Economic Inquiry

HETEROGENEITY IN STATE-DEPENDENT UTILITY: EVIDENCE FROM STRATEGIC SURVEYS

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A standard result of life-cycle models under uncertainty is that optimizing individuals equate the expected marginal utility of consumption across states of the world if insurance is available at actuarially fair rates. A small empirical literature has suggested that the marginal utility of consumption is lower in less healthy states. We use a novel survey-based measure to document significant heterogeneity in health-state dependence across individuals largely orthogonal to standard controls. We further show that individuals value unhealthy states of the world more when facing work-limiting disabilities than when facing disabilities requiring long-term care, and when facing physical rather than mental disabilities. (*JEL* D12, I10)

I. INTRODUCTION

An implication of standard life-cycle models is that optimizing individuals will equate the expected marginal utility of consumption across states and periods if insurance is available at actuarially fair rates. Yet a number of empirical regularities—such as consumption declines at older ages or the apparent underinsurance of many consumption risks, including long-term care (e.g., Brown and Finkelstein 2009, 2011) and longevity risk (e.g., Benartzi, Previtero, and Thaler 2011; Brown 2001)—have led some to suggest that the marginal utility of consumption may depend on one's health status. Direct empirical evidence of state dependence is rare, due in large part to the difficulty in measuring how a consumer values, ex ante, consumption in future, uncertain states.[1] In theory, one could infer state dependence from observing insurance purchase decisions, but given that most insurance markets suffer from multiple market failures (e.g., adverse selection, moral hazard, imperfect competition, public policy–induced demand distortions, etc.), it would be hazardous to measure state dependence by observing behavior in incomplete insurance markets.

In this article, we propose a novel mechanism to assess the extent of state-dependent utility using a "strategic survey" approach, in the spirit of Ameriks et al. (2011, 2015a, 2015b). They note that a key advantage of surveys is that one can design questions that "represent natural thought experiments concerning behaviors in contingencies selected for high information content."

1. Important exceptions to this lack of empirical evidence will be discussed in the next section.

ABBREVIATIONS

ALP: American Life Panel
MS: Monthly Survey
RDD: Random-Digit-Dial
SRC: Survey Research Center

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We designed questions to elicit how an individual would value marginal consumption in healthy versus disabled states, being careful to isolate the state dependence from other factors—such as wealth shocks—that would normally confound empirical inference in "real world" data. These survey questions, which we field in the American Life Panel (ALP), ask individuals to allocate resources across various health states, while holding fixed the household's health expenditures. A second advantage of using a strategic survey is that it allows an examination of within-person differences in resource allocations based on expected future health status, and thus also addresses concerns about unobservable factors that would typically afflict studies that rely on cross-sectional variation in responses to shocks. A third advantage is that we can examine responses for the same person across different types of health shocks to assess whether the behavior varies depending on the type of illness. Partially offsetting these advantages is that stated preferences in response to hypothetical questions are an imperfect proxy for true underlying preferences. Thus, although we consider our approach informative as to the presence and relative size of state dependence, we urge caution against using our findings to precisely parameterize state dependence. We hope that other researchers will refine and advance this methodology to a point where such parameterization becomes possible.

For several reasons, our scenarios focus on disabilities. First, we hypothesize that a health shock that leads to a permanent disability is more likely to be associated with changes in preferences than is a temporary shock. Second, disabilities are an interesting setting to examine the possibility that marginal utility could rise or fall with the onset of a disability (Finkelstein, Luttmer, and Notowidigdo 2009). For example, a severe physical injury that requires expensive modifications to one's life-style might increase one's marginal utility whereas the onset of cognitive impairment that diminishes one's enjoyment of consumption goods might decrease one's marginal utility. Thus, this is an interesting context to explore heterogeneity, both across the population and across different types of disabilities. Finally, this is a highly policy-relevant context. A significant risk that people face during their lifetimes is that of becoming disabled—either early in life when the disability decreases one's earnings capacity, or later in life when chronic/custodial care in a nursing facility may be needed—yet most Americans have little private insurance to protect against these risks, even though public insurance is incomplete. The reasons why so few people choose to insure against these substantial risks are still not fully understood, and yet such an understanding is essential to designing and implementing appropriate policies and to ensuring adequate care for our disabled and aging populations.

On average, we see that working-age respondents value healthy and unhealthy states of the world similarly when facing a possible disability that limits participating in the labor market, although respondents are more likely to value unhealthy states when physically disabled rather than mentally disabled. At older ages, when facing a possible disability that requires long-term care, respondents have a preference for more consumption while healthy than unhealthy. Again, the preference for more consumption while healthy is more pronounced for mental disabilities rather than physical disabilities. To our knowledge, these differences across different types of disabilities have not been documented previously. Given the importance of cognitive decline among the growing elderly population, the differences between mental and physical disabilities may be important for understanding how individuals plan for late-life consumption and insurance decisions.

Our results also indicate that there is significant heterogeneity in the extent of state dependence in the population. Furthermore, we find that the degree of state dependence is largely orthogonal to other observable characteristics, suggesting that while it may be important for explaining variation in decision-making, its omission from empirical analyses is unlikely to lead to bias in other observed relations.

The article proceeds as follows. In the next section, we discuss the previous literature regarding state dependence and its role in affecting insurance decisions. Section III describes a simple model, which provides intuition on the relationship between state dependence and demand for insurance. Section IV discusses our approach to examining these issues and focuses on the survey we develop for the ALP. Section V outlines our results and a final section concludes.

II. PREVIOUS LITERATURE

There is a long history of intellectual contributions relating to the possibility of preferences that vary across states (see Kremslehner and Muermann 2009 for a recent review). However,

few empirical studies have attempted to measure the extent of state dependence in the population. Notable exceptions include Viscusi and Evans (1990), who find evidence of state dependence using a survey related to compensation for risk-taking at work, and Finkelstein, Luttmer, and Notowidigdo (2013) who find that "the marginal utility of consumption declines as health deteriorates" with a central estimate that "a one-standard deviation increase in the number of chronic diseases is associated with an 11% decline in the marginal utility of consumption relative to this marginal utility when the individual has no chronic diseases." In more recent work, Ameriks et al. (2015a) find evidence that utility is state dependent when facing disabilities that require long-term care. Although these articles provide important empirical evidence on the average level of state dependence, they do not explore the extent to which there is cross-sectional variation in its degree or whether it varies with the type of health shock. This article seeks to fill these gaps.

Our methodology is most similar to the study of Ameriks et al. (2011), who use strategic surveys to disentangle aversion to public assistance (e.g., from Medicaid) from bequest motives, which are otherwise difficult to separately identify from observational data. The survey instrument describes a series of hypothetical questions that can isolate factors from one another by providing subjects with thought experiments that lead to a novel set of findings. Ameriks et al. (2015a) also use strategic survey questions to understand state dependence as it relates to disabilities that require long-term care. They find evidence that utility is state dependent, although their model includes many different parameters making it difficult to compare directly to our estimates.

