk aversion. Finally, we control for net financial wealth, net not-housing wealth, and the self-reported probability of leaving above $10,000 in bequests.

One might suspect that our measure of narrow framing could be capturing some respondents' cognitive limitations. However, this hypothesis can be ruled out since cognition scores are uncorrelated with narrow framing in our data. Accordingly, our results remain unchanged if we do or do not control for cognition (see Table C2).

RESULTS

In our full sample ($N = 1{,}699$), about 21 percent of respondents are classified as narrow framers (since they selected the safe option in the "300 will be saved" condition and the risky option in the "300 will die" condition). Interestingly, being a narrow framer is generally uncorrelated with the control variables: in fact, the only significant coefficients at conventional levels are for the Male and Cautiousness variables. Men are 8 percent less likely than women to be narrow framers, whereas

[18]Fortunately, the risk preference measures for those respondents asked the questions in different waves are substantially stable over time (Sahm, 2012).

[19]As Rabin (2000) shows, risk aversion cannot explain risk aversion over lotteries with small stakes. Accordingly, lotteries involving small stakes can be used to measure the loss aversion coefficient λ from Equation (2). This approach is also used, for example, by Fehr and Goette (2007).

TABLE 1
Narrow Framing and Long-Term Care (LTC) Insurance

	Has LTC Insurance	No LTC Insurance
Broad Framing	12.74% (157)	87.26% (1,075)
Narrow Framing	8.68% (31)	91.31% (326)
Inverse Violation	12.73% (14)	87.27% (96)

Notes: The sample ($N = 1{,}589$) consists of respondents to our 2012 HRS module who were not in a nursing home and who did not violate transitivity in the opposite direction to the theory. Cell counts in parentheses. For more detail, see Appendices A and B.

individuals classified as cautious are 5 percent more likely to be narrow framers. In particular, education, cognition, risk aversion, and the health variables are not significantly associated with being a narrow framer.

Our main prediction from the model is that narrow framing reduces the demand for LTC insurance after controlling for other variables.[20] Table 1 presents descriptive statistics regarding LTC insurance and narrow framing. In the full sample, 11.8 percent of respondents had LTC insurance. Only 8.7 percent of narrow framers had

TABLE 2
Determinants of Long-Term Care (LTC) Insurance

Dependent Variable: Has LTC Insurance	Probit		LPM	
Narrow Framing	−0.0406**	−0.0275**	−0.0407**	−0.0402**
	[0.0176]	[0.0133]	[0.0177]	[0.0179]
Inverse Violation	−0.0003	0.0189	−0.0003	0.0244
	[0.0314]	[0.0286]	[0.0332]	[0.0325]
Cautious		0.0873***		0.0879***
		[0.0220]		[0.0228]
PercentChanceNH		0.0008**		0.0011**
		[0.0004]		[0.0005]
N	1,699	1,699	1,699	1,699
R^2/pseudo R^2	0.004	0.127	0.003	0.085

Notes: LPM, Linear Probability Model. Reported coefficients for Probit models are marginal effects. Analysis sample consists of all respondents to the 2012 HRS module who did not live in a nursing home. The estimates for the Probit model are marginal effects. Also included in columns (2) and (4) are controls for age, age squared, sex, race/ethnicity, marital status, number of children, cognition, cognition squared, health (ADL count, smoking, drinking, depression, diabetes, stroke, heart problems, high blood pressure, lung problems, cancer, and arthritis), household net financial and net nonhousing wealth, self-reported probability of leaving a bequest larger than $10,000, and loss aversion dummy variables, along with dummies for missing control variables. Robust standard errors are reported, with observations clustered on households. For more detail and results for the extended model, see Appendices A and B. *Significant at 0.10 level; **Significant at 0.05 level; ***Significant at 0.01 level.

[20]Appendix B presents the correlations between narrow framing and other explanatory variables.

Table 3
Determinants of Long-Term Care (LTC) Insurance (Incl. Risk Aversion)

Dependent Variable: Has LTC Insurance	Probit		LPM	
Narrow Framing	−0.0908***	−0.0534***	−0.0912***	−0.0883***
	[0.0310]	[0.0166]	[0.0310]	[0.0316]
Inverse Violation	−0.0161	0.0124	−0.0181	0.0208
	[0.0632]	[0.0489]	[0.0715]	[0.0691]
Risk Aversion		−0.0447		−0.0403
		[0.0673]		[0.1106]
Cautious		0.0381		0.0521
		[0.0330]		[0.0510]
PercentChanceNH		0.0012*		0.0017
		[0.0006]		[0.0013]
N	514	514	514	514
R^2/pseudo R^2	0.016	0.182	0.012	0.136

Notes: LPM, Linear Probability Model. Reported coefficients for Probit models are marginal effects. Analysis sample consists of respondents to the 2012 HRS module with answers to the risk aversion question and who did not live in a nursing home. The estimates reported are marginal effects from the Probit model. Also included in columns (2) and (4) are controls for age, age squared, sex, race/ethnicity, marital status, number of children, cognition, cognition squared, health (ADL count, smoking, drinking, depression, diabetes, stroke, heart problems, high blood pressure, lung problems, cancer, and arthritis), household net financial and net nonhousing wealth, self-reported probability of leaving a bequest larger than $10,000, loss aversion dummy variables, along with dummies for missing control variables. Robust standard errors are reported, with observations clustered on households. For more detail and results for the extended model, see Appendices A and B. *Significant at 0.10 level; **Significant at 0.05 level; ***Significant at 0.01 level.

LTC insurance. Broad framers had an ownership rate of 12.7 percent (47 percent more likely to have LTC insurance). As we will see next, this relationship persists even after controlling for other factors. Moreover, respondents who violated transitivity in the opposite direction to that predicted by loss aversion had an almost identical LTC ownership rate as broad framers.

