The Impact of Consumer Numeracy on the Purchase of Long-Term Care Insurance

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Objective. To determine the effect of consumers' numeric abilities on the likelihood of owning private long-term care insurance.

Data Source. The 2010 wave of the Health and Retirement Study, a nationally representative survey of Americans age 50 and older, was used ($n = 12,796$).

Study Design. Multivariate logistic regression was used to isolate the relationship between numeracy and long-term care insurance ownership.

Principal Findings. Each additional question answered correctly on a numeracy scale was associated with a 13 percent increase in the likelihood of holding LTCI, after controlling for predictors of policy demand, education, and cognitive function.

Conclusions. Poor numeracy may create barriers to long-term care insurance purchase. Policy efforts aimed at increasing consumer decision support or restructuring the marketplace for long-term care insurance may be needed to increase older adults' ability to prepare for future long-term care expenses.

Key Words. Long-term care insurance, consumer decision making, numeracy, long-term care financing

Relatively few individuals own private long-term care insurance (LTCI). Over the last two decades, various policy initiatives have been implemented to increase the uptake of this product including state and federal tax incentives (Courtemanche and He 2009; Goda 2011), the creation of public-private Partnership Plans (Bergquist, Costa-Font, and Swartz 2015), the tightening of Medicaid eligibility requirements (Koss 2007), and the creation of federally and state-funded consumer awareness campaigns (Iwasaki et al. 2010). Despite these efforts, only about 12 percent of elderly Americans are covered by a plan (Johnson and Park 2011). Additionally, public safety-net coverage in the form of Medicaid continues to serve as the primary payer of long-term

care (LTC) with about a third of national Medicaid spending being devoted to these services (Eiken et al. 2014). A significant amount of prior research has examined why so few individuals insure against one of the largest financial risks currently facing older individuals. Potential explanations have focused on both demand- and supply-side factors that explain the current LTCI market size within the framework of rational consumers appropriately responding to incentives. These include crowd-out of demand for LTCI by Medicaid (Brown, Coe, and Finkelstein 2007; Brown and Finkelstein 2008), substitution of informal caregiving by friends and family for formal LTC (Mellor 2001), the strategic use of bequests to encourage children to provide informal care (Pauly 1990), and the high price of policies due to market inefficiencies that result from asymmetric information, adverse selection, and the challenges associated with insuring a long-term risk (Crown, Capitman, and Leutz 1992; Brown and Finkelstein 2004; Finkelstein, McGarry, and Sufi 2005). These explanations have been found to have varying degrees of empirical support, yet there may be additional factors that further explain the low levels of LTCI ownership.

An area that has not received much attention is the extent to which older adults have the necessary skills and competencies to appropriately prepare for future LTC expenses. Given the complexity of planning for a long-term risk and navigating the various mechanisms through which LTC can be financed, consumer competency may be a key factor in understanding current insuring behavior. One competency that may be of particular importance is numeracy, or the ability to understand and correctly manipulate numeric information (Reyna and Brainerd 2007). Assessing the value of a private LTCI policy requires a variety of computations, including determining the probability of needing LTC, evaluating the anticipated lifetime expense of LTCI premiums against the total payments one can expect to receive from a policy in present dollar terms, and comparing the costs and benefits of LTCI against other consumption-smoothing mechanisms such as “spending-down” income and assets to meet Medicaid eligibility requirements or self-insuring. Individuals

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without adequate numeracy may be overwhelmed by these calculations and could face significant barriers to purchasing LTCI. Previous research from the related fields of retirement planning, medical decision making, and the navigation of health insurance markets has provided evidence that higher numeracy is an important independent predictor of a variety of positive outcomes, including greater wealth accumulation in preparation for retirement, better understanding of the risks and benefits of health testing, greater uptake of Medigap and Medicare Part D policies, and better health insurance comprehension (Peters et al. 2007; Smith, McArdle, and Willis 2010; Chan and Elbel 2012; Kuye, Frank, and McWilliams 2013; Barnes, Hanoch, and Rice 2015). Furthermore, international studies have documented high levels of innumeracy in the United States relative to other developed countries (OECD 2013), suggesting that many individuals may lack the numeric abilities needed to navigate a complex insurance market.