Our article also builds upon previous work examining heterogeneity in preference parameters. Barsky et al. (1997) construct measures of risk tolerance, time preference, and intertemporal substitution using survey questions in the health and retirement survey. They document substantial heterogeneity in the population that explains some variation in economic behaviors, such as smoking, drinking, insurance coverage, and equity exposure. More recently, Heutel et al. (2014) measure time preferences in a representative U.S. sample and document both heterogeneity in the population and correlations with economic outcomes and Goda et al. (2015) show substantial heterogeneity in exponential-growth bias and time preferences and its relation to retirement savings.

In earlier work focused on long-term care insurance, we included some survey-based controls that were meant to proxy for state dependence (Brown, Goda, and McGarry 2012). Although it was not the primary focus of that research, we did document variation in the extent to which individuals rated the relative importance of having additional wealth available in healthy versus sick states. In the current article, we investigate this issue more formally while also making several methodological innovations. First, we take care to distinguish pure state dependence from wealth effects by being clear in the current survey about how care would be provided and thus how wealth would be affected. Second, this survey distinguishes between mental and physical disabilities, which introspection suggests may be important. If, for example, individuals value resources more highly when physically disabled than when healthy, but less highly when mentally disabled than when healthy, then our failure to distinguish these types of disability would bias estimates of state dependence toward zero. Third, our scenarios consider a broader range of ages, with questions focusing on work-life disabilities as well as questions focused on late-life disabilities. Finally, we use a new approach to eliciting state dependence by allowing individuals to allocate "balls to bins" representing alternative health states, thus providing a more continuous and dollar-denominated measure of state dependence.

III. CONCEPTUAL FRAMEWORK

To illustrate the importance of state dependence in affecting behavior and to provide some context for our discussion, we present a highly stylized model of state-dependent consumption allocation. Suppose an agent has wealth w and has a potential exogenous loss of M with probability p. The agent chooses to purchase fraction units of insurance that each pays M at an actuarially fair price $\pi = pM$.

Now suppose her utility is given by:

$$V = pU^d\left(C^d\right) + (1-p)\,U^h\left(C^h\right)$$

where

$$C^h = w - \alpha\pi$$

$$C^d = w - \alpha\pi - M + \alpha M.$$

U^q, C^q, and M^q represent the utility function, consumption, and utility-generating medical

spending in state q (healthy or disabled).[2] Specifically, the agent chooses α to maximize its utility. The first-order condition is:

$$U^{d\prime}\left(C^{d}\right) = U^{h\prime}\left(C^{h}\right). \quad (1)$$

In the simplest case where utility is not state dependent, the optimal solution is full insurance which equalizes consumption in the healthy and disabled states. Suppose that utility is state dependent with state-dependence parameter Ø, that is, $U^{d}(\cdot) = \text{Ø}\, U^{h}(\cdot)$. The parameter Ø represents the degree to which individuals prefer consumption while disabled relative to consumption while healthy. Equation (1) now becomes:

$$\text{Ø}U'\left(C^{d}\right) - U'\left(C^{h}\right) = 0. \quad (2)$$

We can now use the implicit function theorem to determine how the optimal level of insurance varies with the state-dependence parameter. Define the function H as the left-hand side of Equation (2). By the implicit function theorem:

(3)

$$\left(\mathrm{d}\alpha/\mathrm{d}\text{Ø}\right) = -\left[\left(dH/d\text{Ø}\right)/\left(dH/d\alpha\right)\right]\Big|_{\alpha=\alpha^{*}}$$

$$= -\left[\left(U'\left(C^{d}\right)/dH/d\alpha\right)\right]\Big|_{\alpha=\alpha^{*}} > 0.$$

Under standard assumptions of utility functions, Equation (3) implies the optimal level of insurance is increasing with respect to the state-dependence parameter Ø. Thus, in this model, and consistent with intuition, agents are more (less) likely to purchase insurance if they place a higher (lower) value on medical spending in the sick state. The purpose of this article is to design a set of survey questions to create proxies for Ø, to examine its distribution, to understand how it varies with observable characteristics of the respondents, and whether it differs depending on whether the health shock is primarily physical or mental.

IV. DATA AND SAMPLE CHARACTERISTICS

A. Sample, Survey Construction, and Response Rates

In June 2013, we fielded a series of surveys in the RAND ALP. The ALP is a sample of approximately 6,000 individuals age 18 and older who have agreed to participate in regular online surveys. Relative to most other Internet panels, the ALP is more representative because it is primarily based on a probability sample of the U.S. population.[3] Respondents use their own internet connections or a WebTV connection to access the survey.[4] We used this framework to ask a series of questions, divided across three surveys, to help us understand the issue of state dependence. We merged our data to existing demographic and economic data collected in previous waves.

In our first survey (ALP Well Being 342), we asked a number of background questions regarding household wealth, risk preferences, health status, and insurance ownership. Two weeks later, we fielded two additional surveys. One (ALP Well Being 343) was limited to individuals under the age of 60 who were working full-time and focused on eliciting state dependence in the context of work-related disabilities. The other (ALP Well Being 344) was limited to individuals ages 50–80 and focused on questions related to disabilities that would require long-term care. We note that there is some overlap between the samples for the two surveys and we later exploit this feature to compare preferences for resources for the same individual in different hypothetical disability states.

Although there are approximately 6,000 individuals participating in the ALP, as noted above our surveys were targeted based on age and, for the disability survey, working status. In the group working full time and under age 60, there are 3,006 participants in the ALP, of which 1,396 completed both the first survey and the state dependence survey regarding work-related disabilities.[5] In the age 50–80 group, there are 2,739 participants, of whom 1,565 completed both the first survey and the state dependence survey for long-term care type disabilities. [6] Because there is overlap in these two samples (i.e., those age 50–60 who are employed full-time), we also have

2. Here, utility-generating medical spending is defined as spending in addition to necessary care that ensures a minimum level of consumption in the sick state. This could be both spending that improves medical care (e.g., nursing homes with better trained staff, new equipment, or more staff per patient) or spending that is on better accommodations (e.g., a private room, better quality food, and better furnishings).

3. Details regarding the ALP sample construction are provided in Appendix A.

4. Respondents who were enrolled in the survey but who did not have an internet connection were provided with a WebTV (http://www.webtv.com/pc/), which allows them to access the Internet using their television and a telephone line. This technology allows for a more representative sample than one drawn from current internet users.