Multivariate Analysis

To control for the other variables, we estimate the probability of having LTC insurance using a Probit and a Linear Probability Model (LPM). For clarity, in the text we only discuss the factors most commonly used to explain demand for insurance to date—namely, cautiousness, subjective probability of needing care, and, when applicable, risk aversion—as well as narrow framing and the inverse violation of transitivity. (A complete set of results appears in Appendix C.)

Table 2 presents the results for the full sample. The first column reports the marginal effect in a simple model that includes only narrow framing as the explanatory variable. The second column, our preferred specification, reports the marginal effects when the other controls are included as well. Adding the controls is influential, but in both cases and as predicted by the model, individuals who are more subject to narrow framing are substantially less likely to purchase LTC insurance. The coefficient is statistically significant (p-values of 0.038 and 0.025 for the Probit and LPM, respectively) and implies a large economic effect. Other things equal, being subject to narrow framing reduces the demand for LTC insurance by 2.75 percentage points in the Probit model and 4 percentage points in the LPM. Compared with the base LTC insured rate of 11.8 percent, the estimates imply that narrow framing reduces LTC insurance demand by about 25 percent, on average.

Individuals who violate transitivity in the opposite direction of loss aversion are no less likely to have LTC insurance. This result is in line with Table 1, which showed that the ownership rates among broad framers and those who display this inverse violation of transitivity are almost identical. Therefore, not all violations of transitivity correlate with not having LTC insurance. Only respondents who violate transitivity in the direction predicted by loss aversion are less likely to have LTC insurance.[21]

Next, we include the risk aversion measure in the regressions, though doing so requires us to drop about 1,000 observations. The estimated effects of risk aversion are qualitatively similar but larger in magnitude, compared to the full sample (Table 3). The coefficients are statistically significant and imply very large effects. All else equal, being classified as a narrow framer is now associated with a 5.3 percentage point lower demand for LTC insurance in the Probit model (8.8 in the LPM). Compared to the base LTC insured rate of 14 percent in this sample, these point estimates imply that narrow framing reduces LTC insurance demand by about half.

This is a very large effect, particularly in comparison with the effects of other factors. Cautiousness and the subjective probability of needing care have the correct sign but are not statistically significant at conventional levels. Moreover, the estimated coefficients have magnitudes that are small in comparison with narrow framing. For example, according to our estimates, a 10 percentage point increase in the chance of needing care would increase the demand for LTC insurance by a single percentage point. That is, it would take a 50 percentage point increase in the self-reported probability of needing nursing home care for adverse selection, measured by our subjective probability question, to generate the same effect as narrow framing.[22]

[21] In fact, if anything, those who violate transitivity in the opposite direction are more likely to have LTC, although the coefficient is statistically insignificant. In principle, the positive coefficient associated with the variable "Inverse Violation" may be due to loss seeking behavior among a small fraction of respondents since, by the same argument as in Proposition 1, an individual who narrow frames and is loss seeking ($\lambda < 1$) is more likely to purchase insurance. However, because only about 5 percent of the sample display this violation, we lack power to disentangle this explanation from having a small fraction of respondents who make random mistakes in answering the framing questions but are no different from broad framers in terms of insurance purchases.

[22] The difference in point estimates with the full sample and with the sample including risk aversion does not appear to be caused by omitted variable bias due to failing to control for risk aversion. When we run the regressions without risk aversion in the sample for which risk aversion measures are available, we obtain the same results as when we include risk aversion. However, although the point estimate is higher in the subsample for which we have a measure of risk aversion, the difference between these two subsamples is statistically insignificant at standard

Although it is not statistically significant, the risk aversion variable has the opposite sign from what one would expect if consumers were broad framers. More specifically, insurance purchases should be increasing in risk aversion for respondents who evaluate insurance policies solely in terms of their ability to smooth consumption. By contrast, for respondents whose preferences include both consumption and gain–loss utility, standard measures of risk aversion conflate the concavity of their consumption utility with the concavity of their gain–loss utility. As shown in the "Model" section, these two terms have opposite predictions for insurance purchases: concavity of consumption utility induces individuals to buy more insurance, whereas concavity of gain–loss utility induces them to buy less insurance. This could explain why the risk aversion coefficient is not only statistically insignificant but also has the "wrong" sign.

As Tables 2 and 3 show, individuals with the opposite violation of transitivity are slightly more likely to have LTC insurance, although the effect is not statistically significant. In Appendix C, we show that the point estimates are similar when we consider the effect of narrow framing for loss averse individuals only. However, because the standard deviations are higher, some of the estimates lose significance in this case.

CONCLUSION

We show that narrow framers have a substantially lower demand for LTC insurance, and this result is robust to controlling on a host of factors including health, cautiousness, risk aversion, the probability of needing LTC, and socio-demographics. Moreover, narrow framing is a more important deterrent to people's LTC insurance purchases than factors previously suggested in the literature, including risk aversion and private information.

Future work could investigate the importance of narrow framing in other insurance contexts, since economists have been surprised by the low demand for insurance products that, in theory, should be highly valued. For instance, there has been little demand for home equity insurance protecting homeowners against house price drops, despite the fact that residential equity is the largest and least well-diversified component of most American families' wealth (Shiller, 2008). Because they are mainly indexed, home equity insurance policies are largely immune from adverse selection and moral hazard concerns. Accordingly, standard insurance theory suggests that people should be willing to pay a considerable amount for them. Narrow framing may explain why consumers have been uninterested in buying these policies.