This study seeks to close a gap in the literature by examining the impact of numeric abilities on the likelihood of owning an LTCI policy in a nationally representative sample of older Americans.

Conceptual Model

Purchasing a LTCI policy can be complex. The process of obtaining private coverage involves two key decision points which present significant demands on an individual's ability to understand and manipulate numbers. The first decision point entails a choice of whether to purchase an LTCI policy. This stage likely involves evaluations of one's probability of needing LTC, the anticipated costs of such care, the risk he or she is willing to bear, and the value of LTCI relative to competing alternatives such as self-insurance or strategic reliance on Medicaid. Conditional on choosing to purchase a policy, the consumer must then make decisions regarding the design of his or her plan. Because the majority of policies are sold on an individual basis (LifePlans 2012), a high degree of policy customization is typically available. For example, a LTCI buyer can face decisions regarding the elimination period of the policy (a deductible that sets the number of days over which one must receive LTC before the policy begins paying for these services), the daily benefit amount, the duration of benefits, and whether this amount is adjusted for inflation over time. All of these variables influence both the expected benefit of coverage and the associated monthly premium and therefore require careful evaluation and calculation by the buyer.

In light of the challenging nature of navigating the LTCI market, it is reasonable to expect that individuals with lower numeric ability face unique barriers to purchase. Specifically, those without sufficient numeric abilities are likely to have additional transaction costs that stem from the need to obtain requisite numeric knowledge needed for product evaluation or assistance from a third party or decision aid to overcome this deficiency. Furthermore, in accordance with the theory of bounded rationality (Simon 1987), individuals with low numeracy may be more likely to be overwhelmed by the problem of deciding whether to insure against LTC costs as the task at hand exceeds one's available knowledge and computational capacity. In both cases, innumerate consumers would be biased toward "choosing" the default option: doing nothing and forgoing LTCI purchase. As a result, we hypothesize that higher numeracy will be predictive of owning an LTCI policy.

The precise determinants of an individual's numeric abilities are currently not well understood. Because the construct of numeracy extends beyond simple knowledge of mathematical concepts and encompasses one's quantitative reasoning skills and propensity to implement them during decision-making tasks (Reyna et al. 2009; Peters 2012), this construct is believed to be multifaceted and complex. It has been shown to be related to both an individual's acquired knowledge (formal education) and innate intelligence (Peters et al. 2006; Rothman et al. 2008). However, existing evidence also suggests that numeracy represents a distinct ability as it remains predictive of better decision performance even after controlling for measures of educational attainment and general cognitive ability (Peters et al. 2006; Wood et al. 2011). This notion is further supported by research that finds generally low levels of numeracy that persist among highly educated samples (Lipkus, Samsa, and Rimer 2001). The relationship between numeracy and other individual characteristics or preferences is presently unclear. One preference with particular relevance to LTCI purchase is risk tolerance. No studies have specifically evaluated the relationship between numeracy and risk aversion, but general cognitive abilities have been shown to have either a positive association with greater risk tolerance (Benjamin, Brown, and Shapiro 2008) or no meaningful association (Andersson et al. 2013). These relationships are in concordance with the finding that less numerate individuals are less likely to participate in the stock market, a relatively risky investment vehicle (Van Rooij, Lusardi, and Alessie 2011). Collectively, the available evidence suggests that numeracy is a skill that stems from both an individual's inherent abilities and his or her experience and training. It is not thought to be a manifestation of preferences or personality. With this in mind, we assume that

numeracy does not impact an individual's demand for insurance, only the ability to navigate the market in which it is sold.