5. A total of 1,543 participants were offered the survey, for a response rate of 87%.

6. 1,619 participants were offered the survey, for a response rate of 94%.

a subset of 449 respondents who are asked about both disability types.[7]

B. Basic Demographics of Our Sample

Before delving into the construction of our state dependence proxy, we first discuss the characteristics of our sample. Table 1 displays summary statistics for demographic characteristics used in the analysis for the sample of respondents to questions related to disabilities that prevent work (Panel A) and the sample of respondents to questions related to disabilities needing long-term care (Panel B). By construction, the sample in Panel A is significantly younger and thus healthier than the sample in Panel B. Both samples are more than 50% female, and approximately 62% are married.[8] We also construct a measure of risk aversion from a question asking respondents to rate their willingness to take financial risks, on a scale of 0 to 10. Respondents reporting 0, 1, or 2 are categorized as risk averse.[9] We also include demographic characteristics of the ALP sample active at the time the survey was administered as well as characteristics of non-responders in Table A1.

C. Measuring State Dependence

The primary contribution of this article is methodological, using a novel survey approach to measure state dependence. We measure state dependence separately for (a) work-related disabilities and (b) long-term disabilities that would require a type of nursing home care. We also ask separate questions for (a) physical versus (b) mental impairments. Crossing these two dimensions, we have four distinct questions, the full texts of which are available in the Appendix. Here, we use the case of a physical disability requiring long-term care to illustrate the basic structure.

First, we introduce the survey by defining some key terms, for example, "when we use the term 'long-term care,' we are referring to assistance with personal care such as dressing, bathing, getting in and out of bed, using the bathroom or eating." We then ask questions along these lines:

> *Consider what your life may be like at age 80. Suppose there is a 50 percent chance that you will be healthy and able to live independently in your own home for the rest of your life and a 50 percent chance that your physical health will have deteriorated to the point where you will have to live in a nursing home for the rest of your life. Also assume that your basic nursing home costs are fully covered, so you need not pay anything for this basic level of care. Your physical health and lifespan will be the same whether or not you are in a nursing home at age 80 and additional spending on medical care will not change your lifespan.*

The question then goes on to ask:

> *Now suppose that you are given the opportunity—at no cost to you—to have an additional $10,000 provided to you either if you are healthy and in your own home or if you are in a nursing home. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you are in a nursing home, or any other combination. In either state, you can spend the money any way that you wish. Using the balls and bins shown below, please allocate the $10,000 across these two options:*
> *Money to spend on goods and services while physically disabled in a nursing home.Money to spend on any goods and services while healthy and living at home. Each ball represents $500.*

This question was designed specifically to isolate state dependence. Individuals are being asked to allocate $10,000 (in $500 increments) to consumption in the healthy state or to consumption in the disabled state.

Several features of the question ensure that we are measuring state dependence rather than other confounding factors. First, to ensure we are not inadvertently capturing differential income effects by health state, we are clear that (a) there is no cost to allocating the money (i.e., no insurance loads), (b) that basic nursing home costs are fully covered so that there is no wealth shock in the sick state, and (c) spending more money on medical care does not change one's lifespan so that the individual is not allocating money to the sick state for health rather than consumption purposes.

7. Due to some missing values, our estimation sample is 1,301 for work-related disabilities and 1,486 for long-term care disabilities.

8. Although the ALP attempts to be population representative, our samples have somewhat greater income and wealth than the population, more schooling, and are less likely to be nonwhite.

9. While we collected information on insurance ownership for both disability insurance and long-term care insurance, we do not use these measures to examine the relationship between state dependence and insurance purchase. Although our previous article presented some exploratory work along these lines, any results are likely to be biased due to the potential for justification bias. We also note that much disability insurance comes through an employer so voluntary purchase is difficult to discern. Still, as is true for the general population, private purchase of such policies is rare. Just over 20% of our employed sample appears to have purchased disability insurance voluntarily and just 15% of our older sample reports having long-term care insurance.

TABLE 1
Sample Characteristics

	(A) Sample for Disabilities that Prevent Work		(B) Sample for Disabilities Needing Long-Term Care	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Age	42.14	11.58	61.31	7.406
Female	0.565	0.496	0.534	0.499
Married	0.621	0.485	0.618	0.486
High school or less	0.184	0.387	0.203	0.403
Some college	0.372	0.484	0.361	0.48
College graduate	0.259	0.438	0.229	0.42
Graduate degree	0.185	0.389	0.207	0.405
African American	0.105	0.306	0.0801	0.272
Other race	0.126	0.332	0.0538	0.226
Hispanic	0.19	0.392	0.0956	0.294
Fair or poor health	0.0976	0.297	0.186	0.389
Risk averse	0.217	0.412	0.271	0.445
		Family income		
<$5,000	0.0162	0.126	0.0196	0.139
$5,000–$7,499	0.00847	0.0917	0.00877	0.0932
$7,500–$9,999	0.0108	0.103	0.0249	0.156
$10,000–$12,499	0.0162	0.126	0.0364	0.187
$12,500–$14,999	0.0116	0.107	0.0324	0.177
$15,000–$19,999	0.0293	0.169	0.0405	0.197
$20,000–$24,999	0.0547	0.227	0.0472	0.212
$25,000–$29,999	0.0393	0.194	0.0472	0.212
$30,000–$34,999	0.0647	0.246	0.0573	0.233
$35,000–$39,999	0.0609	0.239	0.0472	0.212
$40,000–$49,999	0.103	0.304	0.0971	0.296
$50,000–$59,999	0.109	0.311	0.109	0.312
$60,000–$74,999	0.129	0.335	0.129	0.335
$75,000+	0.347	0.476	0.303	0.46
		Financial wealth		
<$1,000	0.144	0.351	0.102	0.303
$1,000–$9,999	0.186	0.389	0.135	0.341
$10,000–$49,999	0.223	0.416	0.151	0.359
$50,000–$99,999	0.146	0.353	0.12	0.325
$100,000–$249,999	0.156	0.363	0.182	0.386
$250,000+	0.146	0.353	0.31	0.463
Observations	1,301		1,486	