We should also mention that, while our model predicts that individuals will be reluctant to buy insurance, there are several other markets in which consumers seem "too eager" to buy insurance. Sydnor (2010), for example, finds that deductible choices in home insurance imply unrealistically large levels of risk aversion. Many consumers also insure small durable goods (see, e.g., Cutler and Zeckhauser, 2004). One possible cause for this divergence in preferences may be the effect of framing in different insurance markets,

levels. It is possible that this (statistically insignificant) difference is due to some heterogeneity between cohorts not captured by the demographic and other controls. In fact, subjects for which risk aversion data are available are about 4 years younger, have a 4 percentage point lower chance of needing nursing home care, and are 6 percentage points more cautious than those for whom the data are not available.

which could shift peoples' reference points. For example, in markets where insurance is relatively uncommon, remaining uninsured may be the natural reference point, whereas in markets where most people have insurance, buying insurance may be the most appropriate reference point. As we show in Appendix A, this is consistent with a model with expectations-based reference points, as in Kőszegi and Rabin (2007). In the present paper, we have also abstracted from probability weighting, which has been shown to be important in other insurance markets (see Barseghyan et al., 2013; Dimmock et al., 2018). Understanding which behavioral theories are most relevant to each market would be a fruitful avenue for future research.

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Appendix A

Proofs

Proof of Proposition 1: The derivative of (1) evaluated at $I = L$ is $-\,lU'(W - (p + l)L)$, which is negative whenever $l > 0$. Since the expression in (1) is strictly concave, it is optimal to buy full insurance if and only $l = 0$.

The derivative of (1) evaluated at $I = 0$ is

$$p(1 - p - l)U'(W - L) - (1 - p)(p + l)U'(W),$$

which is positive if

$$\frac{p}{p + l} \cdot \frac{1 - p - l}{1 - p} > \frac{U'(W)}{U'(W - L)}.$$

The expression on the left is continuous and decreasing in $l \in [0, 1 - p]$. Since it equals 1 at $l = 0$, 0 at $l = 1 - p$, and the expression on the right is between 0 and 1, there exists a unique threshold $\bar{l}$ for which such inequality holds. □

Proof of Proposition 2: We claim that $I = 0$ is the unique maximum of the expected gain–loss utility from insurance. The derivative of the expected gain–loss utility (3) with respect to I is

$$\begin{aligned} p(1-p-l)v'((1-p-l)I)-(1-p)(p+l)\lambda v'((p+l)I) &\leq p(1-p)[v'((1-p)I)-\lambda v'(pI)] \\ &< p(1-p)[v'((1-p)I)-v'(pI)], \\ &\leq 0 \end{aligned}$$

where the first line follows from $l \geq 0$, the second line follows from $\lambda > 1$ (loss aversion), and the third line follows from $(1-p)I \geq pI$ (because $p \leq 1/2$) and the concavity of v. Therefore, if zero coverage maximizes expected consumption utility, it must also maximize the sum of consumption and gain–loss utility. Moreover, because positive coverages give a strictly negative gain–loss gain–loss utility, the inclusion is strict. □

Probability Weighting

The following example introduces probability weighting in the gain–loss utility function. Consider the functional form suggested by Tversky and Kahneman (1992). The value function is $v(x) = x^\theta$ and the probability weighting function is

$$w(p) = \frac{p^\gamma}{[p^\gamma + (1-p)^\gamma]^{1/\gamma}}.$$

As in expected utility, the consumption utility function is still weighted linearly. The gain–loss utility when policies are actuarially fair is then

$$\begin{aligned} w(p)((1-p)I)^\theta - w(1-p)\lambda(pI)^\theta &= [w(p)(1-p)^\theta - w(1-p)\lambda(p)^\theta]I^\theta \\ &= [p^\gamma(1-p)^\theta - (1-p)^\gamma p^\theta \lambda]\frac{I^\theta}{[p^\gamma + (1-p)^\gamma]^{1/\gamma}}, \end{aligned}$$

which is maximized at 0 if and only if

$$\left(\frac{p}{1-p}\right)^{\gamma-\theta} < \lambda.$$

Rearranging this expression, gives

$$p > \frac{1}{1+\lambda^{\frac{1}{\theta-\gamma}}}. \tag{A1}$$

Tversky and Kahneman (1992) estimate $\theta = 0.88$, $\lambda = 2.25$, and $\gamma \approx 0.65$.[23] Substituting in (A1), we obtain that the result from Proposition 2 holds as long as $p > 0.02858$. Similarly, Tversky and Fox (1995) estimate $\theta = 0.88$, $\lambda = 2.25$, and $\gamma = 0.69$, which gives the same result as in Proposition 2 whenever $p > 0.0138$.

Expectations-Based Reference Points

In this appendix, we show how the model in the text relates to models in which the reference point is determined by expectations. As in Kőszegi and Rabin (2006, 2007),

[23]They estimate a different weighting function for gains and losses, with parameters 0.61 and 0.69, respectively.

the gain–loss utility is calculated by contrasting the percentiles of the CDF in the stochastic reference point with the outcome of the lottery.