To better isolate the role of numeracy in the LTCI purchasing decision, this study evaluated if greater numeracy was an independent predictor of LTCI ownership after controlling for measures of general cognitive ability and educational attainment. Additionally, we account for potential differences in demand for and availability of LTCI between those with high versus low numeracy by controlling for a variety of observable individual-level factors that economic theory predicts influence these factors.

STUDY DATA AND METHODS

Data and Sample

We used the 2010 wave of the Health and Retirement Study (HRS), a nationally representative panel survey of Americans age 50 and older (2013). The HRS is a household survey, meaning that questions are asked of both the sampled individual and his or her spouse, if applicable. For our analysis, we restricted our sample to those ages 50 years and older that identify as the "financial respondent," meaning the spouse who is most knowledgeable about the household's finances. It is likely that the financial respondent is the one most directly involved in the making of family financial decision, such as purchasing an LTCI policy. As such, restricting the sample to these individuals was best suited to examining the relationship between numeracy and LTCI ownership.

In 2010, there were 14,007 financial respondents. Individuals with missing information related to LTCI ownership (329 respondents) and numeracy scores (194 respondents) were excluded. Additionally, 753 respondents with no available information in the control variables of interest were excluded, resulting in a final analytic sample of 12,796 (91 percent of those initially eligible for study inclusion).

Variables

Measure of Numeracy. The HRS contains a three-question assessment of numeric ability that focuses on probability, computation, and working with large numbers that has previously been used to capture the construct of numeracy and has been linked to several insurance and economic outcomes (McArdle, Smith, and Willis 2009; Smith, McArdle, and Willis 2010; Chan and Elbel 2012; Kuye, Frank, and McWilliams 2013). The full text of the

questions can be found in the Supplemental Materials. Questions 1 and 2 were asked of all respondents, while the third question was asked only of those who got at least one of the first two questions right. The measure is scored in accordance with the Guttman scaling approach, used in most intelligence tests (Wechsler 2008), by counting the number of correct responses and treating “Don’t Know” responses as a wrong answer.

Measure of Cognitive Ability. We attempted to isolate the independent effect of numeracy from the more global concept of overall cognitive ability. The HRS contains several measures of various components of cognitive ability. We used two composite scales that capture one’s “executive function,” or overall basic mental status, and immediate and delayed recall abilities. The mental status measure ranges from 0 to 15, while the word recall measure ranges from 0 to 20. Collectively, these two scales provide a good measure mental intactness; they have previously been used as a total cognition measure that broadly captures an individual’s general cognitive ability (Blaum, Ofstedal, and Liang 2002; Hung et al. 2009; Chan and Elbel 2012). Further details on the individual measures within these composite scales can be found in the Supplemental Materials.

Control Variables. Our model accounts for a variety of individual-level factors that economic theory or previous empirical work suggests are important predictors of LTCI demand and/or ownership. Specifically, we include demographic factors such as age, marital status, gender, race/ethnicity, number of living children, and education (Pauly 1990; McCall et al. 1998; Mellor 2001; Brown and Finkelstein 2007, 2009; Brown, Goda, and McGarry 2012; Department of Health and Human Services 2012; McGarry, Temkin-Greener, and Li 2013). We also include household measures of income and assets, created using the detailed financial information available in the HRS (Sloan and Norton 1997; Brown, Coe, and Finkelstein 2006). Health status is another important individual predictor of demand (Finkelstein and McGarry 2006; LifePlans 2010). We account for this construct using a self-report of overall health (using a 5-point Likert scale), a count of the presence of particular chronic conditions (high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis), the presence of memory-related diseases (such as Alzheimer’s or dementia), and counts of the number of limitations in activities of daily living (bathing, eating, dressing, walking across a room, and get-

ting in/out of bed) or instrumental activities of daily living (using a telephone, taking medication, handling money, shopping, and preparing meals).