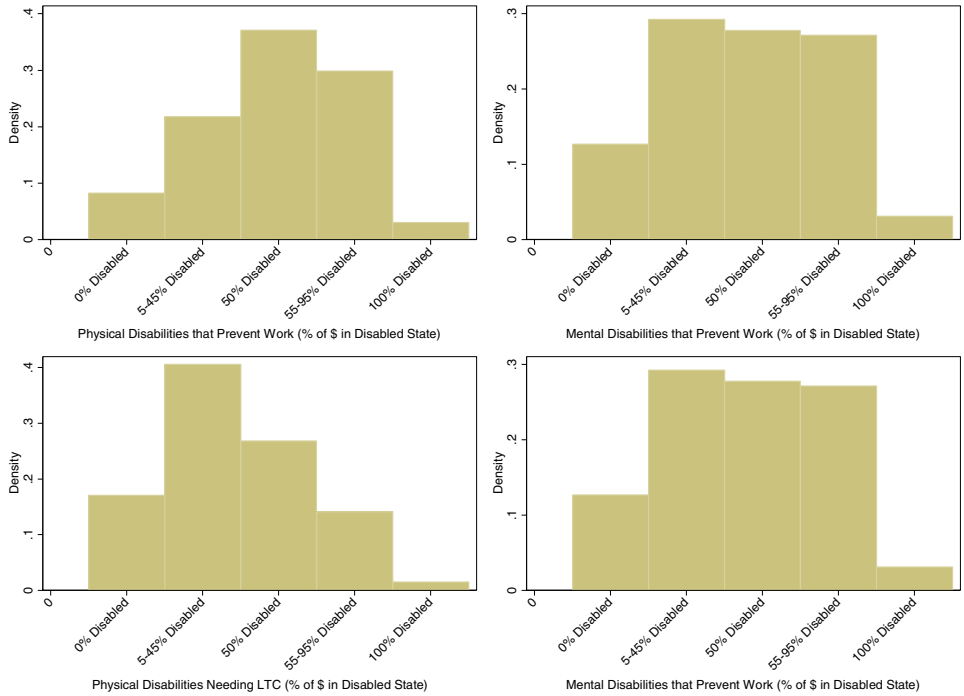
Also, to ensure that individuals are responding based on state dependence in the marginal utility of consumption rather than on differential expectations about life expectancy, the question is clear that health and lifespan are not affected by the state in which they find themselves. Because we stipulate that basic nursing home costs are covered, we note that our questions provide a proxy for the marginal utility of *additional* consumption above this basic level of spending, rather than *total* consumption which may be defined to include basic nursing home expenses.

We use the process of allocating balls to bins because it is an activity that ALP users are familiar with, as it has been used in prior ALP surveys on other topics. It also has the advantage that there is no "default" allocation; both bins begin with zero balls and the respondent must allocate each of the 20 bins into a bin for the response to count. The probabilities were explicitly set at 50/50 in order to set a natural benchmark for full consumption smoothing of simply allocating wealth equally across both states—in effect biasing the results against finding evidence of state dependence. This set-up also allows for symmetric opportunities for deviating from perfect consumption smoothing in either direction (i.e., positive or negative state dependence).

The remaining questions vary in either whether the disability is mental or physical, or whether the disability is one that prevents work or one that requires long-term care. As the questions regarding disabilities that prevent work and require long-term care were fielded in separate surveys to separate samples, both had a lengthy preamble that described the applicable scenarios.

As our empirical proxy for the state-dependence parameter Ø, we simply take the fraction of the $10,000 allocated to the disabled

FIGURE 1
Distribution of Money Allocated to Disabled State by Type of Disability (Full Sample)



Notes: Samples for disabilities that prevent work are under age 60 and working ($N = 1{,}301$). Samples for disabilities needing long-term care (LTC) are ages 50–80 ($N = 1{,}486$).

state.[10] Thus, individuals allocating all 20 balls to the health state will have a value of 0%, those engaging in perfect consumption smoothing will have a value of 50%, and those allocating all of their wealth to the disabled state will have a value of 100%. Of course, intermediate values, in increments of 0.05, are also possible. We explore the empirical distribution of these responses in the next section.

V. RESULTS

A. *The Distribution of State Dependence*

We begin by examining the distribution of responses to our questions measuring state dependence in Figure 1. The top set of histograms shows the distribution of responses for questions regarding disabilities that prevent work, while the bottom set shows the distribution for disabilities needing long-term care. For both types of disabilities, we distinguish between physical disabilities in the left column and mental disabilities in the right column. In each case, we divide the sample into five bins—two for those that allocate 0% or 100% of the money to the disabled state, one for those who make an even 50/50 split, and two for those that give intermediate answer 5%–45% or 55%–95%, keeping in mind that because there were 20 balls, the answers are in 5-percentage-point increments.[11]

For working individuals under age 60 when asked about a physical disability (top left panel of the figure), the mean division is to provide 49.1% (SE 0.64%) of wealth to the disabled state, suggesting that on average individuals are allocating wealth in a manner that is approximately what

10. Estimating the parameter Ø directly is possible if a utility function is specified under the assumption of homothetic preferences and taking the allocation of balls into bins as optimal consumption levels in the sick and healthy state. However, using common utility functions like the constant relative risk aversion class of utility functions, the parameter Ø is undefined for one who allocates $0 in the healthy state. Therefore, we prefer a non-parametric measure of state dependence rather than one that depends on any particular functional form for utility.

11. We show the distribution of raw responses in Figure A1.

we would expect if utility is not state dependent. However, this average masks considerable dispersion in responses, with close to 15% of the sample allocating all wealth to one of the extreme states, only one-third of the sample choosing a 50–50 split, and the balance leaning more heavily toward allocations to the sick state than to the healthy state. This rightward skew of the distribution suggests that there are slightly more people who view physical health and consumption as substitutes rather than complements, contrary to the findings of Finkelstein, Luttmer, and Notowidigdo (2013).

In the top right panel of Figure 1, we show a similar histogram for states with a mental disability. Although there is still considerable dispersion, it is notable that the distribution shifts left, toward the healthy state. The mean allocation falls to 44.7% (SE 0.72%), suggesting that for a *mental* disability, mental health and consumption are more often viewed as complements. We reject the null hypothesis that the mean allocation is the same for physical and mental disabilities, and also find evidence that the responses for physical and mental disabilities are drawn from different distributions.[12]

The bottom panels of Figure 1 repeat this exercise for individuals age 50–80 in the context of long-term care. Relative to the top panels, these distributions are shifted substantially to the left. The mean allocation to the disabled state is only 35.6% (SE 0.62%) of wealth in the case of a physical disability, and only 31.9% (SE 0.66%) of wealth for mental disability. This pattern suggests that individuals are less interested in transferring money to sick states of the world when in need of long-term care than they are when dealing with disability that reduces earnings. Put differently, good health and consumption exhibit more complementarity at older ages than at younger ages. We also again see that the willingness to transfer money to sick states is lower for mental than for physical disabilities, and this difference is statistically significant. We view these results as strong evidence that the phenomenon of state dependence is far more complicated than our models have asserted and, furthermore, models which ignore state dependence are missing an important aspect of individual preferences.