An individual who purchases coverage I with a load $l \geq 0$, has the following consumption:

$$c = \begin{cases} W - L + (1 - p - l)I & \text{with probability } p \\ W - (p + l)I & \text{with probability } 1 - p \end{cases}.$$

Since the vast majority of people do not buy long-term care insurance, we think the appropriate expectation is not to purchase any policy. That is, as discussed in Kőszegi and Rabin (2007), being offered long-term care insurance is a surprise, so the individual's stochastic reference point is

$$c = \begin{cases} W - L & \text{with probability } p \\ W & \text{with probability } 1 - p \end{cases}.$$

As in Kőszegi and Rabin (2007), suppose the consumption utility function is linear. Then, the gain–loss utility from buying coverage I is

$$\begin{aligned} & p \cdot \mathcal{V}((W - L + (1 - p - l)I) - (W - L)) + (1 - p) \cdot \mathcal{V}((W - (p + l)I) - W) \\ & = p \cdot \mathcal{V}((1 - p - l)I) + (1 - p) \cdot \mathcal{V}(-(p + l)I), \end{aligned}$$

which is the same expression as in (3). Therefore, the predictions of our model coincide with the ones from a model in which reference points are determined by expectations and individuals do not expect to purchase coverage.[24]

If, instead, the individual was expecting to purchase full insurance, the reference point would be a degenerate distribution at $W - (p + l)L$, so the gain–loss utility from buying coverage $I \in [0, L]$ is

$$\begin{aligned} & p\mathcal{V}(W - L + (1 - p - l)I - (W - (p + l)L)) \\ & \quad + (1 - p)\mathcal{V}(W - (p + l)I - (W - (p + l)L)) \\ & \quad = p\mathcal{V}(-(1 - p - l)(L - I)) + (1 - p)\mathcal{V}((p + l)(L - I)). \end{aligned}$$

Following the same arguments as Proposition 2, it can be shown that, controling for preference parameters, someone who expected not to purchase insurance would be less likely to buy insurance than someone who expected to buy full insurance. As in standard nonexpected utility theories, individuals who expect to purchase full insurance may buy full insurance even when policies are actuarially unfair. However, unlike those theories, someone who did not expect to buy insurance may not buy coverage even when they are actuarially fair.

[24]This model differs from Kőszegi and Rabin (2009) in that the individual does not take into account the utility from being surprised with the insurance policy. Incorporating this "news utility" would lead to an additional effect, due to the current reduction in risk, which would partially offset the loss described above.

APPENDIX B

Variable Construction

The empirical analysis in the main text focuses on our dependent variable of most interest, "Has LTC insurance." This variable is derived from responses to the RAND 2012 HRS Core,[25] where the question for variable r11hiltc was worded as follows:

> *[Not including government programs, do] you now have any long-term care insurance which specifically covers nursing home care for a year or more, or any part of personal or medical care in your home?*

The response is coded as 1 if r11hiltc = 1, and 0 otherwise.

We also control on five other factors: Narrow Framing, Inverse Violation, Risk Averse, Cautious, and PercentChanceNH.

As described in the text, we create our measure of narrow framing using the answers to two of our module questions. These hypothetical questions, which are based on Tversky and Kahneman (1981), measure whether respondents have different preferences depending on whether outcomes are described in terms of gains or losses. By departing from the investment context, these questions permit us to measure loss aversion in individuals who are otherwise averse to investments for reasons unrelated to risk preferences (e.g., for religious reasons). The order of the questions shown was random. Then the Narrow Framing variable takes a value of 1 if the respondent selected the safe option in the "300 will be saved" condition and the risky option in the "300 will die" condition, and 0 otherwise.

Risk Averse: Early waves of the HRS included hypothetical gamble questions widely used in empirical research on risk aversion (Barsky et al., 1997). These questions were, however, discontinued after 2006, so we only have risk aversion measures available for the one-third of our respondents who entered the survey prior to that year. These risk preference measures prove to be substantially stable over time for those respondents asked the questions in several different waves (Sahm, 2012).

Cautious: Following Finkelstein and McGarry (2006), we create a variable from the 2012 HRS Core indicating the percent of sex-appropriate annual medical exams each individual undertook. Thus if the respondent was female, she received a maximum score of 4 based on whether she had had a flu shot, a mammogram, a pap smear, and a cholesterol test. Men received scores out of 3 based on whether they had had a flu shot, a prostate test, and a cholesterol test.

Percent Chance NH: This variable indicates the respondent's self-reported chance out of 100 of being in a nursing home in the next 5 years (r*pnhm5y in the Core HRS). If the variable was missing, we created a missing variable flag and imputed a median among those not missing if age ≥ 65; else $= 0$.

[25] Data documentation is available in Rohwedder, Oshiro, and Zissimopoulos (2011); St. Clair et al. (2011); and NIA (2014).

Other Controls

All demographic controls are taken from the respondent's HRS Core interview in the RAND files; missing values were recoded to missing and a dummy added in the list of regressors.

Age = na501-birthyr or na501-nx067_r;
Male = 1 if gender = 1; male = 0 if gender = 2;
White = 1 if raracem = 1, 0 else;
Hispanic = 1 if rahispan = 1, 0 else;
Married = 1 if 1 < = r11mstat < = 3; 0 if 3 < r11mstat < = 8; and
Education year = schlyrs if schlyrs < = 17.
We used several controls for respondent health taken from the HRS Core, constructed as follows:
Good health: healthgood = 1 if 1 < = r11shlt < = 3; 0 if 4 < = r11shlt < = 5
Cognition score: rcogtot = r*cogtot
ADL summary: radla = r11adla
Smoking: r10smoken
Depression: depression = 1 if r10cesd > = 3, 0 else
Drinking problem: drink = 1 if r10drinkn > = 3; 0 else
Diabetes: diabetes = 1 if r10diab = 1 or 3; diabetes = 0 if r10diab = 0 or 4
Stroke: stroke = 1 if r10strok = 1, 2 or 3; stroke = 0 if r10strok = 0 or 4
Heart condition: heart = 1 if r10heart = 1 or 3; heart = 0 if r10heart = 0 or 4
High blood pressure: highbp = 1 if r10hibp = 1 or 3; highbp = 0 if r10hibp = 0 or 4
Lung disease: lung = 1 if r10lung = 1 or 3; lung = 0 if r10lung = 0 or 4
Cancer: cancer = 1 if r10cancr = 1 or 3; cancer = 0 if r10cancr = 0 or 4
Arthritis: arthritis = 1 if r10arthr = 1 or 3; arthritis = 0 if r10arthr = 0 or 4

Loss Aversion

Two presentations (A and B) in the module get at loss aversion; which one a respondent was asked first depended on random assignment, and everyone saw both versions by the end of the module. Presentation A posed the risky choice as having to pay $100 to undertake a risky investment, while Presentation B offered the risky investment as a chance of winning money or having to pay.