We also control for several measures concerning one's future expectations. Namely, we account for an individual's anticipated need for nursing home use using an HRS question that measures perceived probability of needing a nursing home within the next 5 years for those aged 65 years and older. We assumed that the probability of nursing home need for those under 65 years is zero, consistent with an approach used previously by Sloan and Norton (1997). To minimize the effects of response anchoring around particular whole numbers (i.e., probability = 0/50/100) and our assumption for respondents younger than 65, we categorize nursing home risk into the following groups: (1) low risk ($0 \leq p < 10$); (2) medium risk ($10 \leq p < 50$); and (3) high risk ($50 < p \leq 100$). A fourth category was created to account for the 847 individuals over the age of 65 years who did not have a current response to this question. We capture bequest motives using responses to a series of questions concerning the amount of any anticipated bequest. The measure has four categories: (1) unlikely to leave a bequest; (2) likely to leave a bequest worth less than \$10,000; (3) likely to leave a bequest between \$10,000 and \$100,000; (4) likely to leave a bequest greater than \$100,000. A fifth category was also included to account for the 146 individuals who did not have a response to any of the bequest questions available in any waves of the HRS. We account for the anticipated availability of informal caregivers using respondents' yes/no responses to a question regarding whether they anticipate a relative or friend being available to provide personal care for an extended period of time should the need arise. Individuals without a response to this question across all available HRS waves were classified as "unknown."

A final individual-level factor that is likely to influence demand for LTCI is one's level of risk tolerance. To assess risk preferences, we follow an approach used by Finkelstein and McGarry (2006) in their evaluation of private information in the LTCI market. Namely, we construct two measures of risk preferences using responses to questions regarding participation in preventive behaviors. The first is a dichotomous variable equal to one if the respondent reports wearing his/her seatbelt "all of the time" when in a car. The second measure captures the percent of gender-specific preventive health behaviors an individual reports doing in the past 2 years. For both genders, these activities include a flu shot and blood test for cholesterol. For men, a prostate exam is added to the list, while women were also asked if they performed monthly breast exams, had a mammogram, and had a Pap smear. Finkelstein and McGarry

found evidence that these measures were a good proxy for risk aversion as they were significantly predictive of owning a LTCI policy despite also being associated with lower likelihood of using LTC.

Statistical Analyses

To evaluate the relationship between numeracy and LTCI ownership, we performed bivariate and multivariate analyses. In bivariate analyses, we used χ^2 tests to examine how the rate of private LTCI ownership varies across scores on our measure of numeracy. We then isolated the independent effect of numeracy on LTCI purchase by adding our numeracy measure to a multivariate logistic regression with an indicator for owning a private LTCI policy (1 = yes; 0 = no) as the dependent variable and independent variables related to cognitive function, education, and demand for LTCI coverage. Odds ratios (OR) and associated *P*-values of both models were reported. We used survey estimation routines throughout our analyses to account for the complex sampling design of the HRS and produce unbiased standard errors and point estimates. All analyses were performed with *Stata version 12.1, Special Edition* (STATA Corp., College Station, TX, USA).

RESULTS

Overall, the rate of LTCI ownership in our sample was 12 percent, consistent with previous estimates of ownership rates. The average numeracy score was 1.38 (95 percent CI: 1.34, 1.41) out of a possible 3 points (Table 1), with only 11 percent of respondents answering all three questions correctly. It is important to note that our sample was restricted to those who identified themselves as the household's financial respondents, so this group presumably has better numeric abilities than a general sample of older adults. In fact, when numeracy scores are examined for nonfinancial respondents in the HRS, the average numeracy score falls to 1.26 (95 percent CI: 1.23, 1.31). Results of bivariate analysis showed that rates of LTCI ownership do vary significantly across numeracy scores with about 17 percent of those with a numeracy score of 3 owning a policy compared to just 7 and 10 percent of those with a score 0 and 1, respectively ($p < .001$; Table 2).