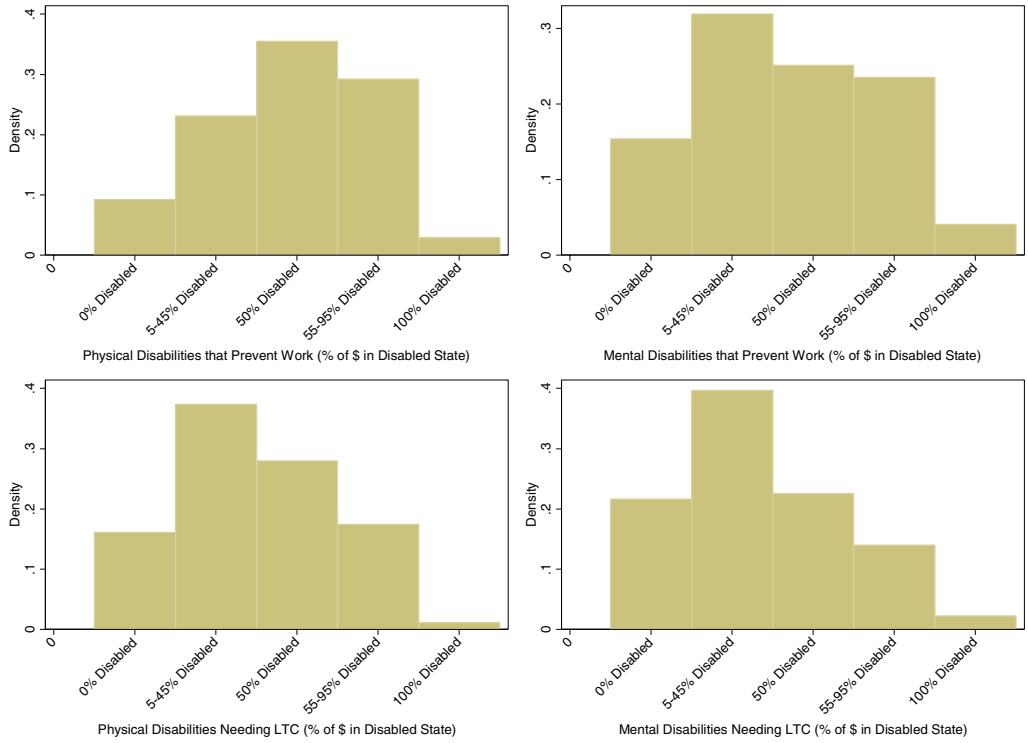
12. Both the Mann–Whitney and Kolmogorov–Smirnov tests for equality of distribution functions provide test statistics that reject the null hypothesis that allocations for physical and mental disabilities are drawn from the same distribution.

Our comparison of responses regarding disabilities that prevent work with long-term care disabilities (i.e., comparing the top panel of Figure 1 to the bottom panel) confounds the *type* of disability with the age of the different cohorts being sampled. We can abstract from the age dimension, by taking advantage of the subset of 449 individuals age 50–59 who responded to both sets of disability questions. The distribution of responses for each type of disability among this subsample is shown in Figure 2 and is quite similar to those for the full sample, with the exception of a slightly lower weight in the "100% disabled" category. We therefore conclude that the differences in the distributions shown in Figure 1 for the full sample are largely due to the type of disability rather than the differences in the samples.

We also look directly at the correlations of the four measures for this subsample. The correlations are highest when comparing mental and physical disabilities, for the same age of onset, in the same survey (i.e., the correlation is 0.676 for mental and physical state dependence when asked about work disabilities, and 0.651 when asked about disabilities requiring long-term care). When we compare responses across surveys and for different types of disabilities, we still find reasonably high correlations of 0.470 and 0.477. These similarities provide some assurance that respondents are providing thoughtful answers and not simply allocating resources to different states at random. They also suggest that there is an individual component to state dependence.

Recall from our stylized model that the parameter Ø represents the degree to which individuals prefer consumption while disabled relative to consumption while healthy. Under the assumption of log utility, we can use our average responses to generate a preference shifter between healthy and unhealthy states by taking the amount allocated to disabled states and dividing it by the amount allocated to healthy states. A value of 1.0 thus indicates equal division The estimates above suggest that *on average*, Ø is 0.965 for physical disabilities that prevent work, 0.808 for mental disabilities that prevent work, 0.553 for physical disabilities that require long-term care, and 0.468 for mental disabilities that require long-term care. However, the values for individuals may differ substantially given the degree of heterogeneity indicated in the data.

FIGURE 2
Distribution of Money Allocated to Disabled State by Type of Disability (Overlap Sample)



Notes: Sample includes individuals between 50 and 60 who are working ($N = 449$). LTC, long-term care.

B. Differences in State Dependence by Income and Wealth

We next examine differences in the amount of resources allocated to healthy and unhealthy states by income and wealth. We classify respondents as "high income" if their annual household income exceeds $50,000. Similarly, respondents are classified as "high wealth" if they have at least $50,000 in financial assets. This cut defines 58.5 (54.1)% of the sample facing disabilities that prevent work (needing long-term care) as high income and 44.8 (61.2)% of the sample facing disabilities that prevent work (needing long-term care) as high wealth. We then perform nonparametric statistical tests to determine whether the median allocations, as well as the full distributions, differ across these two groups. These tests are performed separately for each type of disability.

For disabilities that prevent work, both physical and mental, we fail to find evidence that rejects the null hypothesis that state dependence is the same across different income or wealth groups. In other words, the available evidence suggests that the allocation of resources in healthy and unhealthy states is similar for high income/wealth populations and low income/wealth populations.

When we examine disabilities at older ages that require long-term care, a different picture emerges. For both mental and physical disabilities, we find that higher wealth and income are associated with *less* resources allocated to unhealthy states of the world when faced with disabilities requiring long-term care and these differences are statistically significant. Furthermore, we reject the null hypothesis that the distributions are the same for high wealth or income groups. The fact that differences across income and wealth are present for disabilities requiring long-term care and not for disabilities that prevent work suggests that existing resources are more important when allocating additional resources for states of the world where long-term care is needed relative to states of the world where disabilities prevent work.