When a respondent was randomized to Presentation A of the module, we noted this fact (in a randomization question order variable) and then asked him the following:[26]

- Suppose that a relative offers you an investment that costs you $100. If you agree to this investment, there is a 50–50 chance that you would receive either $215 or nothing. Would you agree to this investment?

If the answer was affirmative, the person received a less-good offer:

[26]The entire module with all branches appears at http://hrsonline.isr.umich.edu/modules/meta/2012/core/qnaire/online/HRS2012_Module1.pdf.

- Now instead, suppose that a relative offers you an investment that costs you $100. If you agree to this investment, there is a 50–50 chance that you would receive either $207 or nothing. Would you agree to this investment?

If still affirmative, an even less-good offer was as follows:

- Now, suppose that a relative offers you an investment that costs you $100. If you agree to this investment, there is a 50–50 chance that you would receive either $203 or nothing. Would you agree to this investment?

If the answer to the first question was negative, the branching led to a more attractive offer:

- Now instead, suppose that a relative offers you an investment that costs you $100. If you agree to this investment, there is a 50–50 chance that you would receive either $230 or nothing. Would you agree to this investment?

If the respondent still said no, he or she would see a yet more attractive offer:

- Now suppose that a relative offers you an investment that costs you $100. If you agree to this investment, there is a 50–50 chance that you would receive either $400 or nothing. Would you agree to this investment?

Thereafter (or first, if the respondent had been randomized to Presentation B first), the following question was posed:

- Suppose that a relative offers you an investment opportunity for which there is a 50–50 chance you would receive $115 or have to pay $100. Would you agree to this investment?

An affirmative answer led to this follow-up:

- Now instead, suppose that the same relative offers you a different investment opportunity for which there is a 50–50 chance you would receive $107 or have to pay $100. Would you agree to this investment?

And again an affirmative answer led to this less attractive offer:

- Now suppose that the same relative offers you a different investment opportunity for which there is a 50–50 chance you would receive $103 or have to pay $100. Would you agree to this investment?

A refusal to accept the first question led to a more positive offer:

- Now instead, suppose that the same relative offers you a different investment opportunity for which there is a 50–50 chance you would receive $130 or have to pay $100. Would you agree to this investment?

And another refusal led to this:

- Now suppose that the same relative offers you a different investment opportunity for which there is a 50–50 chance you would receive $300 or have to pay $100. Would you agree to this investment?

Table B1
Descriptive Statistics

	Full Sample		Subsample With Risk Aversion	
Variable	Mean	St. Dev.	Mean	St. Dev.
Has LTC Insurance (0,1)	0.12	0.32	0.14	0.35
Narrow Framing (0,1)	0.21	0.41	0.23	0.43
Inverse Violation (0,1)	0.06	0.24	0.05	0.22
Risk Averse (1–4)			3.36	1.01
Cautious (0–1)	0.67	0.31	0.72	0.30
PercentChanceNH (0–100)	8.29	18.11	5.50	14.34
Age (years)	66.23	11.19	63.29	5.17
Male (0,1)	0.41	0.49	0.38	0.49
White (0,1)	0.72	0.45	0.80	0.40
Hispanic (0,1)	0.12	0.32	0.10	0.30
Married (0,1)	0.65	0.48	0.74	0.44
Education (years)	12.81	2.98	13.15	2.85
Number of children	3.19	2.07	3.16	2.09
Good health (0,1)	0.73	0.45	0.74	0.44
Cognition score (12–33)	22.44	3.88	23.07	2.05
ADL summary (0–5)	0.27	0.81	0.21	0.76
Smoking (0,1)	0.16	0.36	0.16	0.37
Depression (0,1)	0.22	0.42	0.20	0.40
Drinking problem (0,1)	0.10	0.30	0.13	0.33
Diabetes (0,1)	0.23	0.42	0.26	0.44
Stroke (0,1)	0.08	0.27	0.07	0.26
Heart condition (0,1)	0.23	0.42	0.22	0.42
High blood pressure (0,1)	0.59	0.49	0.59	0.49
Lung disease (0,1)	0.09	0.28	0.09	0.29
Cancer (0,1)	0.14	0.34	0.11	0.31
Arthritis (0,1)	0.56	0.50	0.60	0.49
Loss averse 2 (0,1)	0.02	0.13	0.01	0.11
Loss averse 3 (0,1)	0.01	0.10	0.01	0.08
Loss averse 4 (0,1)	0.04	0.21	0.06	0.24
Loss averse 5 (0,1)	0.02	0.15	0.02	0.13
Loss averse 6 (0,1)	0.02	0.12	0.01	0.12
Loss averse 7 (0,1)	0.11	0.31	0.11	0.31
Loss averse 8 (0,1)	0.63	0.48	0.61	0.49
Net financial wealth ($100k)	105,101	417,209	137,346	573,578
Net nonhousing wealth ($100k)	253,062	675,959	315,053	748,410
Prob. leave bequest ($10k+)	63.2	39.7	68.8	38.0
N	1,699		514	

Notes: Sample consists of respondents to the 2012 HRS who did not live in a nursing home. Subsample with risk aversion excludes those who did not answer the risk aversion question.