Our baseline multivariate model, which excludes numeracy, produces results that are consistent with current theory and previous findings (Table 3—Model 1). Women and whites (relative to Hispanics) were more

Table 1: Sample Characteristics

	<i>Financial Respondents</i>
<i>N</i>	12,796
Population estimate	60,356,257
LTCI ownership	12.0%
Numeracy score; mean (SD); 0–3	1.38 (0.87)
Cognition—word recall; mean (SD); 0–20	10.08 (3.21)
Cognition—mental status; mean (SD); 0–15	12.94 (2.17)
Age; mean (SD); in years	65.05 (10.3)
Race/ethnicity	
White, NH	78.5%
Black, NH	11.3%
Hispanic	7.8%
Other	2.3%
Marital status	
Married	49.4%
Gender	
Female	51.9%
Years of education; mean (SD)	13.29 (2.76)
Number of living children; mean (SD)	2.64 (1.83)
Income; mean (SD)	69,516 (98,223.34)
Wealth; mean (SD)	452,327 (1,143,600)
Self-reported health status	
Poor	7.2%
Fair	18.3%
Good	30.8%
Very good	32.3%
Excellent	11.4%
Number of ADLs; mean (SD); 0–5	0.30 (0.82)
Number of IADLs; mean (SD); 0–5	0.25 (0.73)
Presence of memory-related illness	1.7%
Count of chronic conditions; mean (SD); 0–8	2.06 (1.44)
Bequest motives	
Unlikely to leave bequest	14.1%
Likely less than \$10,000	20.0%
Likely \$10,000–\$100,000	23.9%
Likely more than \$100,000	41.3%
Unknown	0.7%
Expect to use NH in 5 years	
Low risk	77.6%
Medium risk	13.6%
High risk	7.4%
Unknown	1.4%
Percent of preventive behaviors; mean (SD)	67.8 (28.5)
Always wears seatbelt	84.6%
Expect informal caregiver	
Yes	61.7%
Unknown	5.9%

ADLs, activities of daily living; IADLs, instrumental activities of daily living; NH, nursing home.

Table 2: Results of Bivariate Analysis of Numeracy Scores and Long-Term Care Insurance (LTCI) Ownership

	Numeracy Score				<i>p-value</i>
	0	1	2	3	
Percent of population	19.1	35.2	34.9	10.9	<.001***
Own LTCI (%)	7.8	10.3	14.4	17.3	

***Indicates significance at the $p < .001$ level.

likely to own a policy, bequest motives and having greater income were positively associated with ownership, and measures of informal caregiver availability were associated with not owning a policy. The prevention-based measures of risk aversion were associated with having LTCI, as was having higher anticipated need of a nursing home within the next 5 years.

When numeracy was added to this model, we find that numeric ability is a significant predictor of LTCI ownership (AOR = 1.13; $p = .019$; Table 3—Model 2). Each additional numeracy question answered correctly is associated with 13 percent greater odds of owning a policy. As Figure 1 demonstrates, this equates to an adjusted mean rate of LTCI ownership of 10.2 percent (95 percent CI: 8.6–11.8 percent) among those who answered no numeracy questions correctly compared with an adjusted rate of 14.0 percent (95 percent CI: 12.1–16.0 percent) among those who got all three questions right (an increase of about 37 percent). It is interesting to note that in both models, our measures of cognitive function were not found to be significant factors, although the presence of the numeracy measure marginally decreased the associated effect estimates. Similarly, the addition of numeracy resulted in only a small reduction in the effect estimate for years of education, suggesting that this construct is distinct from general cognition and formal education. Other predictors of LTCI ownership were not substantively altered by the inclusion of numeracy, though the estimated difference between females and males increased when the model accounted for numeric ability.

In an additional sensitivity analysis, we included information about life insurance ownership in an attempt to more directly control for risk preferences related to insuring behavior. This measure, which may capture both risk aversion and employment status as many individuals acquire this coverage through a current or former employer at little or no cost, did not alter our estimated relationship between numeracy and LTCI ownership (see Supplemental Materials for full results of this model).