TABLE 2

Relationship between State-Dependence Proxies and Observable Characteristics

	(1)	(2)	(3)	(4)
	Disabilities that Prevent Work		Disabilities Needing LTC	
Variables	**Physical**	**Mental**	**Physical**	**Mental**
Age	0.00451	0.00708	0.00800	0.00390
	(0.00521)	(0.00577)	(0.0146)	(0.0156)
Age^2	−5.71e−05	−8.66e−05	−7.51e−05	−3.82e−05
	(6.24e−05)	(6.92e−05)	(0.000116)	(0.000124)
Female	0.0145	0.0210	−0.00662	−0.00387
	(0.0142)	(0.0157)	(0.0136)	(0.0145)
Married	0.0167	0.0327*	−0.0126	0.00456
	(0.0157)	(0.0173)	(0.0157)	(0.0168)
Some college	−0.0388*	−0.0225	0.0228	−0.00835
	(0.0200)	(0.0222)	(0.0189)	(0.0203)
College graduate	−0.00199	0.0138	0.0254	−0.000294
	(0.0222)	(0.0246)	(0.0218)	(0.0233)
Post graduate	−0.0139	−0.0115	0.0520**	0.0240
	(0.0247)	(0.0274)	(0.0234)	(0.0250)
	Family income (<$5K omitted)			
$5K–$7.5K	−0.130	−0.0518	−0.178**	−0.0672
	(0.0946)	(0.102)	(0.0861)	(0.0918)
$7.5K–$10K	−0.137	0.00741	−0.0962	0.00962
	(0.0871)	(0.0972)	(0.0638)	(0.0679)
$10K–$12.5K	−0.0292	0.0293	−0.0742	0.00474
	(0.0757)	(0.0883)	(0.0596)	(0.0637)
$12.5K–$15K	−0.192**	−0.0383	−0.146**	−0.0703
	(0.0851)	(0.0949)	(0.0621)	(0.0662)
$15K–$20K	0.00178	0.157**	−0.150**	−0.00987
	(0.0663)	(0.0738)	(0.0596)	(0.0635)
$20K–$25K	−0.0331	−0.0277	−0.124**	−0.0395
	(0.0611)	(0.0687)	(0.0577)	(0.0614)
$25K–$30K	−0.0512	0.0771	−0.100*	0.00785
	(0.0633)	(0.0713)	(0.0585)	(0.0624)
$30K–$35K	−0.0677	0.0783	−0.174***	−0.0505
	(0.0600)	(0.0675)	(0.0569)	(0.0605)
$35K–$40K	−0.0452	0.0498	−0.0917	−0.00828
	(0.0605)	(0.0679)	(0.0583)	(0.0622)
$40K–$50K	−0.0722	0.0627	−0.0847	−0.0505
	(0.0577)	(0.0650)	(0.0549)	(0.0585)
$50K–$60K	−0.0427	0.0310	−0.0751	−0.0312
	(0.0578)	(0.0651)	(0.0544)	(0.0579)
$60K–$75K	−0.0804	0.0452	−0.126**	−0.0770
	(0.0577)	(0.0651)	(0.0545)	(0.0580)
$75K+	−0.0904	0.00167	−0.109**	−0.0601
	(0.0571)	(0.0643)	(0.0539)	(0.0573)
	Financial wealth (<$1K omitted)			
$1K–$10K	−0.0163	0.0291	−0.0220	−0.00784
	(0.0245)	(0.0273)	(0.0287)	(0.0305)
$10K–$50K	0.00735	0.0197	−0.0236	0.00199
	(0.0241)	(0.0267)	(0.0288)	(0.0307)
$50K–$100K	0.0260	0.0492	−0.00687	−0.00234
	(0.0272)	(0.0302)	(0.0310)	(0.0330)
$100K–$250K	−0.00633	0.000879	−0.0531*	0.00334
	(0.0291)	(0.0322)	(0.0305)	(0.0325)
$250K+	0.0270	0.0227	−0.0372	0.00916
	(0.0308)	(0.0343)	(0.0303)	(0.0323)
African American	0.00883	0.0106	0.0486*	0.106***
	(0.0241)	(0.0266)	(0.0258)	(0.0277)
Other race	0.00298	−0.01000	0.0108	0.0303
	(0.0231)	(0.0256)	(0.0314)	(0.0338)
Hispanic	0.00643	0.0270	0.0330	0.0515**
	(0.0203)	(0.0224)	(0.0243)	(0.0260)
Fair/poor health status	0.0150	−0.0183	0.0141	−0.0132
	(0.0240)	(0.0270)	(0.0183)	(0.0195)
Risk averse	0.00479	−0.00160	−0.00610	−0.00917
	(0.0172)	(0.0190)	(0.0158)	(0.0169)
Physical disability first	0.0287**	0.0204	0.00107	−0.0615***
	(0.0138)	(0.0153)	(0.0133)	(0.0142)
Constant	0.472***	0.243*	0.281	0.301
	(0.115)	(0.128)	(0.456)	(0.485)
Observations	1,305	1,304	1,497	1,491
R-Squared	0.027	0.033	0.031	0.040

Notes: Dependent variable is percent of money in disabled state for physical and mental disabilities that prevent work and physical and mental disabilities needing long-term care (LTC). Standard errors in parentheses.

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

C. *Who Exhibits More State Dependence?*

In Table 2, we run regressions of our various measures of state dependence against a range of available characteristics, including age, sex, marital status, level of education, family income, financial wealth, race, and ethnicity, and self-reported health status, to assess which individual characteristics might be associated with state dependence. We also include an indicator variable equal to 1 if the individual answered the physical disability question first, and 0 if they saw the mental disability question first in order to control for possible contamination with respect to survey design.

Overall, we find very few consistently significant patterns with respect to most demographic characteristics. Exceptions include less money allocated to sick states for higher income groups when asked about physical disabilities needing long-term care, and more money allocated to sick states for African Americans when asked about any disabilities (physical or mental) needing long-term care. One might imagine that the degree to which health and consumption are complements depends on the type of consumption good being purchased. The difference observed here by income suggests that higher income individuals are purchasing different goods with their marginal dollars than are lower income individuals—goods that require good health to enjoy fully. For example, wealthy individuals may consume travel or fine dining when healthy that they are less able to enjoy when sick, while lower income individuals get similar utility in either health state from purchases such as cable television.

VI. CONCLUSIONS

This study provides significant new insights into an important aspect of individual utility functions, that of state dependence, and provides a mechanism to assess this phenomenon at an individual level. Although there are many additional avenues to explore, this article provides strong evidence regarding the variation in the marginal utility of consumption by health status. Using an innovative survey approach, we find mean estimates of state dependence that are consistent with earlier studies showing that individuals tend to value consumption in unhealthy states less than they value consumption in healthy states. However, we show further that this average masks a substantial amount of heterogeneity both across people and across types of disability. The marginal utility of consumption appears to be lower in unhealthy states when considering disabilities that require long-term care, and also lower for mental rather than physical disabilities. Furthermore, little of the large amount of variation across individuals that we observe is related to standard socio-economic controls, suggesting that control variables typically included in behavioral analyses do not adequately account for variation in state dependence. Future theoretical and empirical work may wish to account for heterogeneity when modeling or measuring state dependence.

There are several possible extensions to this framework. First, assessing the reliability of the measures we obtain by asking the same sample similar questions could help determine whether the responses reflect true measures of state dependence. In addition, varying the probabilities of falling into the healthy and unhealthy states could help determine how much of the state independence we find is due to focal responses of 50% of resources allocated to each state. Finally, varying the amount of additional resources offered to respondents would help determine whether state dependence in utility is multiplicative.