We then translate participants' answers to these module questions into a loss aversion scale, where the reference category refers to the lowest level of loss aversion (LA1). We create seven additional dummy variables (LA2-8) indicating ever-higher levels of loss aversion Tables B1 and B2.

TABLE B2
Correlation between Narrow Framing and other Explanatory Variables

Variable	Full Sample	Subsample With Risk Aversion
Risk Averse (1–4)	0.01	0.06
Cautious (0–1)	0.05*	0.07
PercentChanceNH (0–100)	0	−0.01
Age (years)	−0.02	0
Male (0,1)	−0.08**	−0.07
White (0,1)	−0.05	0
Hispanic (0,1)	0	0.05
Married (0,1)	−0.04	−0.02
Education (years)	−0.01	−0.01
Number of children	−0.02	−0.08
Good health (0,1)	0.02	0
Cognition score (12–33)	−0.01	0.02
ADL summary (0–5)	0	−0.01
Smoker (0,1)	−0.01	−0.01
Depression (0,1)	0.02	0.05
Drinking problem (0,1)	−0.02	−0.02
Diabetes (0,1)	−0.01	−0.04
Stroke (0,1)	−0.03	0.01
Heart condition (0,1)	−0.02	0.01
High blood pressure (0,1)	−0.03	0.02
Lung disease (0,1)	0.03	0.1*
Cancer (0,1)	0	−0.03
Arthritis (0,1)	−0.01	0.02
Loss averse 2 (0,1)	0.02	0.02
Loss averse 3 (0,1)	−0.01	0.02
Loss averse 4 (0,1)	0.02	0.02
Loss averse 5 (0,1)	0.05*	0.08
Loss averse 6 (0,1)	0.03	0.05
Loss averse 7 (0,1)	0.01	−0.05
Loss averse 8 (0,1)	−0.05	−0.05
Net financial wealth ($100k)	−0.01	−0.01
Net nonhousing wealth ($100k)	−0.03	−0.03
Prob. leave bequest ($10k+)	−0.03	−0.07
N	1,699	514

Notes: Correlation coefficients between each variable and an indicator of whether the respondent is classified as a narrow framer. Sample consists of respondents to the 2012 HRS who did not live in a nursing home, excluding those who violate transitivity in the opposite direction. Subsample with risk aversion excludes those who did not answer the risk aversion question. *Significant at 0.10 level; **Significant at 0.05 level; ***Significant at 0.01 level.

APPENDIX C

Table C1
Additional Results for Analysis and Full Sample

Dependent Variable: Has LTC Insurance	Probit				LPM			
	With Risk Aversion		Full Sample		With Risk Aversion		Full Sample	
Narrow Framing	−0.0908***	−0.0503***	−0.0406**	−0.0275**	−0.0912***	−0.0883***	−0.0407**	−0.0402**
	[0.0306]	[0.0159]	[0.0176]	[0.0133]	[0.0310]	[0.0316]	[0.0177]	[0.0179]
Inverse Violation	−0.0161	0.0110	−0.0003	0.0189	−0.0181	0.0208		0.0244
	[0.0632]	[0.0475]	[0.0314]	[0.0286]	[0.0715]	[0.0691]		[0.0325]
Risk Aversion		−0.0401				−0.0403		
		[0.0653]				[0.1106]		
Cautious		0.0351		0.0873***		0.0521		0.0879***
		[0.0329]		[0.0220]		[0.0510]		[0.0228]
PercentChanceNH		0.0011*		0.0008**		0.0017		0.0011**
		[0.0006]		[0.0004]		[0.0013]		[0.0005]
Age		0.0582		−0.0080		0.0677		−0.0062
		[0.0422]		[0.0060]		[0.0451]		[0.0079]
Male		−0.0291		−0.0128		−0.0441		−0.0098
		[0.0220]		[0.0133]		[0.0369]		[0.0179]
White		−0.0007		−0.0008		−0.0182		−0.0027
		[0.0279]		[0.0160]		[0.0381]		[0.0172]
Hispanic		0.0129		−0.0102		0.0276		0.0035
		[0.0430]		[0.0228]		[0.0501]		[0.0222]
Married		0.0160		0.0253*		0.0257		0.0249
		[0.0220]		[0.0138]		[0.0351]		[0.0177]

(*Continued*)

TABLE C1
Continued

	Probit		LPM	
	With Risk Aversion	Full sample	With Risk Aversion	Full sample
Education (years)	0.0124***	0.0107***	0.0181***	0.0114***
	[0.0044]	[0.0026]	[0.0059]	[0.0027]
Good health	0.0018	0.0261*	0.0080	0.0335*
	[0.0272]	[0.0149]	[0.0365]	[0.0181]
Cognition	−0.0166	−0.0012	−0.0687	−0.0085
	[0.0357]	[0.0117]	[0.0618]	[0.0130]
ADL summary	−0.0036	0.0090	−0.0031	0.0091
	[0.0184]	[0.0084]	[0.0203]	[0.0106]
Smoking	0.0010	−0.0015	0.0133	0.0020
	[0.0297]	[0.0189]	[0.0396]	[0.0192]
Depression	−0.0225	−0.0146	−0.0420	−0.0234
	[0.0256]	[0.0158]	[0.0344]	[0.0172]
Drink	−0.0388*	−0.0188	−0.0709	−0.0310
	[0.0207]	[0.0197]	[0.0434]	[0.0255]
Diabetes	−0.0276	−0.0038	−0.0474	−0.0104
	[0.0205]	[0.0156]	[0.0354]	[0.0192]
Stroke	−0.0576***	−0.0220	−0.0804*	−0.0357
	[0.0216]	[0.0221]	[0.0474]	[0.0278]
Heart	0.0194	0.0152	0.0345	0.0238
	[0.0281]	[0.0162]	[0.0445]	[0.0211]
High blood pressure	0.0148	0.0132	0.0293	0.0182
	[0.0212]	[0.0137]	[0.0375]	[0.0181]
Lung	0.0426	−0.0012	0.0448	−0.0063
	[0.0571]	[0.0235]	[0.0595]	[0.0274]
Cancer	0.0686	0.0306	0.0935	0.0429
	[0.0430]	[0.0204]	[0.0597]	[0.0264]