Table 3: Results of Multivariate Analysis of Numeracy and Long-Term Care Insurance (LTCI) Ownership

	<i>Long-Term Care Insurance Ownership</i>			
	<i>Model 1</i>		<i>Model 2</i>	
	<i>Adjusted Odds Ratio</i>	<i>p-value</i>	<i>Adjusted Odds Ratio</i>	<i>p-value</i>
Numeracy score			1.13	.019*
Cognition-word recall	1.01	.583	1.00	.812
Cognition-mental status	1.01	.589	0.99	.773
Age	1.02	.336	1.02	.299
Race/ethnicity				
White, NH	Ref		Ref	
Black, NH	0.99	.943	1.04	.726
Hispanic	0.63	.012*	0.65	.02*
Other	0.53	.007*	0.54	.01**
Marital status				
Married	0.98	.775	0.97	.68
Gender				
Female	1.17	.036*	1.22	.008**
Years of education	1.12	<.001***	1.11	<.001***
Number of living children	0.95	.033*	0.95	.033*
Income (\$10,000s)	1.01	.038*	1.01	.049*
Wealth (\$10,000s)	1.00	.822	1.00	.799
Self-reported health status				
Poor	Ref		Ref	
Fair	1.12	.623	1.12	.626
Good	1.09	.701	1.08	.721
Very good	1.30	.289	1.29	.307
Excellent	1.37	.241	1.36	.254
Number of ADLs	1.07	.293	1.07	.303
Number of IADLs	0.96	.552	0.96	.537
Presence of memory-related illness				
No	Ref		Ref	
Yes	1.02	.948	1.01	.966
Count of chronic conditions	0.98	.467	0.98	.453
Bequest motives				
Unlikely to leave bequest	Ref		Ref	
Likely less than \$10,000	1.64	.01**	1.64	.01**
Likely \$10,000–\$100,000	1.87	.001***	1.85	.001***
Likely more than \$100,000	2.51	<.001***	2.46	<.001***
Unknown	1.26	.763	1.27	.749
Expect to use NH in 5 years				
Low risk	Ref		Ref	
Medium risk	1.20	.011*	1.20	.011*
High risk	1.53	<.001***	1.53	<.001***
Unknown	0.94	.844	0.93	.823

continued

Table 3. Continued

	Long-Term Care Insurance Ownership			
	Model 1		Model 2	
	Adjusted Odds Ratio	p-value	Adjusted Odds Ratio	p-value
Percent of preventive behaviors	1.01	<.001***	1.01	<.001***
Always wears seatbelt	1.31	.029*	1.31	.029*
Expect informal caregiver				
No	Ref		Ref	
Yes	0.85	.075	0.85	.081
Unknown	0.73	.081	0.73	.083
Cohort				
Pre-1924	Ref		Ref	
1924–1930	1.46	.077	1.47	.072
1931–1941	1.55	.209	1.56	.199
1942–1947	1.42	.461	1.42	.456
1948–1953	1.27	.673	1.28	.662
1954–1959	0.94	.927	0.95	.938

*Indicates significance at the $p \leq .05$ level; **Indicates significance at the $p \leq .01$ level; ***Indicates significance at the $p \leq .001$ level.
 ADLs, activities of daily living; IADLs, instrumental activities of daily living; NH, nursing home.