APPENDIX A: ALP RESPONDENT RECRUITMENT

Respondents to the RAND-USC ALP study have been recruited in one of three ways. The majority of respondents were drawn from a sample of those ages 18 or older who participated in the monthly survey (MS) of the University of Michigan's Survey Research Center (SRC). The MS is the leading consumer sentiment survey that incorporates the long-standing survey of consumer attitudes and used to produce well-known index of consumer expectations. Each month, the MS interviews approximately 500 households, of which 300 households are a random-digit-dial (RDD) sample and 200 are re-interviewed from the RDD sample surveyed 6 months previously. Until August 2008, the SRC screened MS respondents by asking them if they would be willing to participate in a long-term research project (with approximate response categories "no, certainly not," "probably not," "maybe," "probably," "yes, definitely"). If the response category is other than "no, certainly not," respondents were told that the University of Michigan was undertaking a joint project with RAND. They were asked if they would object to SRC sharing their information about them with RAND so that they could be contacted later. When contacted, there were asked if they would be willing to participate in an Internet survey (the ALP). Respondents who did not have an Internet connection were told that RAND would provide them with free Internet. Many MS-respondents are interviewed twice. At the end of the second interview, an attempt was made to convert respondents who refused in the first round. This attempt includes the mention of the fact that participation in follow-up research carries a reward of $20 for each half-hour interview.

TABLE A1
Characteristics of ALP Panel and Survey Non-Responders

	All Actives		Work Disabilities Non-Responders		LTC Disabilities Non-Responders	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Age	47.82	15.61	36.47	10.24	57.72	7.21
Female	0.595	0.491	0.605	0.49	0.722	0.452
Married	0.585	0.493	0.544	0.5	0.574	0.499
High school or less	0.258	0.437	0.15	0.358	0.167	0.376
Some college	0.389	0.487	0.374	0.486	0.315	0.469
College graduate	0.212	0.409	0.299	0.46	0.222	0.42
Graduate degree	0.142	0.349	0.177	0.383	0.296	0.461
African American	0.121	0.326	0.156	0.365	0.111	0.317
Other race	0.142	0.349	0.143	0.351	0.111	0.317
Hispanic	0.224	0.417	0.306	0.462	0.111	0.317
			Family income			
<$5,000	0.0504	0.219	0.0204	0.142	0	0
$5,000–$7,499	0.0239	0.153	0.0136	0.116	0.0185	0.136
$7,500–$9,999	0.0279	0.165	0.0068	0.0825	0	0
$10,000–$12,499	0.0352	0.184	0.0136	0.116	0.0185	0.136
$12,500–$14,999	0.0356	0.185	0.0068	0.0825	0.0185	0.136
$15,000–$19,999	0.0513	0.221	0.0612	0.241	0.0556	0.231
$20,000–$24,999	0.0617	0.241	0.068	0.253	0.037	0.191
$25,000–$29,999	0.0646	0.246	0.068	0.253	0.0185	0.136
$30,000–$34,999	0.0657	0.248	0.0612	0.241	0.0741	0.264
$35,000–$39,999	0.0508	0.22	0.0408	0.199	0.037	0.191
$40,000–$49,999	0.0959	0.295	0.122	0.329	0.111	0.317
$50,000–$59,999	0.0894	0.285	0.0884	0.285	0.0556	0.231
$60,000–$74,999	0.0997	0.3	0.0952	0.295	0.111	0.317
$75,000+	0.248	0.432	0.333	0.473	0.444	0.502
Observations	5,860		147		54	

Note: LTC, long-term care.

A second set of respondents (approximately 500) was recruited to the ALP through the use of snowball sampling; here respondents were given the opportunity to suggest friends or acquaintances who might also want to participate in the ALP. Those friends were then contacted and asked to join. Recently, a third group of respondents (again, approximately 500) was recruited after participating in the National Survey Project, run by Stanford University and SRBI. This sample was recruited in person, and at the end of their 1-year participation they were asked whether they were interested in joining the ALP. Most of those in this group of respondents were given a laptop and broadband Internet access. Finally, ALP has recently begun recruiting respondents using a random mail and telephone sample based on the Dillman method (see, e.g., Dillman et al. 2009) with the goal of achieving a total of 5,000 panel members (including a 1,000 Spanish language subsample). As has been the policy throughout, if these new participants do not have Internet access, they will be provided with a laptop and broadband Internet access. This last group is not part of the sample used in this article.

APPENDIX B: STATE DEPENDENCE SURVEY QUESTIONS

Disabilities that Prevent Work (MS 343)

Preamble. In this survey, you are going to be asked questions about work disabilities that affect a person's ability to earn a living. Some disabilities are short term (less than a year), which means that individuals with short-term disabilities will be able to return to work after they recover. Some examples of short-term disabilities are broken bones or temporary illnesses. Many people have some sort of coverage for short-term disabilities through their employment.

Other disabilities are long term. If you have a long-term disability, you would not be able to continue working at your job, nor would you be able to resume working at any point in the foreseeable future. You also would not be able to hold any other job that is suitable for you based on your training, education, and experience.

What may be considered a disability for some occupations may not be a disability for others. For example, not having full use of one's hands may not permanently prevent someone working in an office from doing their job, but could permanently prevent a welder from doing his job.

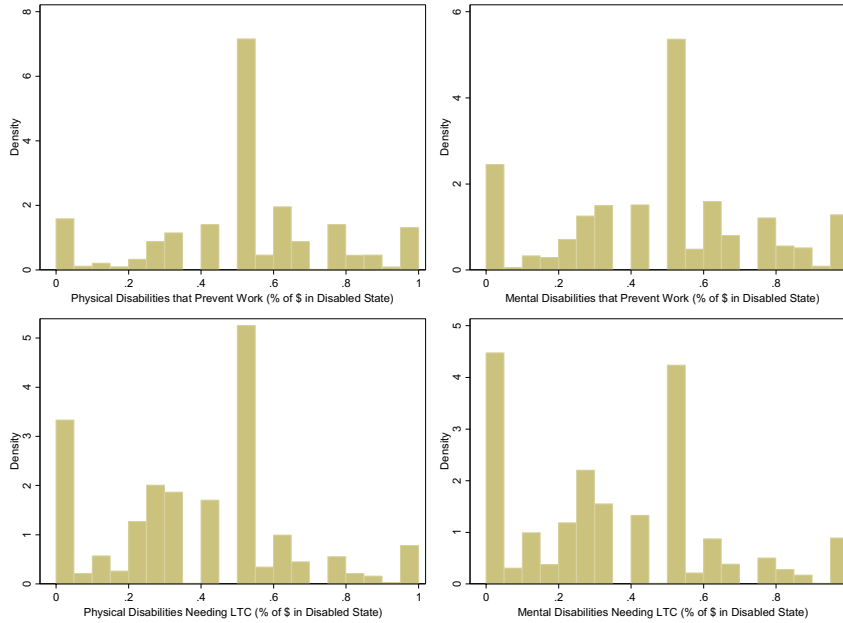
For the following questions, when we refer to disabilities, we mean long-term disabilities, which may permanently prevent someone from earning an income through work. When you answer these questions, think about specific disabilities that would prevent you from performing your job, or any job suitable for you based on your training, education, and experience.