(*Continued*)

Table C1
Continued

	Probit		LPM	
	With Risk Aversion	Full Sample	With Risk Aversion	Full Sample
Arthritis	−0.0195	−0.0304	−0.0307	−0.0008
	[0.0222]	[0.0366]	[0.0362]	[0.0178]
Loss averse 2 (0,1)	−0.0711***	−0.0784	−0.0722	0.0461
	[0.0117]	[0.0575]	[0.0579]	[0.0621]
Loss averse 3 (0,1)	−0.0658***	0.0464	0.0231	−0.0866***
	[0.0109]	[0.0790]	[0.0730]	[0.0265]
Loss averse 4 (0,1)	0.0305	0.0355	0.0296	−0.0047
	[0.0607]	[0.0766]	[0.0760]	[0.0404]
Loss averse 5 (0,1)	−0.0711***	−0.0340	−0.0419	−0.0205
	[0.0118]	[0.0468]	[0.0455]	[0.0438]
Loss averse 6 (0,1)	0.2622	0.2690	0.2609	0.1382*
	[0.2662]	[0.1884]	[0.1852]	[0.0773]
Loss averse 7 (0,1)	0.0840	0.1268*	0.1251	0.0525
	[0.0562]	[0.0690]	[0.0686]	[0.0335]
Loss averse 8 (0,1)	0.0064	0.0144	0.0115	0.0088
	[0.0267]	[0.0428]	[0.0424]	[0.0219]
Age^2	−0.0005	−0.0006	−0.0006	0.0000
	[0.0004]	[0.0004]	[0.0004]	[0.0001]
$RiskAversion^2$	0.0070	0.0067	0.0073	
	[0.0119]	[0.0203]	[0.0201]	
$Cognition^2$	0.0005	0.0017	0.0018	0.0002
	[0.0008]	[0.0014]	[0.0014]	[0.0003]

(*Continued*)

TABLE C1
Continued

	Probit				LPM			
	With Risk Aversion		Full Sample		With Risk Aversion		Full Sample	
Number of children		−0.0036		−0.0042		−0.0047		−0.0033
		[0.0051]		[0.0068]		[0.0068]		[0.0035]
Net financial wealth ($100k)		0.0002		−0.0002				0.0032
		[0.0019]		[0.0038]				[0.0040]
Net nonhousing wealth ($100k)		0.0000		0.0008				0.0003
		[0.0016]		[0.0033]				[0.0020]
Prob. leave bequest ($10K+)		0.0003		0.0005				0.0005***
		[0.0003]		[0.0004]				[0.0002]
n	514	514	1,699	1,699	514	514	1,699	1,699

Notes: LTC, long-term care; LPM, Linear Probability Model. Sample consists of respondents to the 2012 HRS nonresident in a nursing home. Subsample with risk aversion excludes those who did not answer the risk aversion question (see text). Marginal effects are reported for Probit models. Also included in the second and fourth columns are dummies for missing control variables. Robust standard errors are reported, with observations clustered on households. *Significant at 0.10 level; **Significant at 0.05 level; ***Significant at 0.01 level.

TABLE C2
Determinants With Cognition Dropped

	Probit		LPM	
Dependent Variable: Has LTC Insurance	With Risk Aversion	Full Sample	With Risk Aversion	Full Sample
Narrow Framing	−0.0475***	−0.0268**	−0.0867***	−0.0392**
	[0.0167]	[0.0135]	[0.0323]	[0.0179]
Inverse Violation	0.0253	0.0172	0.0324	0.0215
	[0.0513]	[0.0284]	[0.0708]	[0.0324]
Risk Aversion	−0.0476		−0.0523	
	[0.0649]		[0.1122]	
Cautious	0.0357	0.0867***	0.052	0.0882***
	[0.0328]	[0.0223]	[0.0512]	[0.0229]
PercentChanceNH	0.0011*	0.0008**	0.0016	0.0011**
	[0.0006]	[0.0004]	[0.0013]	[0.0005]
N	514	1,699	514	1,699
R^2/pseudo R^2	0.180	0.121	0.130	0.081

Notes: LTC, long-term care; LPM, Linear Probability Model. Same as Tables 2 and 3, except that cognition and cognition squared are not included. Estimates for other controls are omitted for brevity. *Significant at 0.10 level; **Significant at 0.05 level; Significant at 0.01 level.

TABLE C3
Alternative Specification

	Probit		LPM	
Dependent Variable: Has LTC Insurance	With Risk Aversion	Full Sample	With Risk Aversion	Full Sample
Narrow Framing × Loss Averse	−0.0394**	−0.0209	−0.0753**	−0.0325
	[0.0179]	[0.0147]	[0.0356]	[0.0199]
Inverse Violation	0.0179	0.0215	0.0294	0.0272
	[0.0503]	[0.0291]	[0.0677]	[0.0324]
Risk Aversion	−0.0423		−0.0421	
	[0.0662]		[0.1109]	
Cautious	0.0343	0.0861***	0.0473	0.0861***
	[0.0335]	[0.0220]	[0.0508]	[0.0228]
PercentChanceNH	0.0012*	0.0008**	0.0017	0.0011**
	[0.0006]	[0.0004]	[0.0013]	[0.0005]
Age	0.0561	−0.008	0.0672	−0.0063
	[0.0419]	[0.0060]	[0.0451]	[0.0079]
Male	−0.0294	−0.0123	−0.0433	−0.0091
	[0.0224]	[0.0133]	[0.0371]	[0.0179]
White	−0.002	−0.0002	−0.0202	−0.0022
	[0.0287]	[0.0160]	[0.0382]	[0.0172]