Figure 1: Adjusted Mean Rate of Long-Term Care Insurance (LTCI) Ownership by Numeracy Score

DISCUSSION

This study indicates that numeric abilities are an important predictor of LTCI ownership, even after controlling for a variety of determinants of policy

demand, high-level measures of cognitive function, and education. The importance of consumer decision making has grown considerably in recent years, particularly for older Americans. The rise of consumer-directed retirement planning and the expansion of choice in the Medicare program have often placed U.S. seniors at the forefront of experimentations in consumerism. Research in these two areas has shown that numeracy is a key component of one's decision-making abilities that is independently predictive of stock market participation and investment portfolio composition (Banks and Oldfield 2007; Smith, McArdle, and Willis 2010), pension comprehension (Banks and Oldfield 2007), wealth accumulation (Smith, McArdle, and Willis 2010), enrollment in supplemental Medicare coverage (Chan and Elbel 2012), uptake of Part D coverage (Kuye, Frank, and McWilliams 2013), and optimal Part D plan selection in experimental settings (Wood et al. 2011). In light of the lack of a publicly supported entitlement program that covers LTC expenses and the fact that the existing LTCI market is largely unregulated, it is reasonable to expect that consumer decision-making abilities also play an important role in determining how successful one is in preparing for this future financial risk. Indeed, speculation about the role of consumer rationality and decision making in explaining the apparent lack of policy ownership has previously appeared in the LTCI literature (Brown and Finkelstein 2009; Curry et al. 2009).

The results of the present study provide, to our knowledge, the first quantitative evidence that numeracy is predictive of owning LTCI, suggesting that there may be specific skills, such as the ability to understand and work with numbers, which individuals need to successfully navigate the LTCI market. While the estimated difference in the mean rate of ownership between individuals with high and low numeracy is modest in absolute terms (14.0 percent vs. 10.2 percent), it is worth noting that this difference is similar in magnitude to the estimated effects of state LTCI tax subsidies (Goda 2011) and the tightening of Medicaid eligibility requirements (Brown, Coe, and Finkelstein 2006). It is presently unclear what the ideal rate of LTCI ownership should be given the current structure of the Medicaid program, the presence of medical underwriting in the market, the high price of LTCI premiums, and the imperfect coverage LTCI provides. However, there does appear to be the potential for growth in this market. For instance, the National Association of Insurance Commissioners recommends that individuals spend no more than 7 percent of their individual income on LTCI premiums (National Association of Insurance Commissioners 2013). Using the average cost of an individual policy sold in 2010 (\$2,283) (Doty and Shipley 2012), approximately 58 percent of our sample has sufficient household income (approximately \$33,000) to afford

premiums according to this guideline. Brown and Finkelstein more rigorously evaluated the question of who should own a policy, particularly in light of the availability of Medicaid coverage through spend down, using an expected utility framework and simulation techniques (Brown and Finkelstein 2008). Their results suggested that LTCI purchase may be rational for between 30 and 40 percent of individuals, suggesting that the ownership rate could conceivably be more than twice as large as presently observed. This suggests that there may be unrealized demand for LTCI coverage that could be targeted by policy initiatives. Addressing consumer numeric abilities appears to be an important factor that should be considered as part of any comprehensive effort aimed at expanding private LTCI ownership.

Policy Implications

Our results have important implications for policy makers concerned with the current reliance on Medicaid as the major funder of LTC services. Given the low levels of numeracy found in our sample, it appears that many individuals may lack the necessary skills to properly evaluate the value of an LTCI policy. Drastically improving the numeric abilities of this population in the immediate future is unlikely, so policy efforts might be best spent on modifying the LTCI market to limit the numeric demands on consumers. This approach is consistent with many of the LTCI market reforms recently proposed by Frank, Cohen, and Mahoney (2013). For example, the authors suggested standardizing the set of LTCI policies that can be sold as a means for simplifying the purchasing task. This approach would both limit the number of choices available to consumers, thereby reducing cognitive load (Tanius et al. 2009), and facilitate easier comparisons between various plans and insurance providers. Plan standardization has previously been successful in improving consumer choice in the Medigap market (Rice, Graham, and Fox 1997). Frank et al. also proposed enacting federal or state mandates that large employers offer group LTCI policies to their employees. Such a policy may reduce numeracy-related barriers to purchase in two ways. First, employers would be compelled to act as an agent on behalf of their employees, reducing the amount of effort consumers need to exert while “shopping” for a policy and likely filtering out low-value plans from individuals’ choice sets. Second, employers may serve as a trusted channel through which decision supports can be delivered. This may include information about the need to prepare for future LTC costs or the presentation of key LTCI policy information in an unbiased and easy-to-understand format. Employers presently play a similar role in the market for health

insurance, so much of the infrastructure needed for this arrangement is already in place.