Question 1. Consider what your life may be like in 5 years. Suppose there is a 50% chance that you will be healthy and expect to remain so for the rest of your life, and a 50% chance that you have a physical disability and can no longer perform in any job suitable for you based on your training, education, and experience. If you have a disability, it is a condition or injury that is permanent, but will not shorten your lifespan.

Also assume that you have sufficient disability insurance so that if you become disabled, your monthly income remains the same as it was when you were employed and your medical care is covered. The disability is such that no additional amount of medical spending will improve your condition.

FIGURE A1

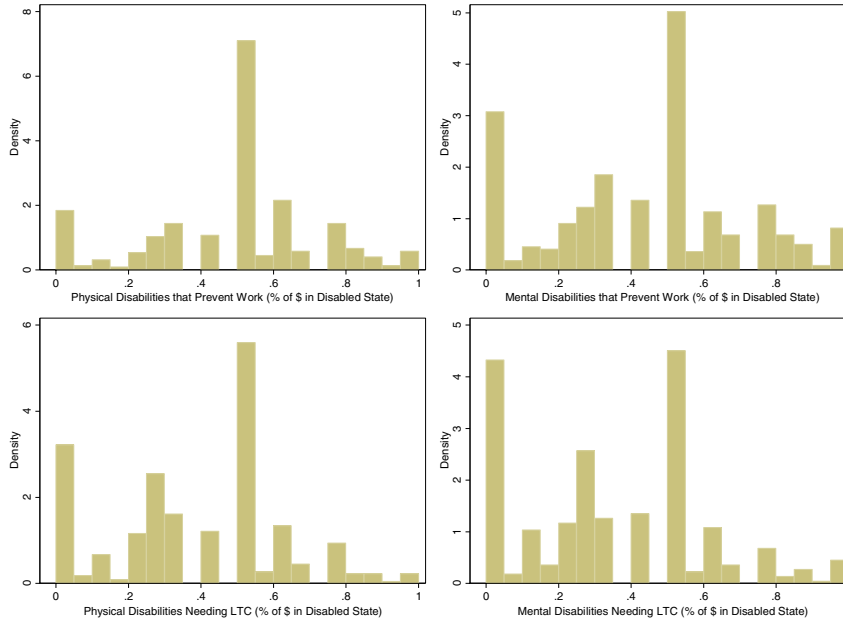
Distribution of Money Allocated to Disabled State by Type of Disability (Raw Data).



Notes: Samples for disabilities that prevent work are under age 60 and working ($N = 1{,}301$). Samples for disabilities needing long-term care (LTC) are ages 50–80 ($N = 1{,}486$).

FIGURE A2

Distribution of Money Allocated to Disabled State by Type of Disability (Overlap Sample, Raw Data)



Notes: Sample includes individuals between 50 and 60 who are working ($N = 449$). LTC, long-term care.

Now suppose that you are given the opportunity—at no cost to you—to have an additional $10,000 provided to you either if you are healthy and working or if you have a physical disability. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you have a physical disability, or any other combination.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while physically disabled.
- Money to spend on any goods and services while healthy.

Each ball represents $500.

Question 2. We would now like to ask a related question, but note that the type of disability is different than in the prior question.

Consider what your life may be like in 5 years. Suppose that there is a 50% chance that you will be healthy and expect to remain so for the rest of your life, and a 50% chance that you have a mental or cognitive disability (e.g., intellectual disabilities, schizophrenic, and psychotic disorders) and can no longer perform in any job suitable for you based on your training, education, and experience. If you have a disability, it is with a condition that is permanent, but will not shorten your lifespan.

Also assume that you have sufficient disability insurance so that if you become disabled, your monthly income remains the same as it was when you were employed and your medical care is covered. The disability is such that no additional amount of medical spending will improve your condition.

Now suppose that you are given the opportunity—at no cost to you—to have an additional $10,000 provided to you either if you are healthy and working or if you have a mental or cognitive disability. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you have a mental or cognitive disability, or any other combination.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while mentally or cognitively disabled.
- Money to spend on any goods and services while healthy.

Each ball represents $500.

[Note: ordering of mental and physical disabilities was randomized.]

Disabilities Needing Long-Term Care (MS 344)

Preamble 1. For purposes of this survey, when we use the term "long-term care," we are referring to assistance with personal care needs such as dressing, bathing, getting in and out of bed, using the bathroom or eating.

Question 1. Consider what your life may be like at age 80. Suppose there is a 50% chance that you will be healthy and able to live independently in your own home for the rest of your life and a 50% chance that your physical health will have deteriorated to the point where you will have to live in a nursing home for the rest of your life (e.g., you have difficulties performing everyday tasks unassisted, such as eating, bathing, or walking).

Also assume that your basic nursing home costs are fully covered, so you need not pay anything for this basic level of care. Your mental and cognitive health and lifespan will be the same whether or not you are in a nursing home at age 80 and additional spending on medical care will not change your lifespan.

Now suppose that you are given the opportunity—at no cost to you—to have an additional $10,000 provided to you either if you are healthy and in your own home or if you are in a nursing home. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you are in a nursing home, or any other combination. In either state, you can spend the money any way that you wish.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while physically disabled in a nursing home.
- Money to spend on any goods and services while healthy.

Each ball represents $500.

Question 2. Now, instead of your physical health, we would like to ask you about your mental or cognitive health.

Consider what your life may be like at age 80. Suppose there is a 50% chance that you will be healthy and able to live independently in your own home for the rest of your life and a 50% chance that your mental or cognitive health will have deteriorated to the point where you have to live in a nursing home (e.g., Alzheimer's disease, severe short term memory loss, or dementia).

Also assume that your basic nursing home costs are fully covered, so you need not pay anything for this basic level of care. Your physical health and lifespan will be the same whether or not you are in a nursing home at age 80 and additional spending on medical care will not change your lifespan.

Now suppose that you are given the opportunity—at no cost to you—to have an additional $10,000 provided to you either if you are healthy and in your own home or if you are in a nursing home. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you are in a nursing home, or any other combination. In either state, you can spend the money any way that you wish.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while mentally or cognitively disabled in a nursing home.
- Money to spend on goods and services while healthy.

Each ball represents $500.

[Note: ordering of mental and physical disabilities was randomized.]

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