(*Continued*)

TABLE C3
Continued

	Probit		LPM	
Dependent Variable: Has LTC Insurance	With Risk Aversion	Full Sample	With Risk Aversion	Full Sample
Hispanic	0.0124	−0.0103	0.0271	0.0038
	[0.0434]	[0.0228]	[0.0505]	[0.0222]
Married	0.0168	0.0255*	0.0274	0.0254
	[0.0222]	[0.0138]	[0.0351]	[0.0177]
Education (years)	0.0128***	0.0108***	0.018***	0.0114***
	[0.0045]	[0.0026]	[0.0059]	[0.0027]
Good health	0.0023	0.0257*	0.0083	0.033*
	[0.0273]	[0.0149]	[0.0366]	[0.0181]
Cognition	−0.0153	−0.0007	−0.0697	−0.0082
	[0.0368]	[0.0116]	[0.0617]	[0.0129]
ADL summary	−0.003	0.0088	−0.0014	0.009
	[0.0187]	[0.0084]	[0.0200]	[0.0106]
Smoking	0.0039	−0.0013	0.015	0.0021
	[0.0308]	[0.0190]	[0.0396]	[0.0192]
Depression	−0.0223	−0.0143	−0.0417	−0.0234
	[0.0263]	[0.0159]	[0.0343]	[0.0172]
Drink	−0.0388*	−0.0185	−0.0706	−0.031
	[0.0213]	[0.0198]	[0.0434]	[0.0255]
Diabetes	−0.0269	−0.0036	−0.0458	−0.0101
	[0.0209]	[0.0156]	[0.0355]	[0.0192]
Stroke	−0.058**	−0.022	−0.08*	−0.0357
	[0.0229]	[0.0222]	[0.0480]	[0.0278]
Heart	0.0209	0.0155	0.0347	0.0238
	[0.0286]	[0.0162]	[0.0447]	[0.0211]
High blood pressure	0.0146	0.0134	0.0303	0.0186
	[0.0215]	[0.0136]	[0.0376]	[0.0181]
Lung	0.0363	−0.0021	0.0383	−0.0072
	[0.0548]	[0.0234]	[0.0593]	[0.0274]
Cancer	0.0673	0.0302	0.0928	0.0424
	[0.0431]	[0.0203]	[0.0595]	[0.0264]
Arthritis	−0.0196	0.0009	−0.0307	−0.0009
	[0.0225]	[0.0136]	[0.0367]	[0.0178]
Loss averse 2 (0,1)	−0.0728***	0.0341	−0.0573	0.0532
	[0.0118]	[0.0612]	[0.0582]	[0.0623]
Loss averse 3 (0,1)	−0.0674***	−0.0815***	0.0691	−0.0789***
	[0.0111]	[0.0072]	[0.0778]	[0.0264]
Loss averse 4 (0,1)	0.0475	0.0104	0.057	0.0024
	[0.0674]	[0.0373]	[0.0767]	[0.0405]
Loss averse 5 (0,1)	−0.0727***	−0.0173	−0.0146	−0.014
	[0.0119]	[0.0459]	[0.0503]	[0.0449]
Loss averse 6 (0,1)	0.2879	0.1361	0.2868	0.1448*
	[0.2698]	[0.0892]	[0.1885]	[0.0777]

(Continued)

TABLE C3
Continued

	Probit		LPM	
Dependent Variable: Has LTC Insurance	With Risk Aversion	Full Sample	With Risk Aversion	Full Sample
Loss averse 7 (0,1)	0.1072*	0.0474	0.1498**	0.0598*
	[0.0617]	[0.0319]	[0.0697]	[0.0340]
Loss averse 8 (0,1)	0.0183	0.0103	0.0359	0.0163
	[0.0266]	[0.0178]	[0.0443]	[0.0223]
Age^2	−0.0005	0.0001	−0.0006	0.0000
	[0.0004]	[0.0000]	[0.0004]	[0.0001]
RiskAversion^2	0.0074		0.007	
	[0.0121]		[0.0204]	
Cognition^2	0.0005	0.0000	0.0018	0.0002
	[0.0008]	[0.0003]	[0.0014]	[0.0003]
Number of children	−0.0031	−0.0026	−0.0036	−0.0032
	[0.0051]	[0.0032]	[0.0068]	[0.0035]
Net financial wealth ($100k)	0.0001	0.0014	−0.0003	0.0032
	[0.0019]	[0.0017]	[0.0037]	[0.0040]
Net nonhousing wealth ($100k)	0.0002	−0.0002	0.0011	0.0004
	[0.0017]	[0.0010]	[0.0033]	[0.0020]
Prob. leave bequest ($10k+)	0.0004	0.0005***	0.0005	0.0005***
	[0.0003]	[0.0002]	[0.0004]	[0.0002]
N	514	1,699	514	1,699
Pseudo R^2/R^2	0.178	0.125	0.132	0.084

Notes: LTC, long-term care; LPM, Linear Probability Model. Sample consists of respondents to the 2012 HRS nonresident in a nursing home. Subsample with risk aversion excludes those who did not answer the risk aversion question (see text). Loss Averse is a dummy variable for those in loss aversion categories 2–8. Marginal effects are reported for Probit models. Dummies for missing control variables are also included. Robust standard errors are reported, with observations clustered on households. *Significant at 0.10 level; **Significant at 0.05 level; ***Significant at 0.01 level.