The health insurance exchanges created as part of the Affordable Care Act provide an example of an alternate approach to selling LTCI policies that may also reduce the numeric demands on consumers. These marketplaces offer a menu of standardized health insurance plans and a central location where all available policies can be viewed. These features again help to limit choice sets and facilitate easier comparisons. Additionally, most exchanges employ Navigators or In-Person Assisters who provide neutral third-party decision support (Dash et al. 2013). Similar support services in the LTCI market could provide consumers with pertinent factual information or assist with necessary calculations and interpretations of numeric information. Although many buyers of LTCI use sales agents as a form of third-party assistance (LifePlans 2012), it is worth noting that these agents may not have a fiduciary responsibility to the consumer. In fact, they may face commission-based incentives that encourage the sale of more expensive policies. Navigators who are employed by the exchange may be better suited to provide consumers with unbiased decision support.

Separate from direct changes to the LTCI market, consumer information campaigns, such as the federal LongTermCare.gov website and the “Own Your Future” program (Iwasaki et al. 2010, 2014), should be closely evaluated to ensure that numeric information is being presented in a manner that is easily understood, even among those with low numeric abilities. Furthermore, additional research into LTCI decision-aids or online calculators that reduce the computational demands on individuals may produce viable options for minimizing any barriers to LTCI purchase associated with inadequate numeracy.

Limitations

Several study limitations should be noted. While the present study demonstrates a significant association between numeric abilities and LTCI ownership, the mechanism underlying this relationship remains unclear. As described in our conceptual model, one explanation is that those with low numeracy face barriers to LTCI purchase that result in lower rates of ownership. However, we cannot completely rule out the possibility of reverse causality wherein the process of considering and evaluating LTCI policies leads to improvements in numeracy. We believe this scenario is unlikely as the questions evaluating numeracy are general and do not contain any information specific to LTC or LTCI that would be obtained by researching these topics.

Another limitation is that this investigation focused primarily on numeracy while controlling for a broad measure of mental intactness. Previous research has suggested that numeracy is likely a key determinant of one's decision-making abilities, yet it is unlikely to be the only important factor. Existing theories of decision making suggest that this skill is multifaceted and dependent on multiple individual characteristics (Finucane et al. 2005). As such, future research regarding the role of consumer decision making in explaining insurance purchase should expand beyond looking at individual abilities in isolation and adopt a more comprehensive decision-making framework, including more complete measures of intelligence.

Finally, it should be noted that no attempt was made to identify individuals for whom LTCI was likely to be a financially reasonable approach to paying for future LTC expenses. LTCI is not generally considered to be appropriate for everyone, particularly those with little wealth to protect from Medicaid or those with very significant liquid assets. As such, it is certainly plausible that poor numeracy or decision-making abilities could cause someone to overvalue a LTCI policy or be more susceptible to marketing campaigns and sales pitches, resulting in the purchase of coverage when it is not in one's best interest to do so. Future research should also examine who is likely to benefit from LTCI ownership and the role of numeracy and broader measures of decision-making abilities on making a "good" or "rational" decision regarding policy purchase.

CONCLUSION

Individuals with better numeracy are more likely to own a LTCI policy, possibly indicating that barriers to LTCI purchase exist for those with lower numeric abilities. Greater consumer support or structural changes to the ways in which policies are sold may be needed to reduce these barriers and increase older adults' ability to prepare for future LTC expenses.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

- Appendix SA1: Author Matrix.
- Data S1. Supplemental Materials.