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ABSTRACT

Objective

To investigate the determinants and quality of coverage decisions among uninsured choosing plans in a hypothetical health insurance marketplace.

Study setting

Two samples of uninsured individuals: one from an internet-based sample comprised largely of young, healthy, tech-savvy individuals (n=276), and the other from low-income, rural Virginians (n=161).

Study design

We assessed whether health insurance comprehension, numeracy, choice consistency, and the number of plan choices, were associated with participants' ability to choose a cost minimizing plan given their expected health care needs (defined as choosing a plan costing no more than $500 in excess of the total estimated annual costs of the cheapest plan available).

Data collection

Primary data were collected using an online questionnaire.

Principal findings

Uninsured who were more numerate showed higher health insurance comprehension; those with more health insurance comprehension made choices of health insurance plans more consistent with their stated preferences; and those who made choices more concordant with their stated preferences were less likely to choose a plan that cost more than $500 in excess of the cheapest plan available.

Conclusions

Increasing health insurance comprehension and designing exchanges to facilitate plan comparison will be critical to ensuring the success of health insurance marketplaces.

Key words: Affordable Care Act; health insurance exchanges/marketplaces; insurance choice, numeracy, health insurance comprehension; uninsured

INTRODUCTION

With the implementation of the Affordable Care Act (ACA) and its mandate requiring health care coverage, millions of Americans have started shopping for health insurance – and are doing so in a new way. Those who do not have employer-based or government-sponsored insurance will purchase coverage through online exchanges, which, depending on state of residence, will be administered by the federal government or the state.

While this presents an opportunity for millions of uninsured, there are enormous challenges facing both those running the exchanges and those who must use them. Outreach is a significant challenge, especially because most of the uninsured had very little understanding of their responsibility to purchase coverage just a few months before the exchanges opened. In April 2013, three years after the law was passed and just a few months before the commencement of enrollment, more than half of young people and almost 60% of the uninsured did not even know the law was still in effect, much less details about their responsibilities (Kaiser Family Foundation, 2013).

Moreover, even after an eligible person is successfully reached and understands the need to obtain coverage, he or she must make a decision on which plan to purchase from what company, which may have significant economic and health-related consequences. Previous research from the market for Medicare prescription drug coverage has shown that individuals find it difficult to navigate multiple choices and the accompanying information. As a result, they often spend more money than they need to and rarely switch to a more appropriate plan later on (Abaluck and Gruber; 2013; Zhou and Zhang, 2012). Providing information that is necessary – but not so much that it causes more confusion – is the major challenge facing those building such information systems.

The exchanges present a daunting challenge because of the people who need to use them. The uninsured differ from other population groups in several ways. While younger (and thus more likely to be facile at using online materials), they are less likely to be married, have lower income and education levels, and are more likely to be minorities and immigrants (O'Neill and O'Neill, 2009). Younger individuals, moreover, tend to be more risk-taking and impulsive (Steinberg et al., 2008).

In this article, compare two samples of uninsured individuals that we constructed, surveyed, and tested: one from an internet-based sample comprised largely of young, healthy, tech-savvy individuals, and the other of low-income, rural Virginians. We conduct a computer-based experiment using a hypothetical exchange like the one the uninsured will face in the marketplace, and examine the quality of the decisions they make in choosing health insurance. Of particular interest are the determinants of the quality of choices made. Going forward, these results can be used by federal and state officials and the research community in devising more effective health insurance marketplaces.

PREVIOUS RESEARCH AND HYPOTHESES

The section is subdivided into three determinants of the quality of insurance choices that are represented in a conceptual model in Appendix 1 and examined empirically below: health insurance comprehension, amount of choice, and numerical ability or numeracy. For the purposes of our study, insurance choice quality is defined as whether or not consumers choose a plan that aligns with their stated preferences and, ultimately, whether they choose a cost minimizing plan given their expected health care needs.

Health Insurance Comprehension

Health insurance comprehension has been defined as "the degree to which individuals have the knowledge, ability, and confidence to find and evaluate information about health plans, select the best plan for their own (or their family's) financial and health circumstances, and use the plan once enrolled" (Consumers Union, 2011). It can be thought of as a decision-making ability, rather than a trait per se, reflecting consumers' understanding of health insurance information. Therefore, it is likely influenced by cognitive abilities consumers' possess (e.g. numeracy) and the amount of information available in the decision environment.

While it may be a critical ability for consumers choosing in health insurance marketplaces, we know little about whether and how health insurance comprehension is related to insurance choices. The few studies to date on health insurance comprehension have focused on enrollees' comprehension of private insurance (e.g. Loewenstein et al., 2013) and specific aspects of public insurance programs (e.g. Medicare; Greenwald et al. 2006; McCormack et al., 2009) and the enrollee characteristics correlated with this comprehension. These studies find that insured Americans have difficulty understanding traditional health insurance plans because they are too complicated (Loewenstein et al., 2013). Although there has been scant evidence on health insurance comprehension and coverage choices (see Kim et al., 2013 for a review), findings from the finance literature suggests consumers with higher financial comprehension are more likely to rely on objective planning measures (e.g. financial calculators, experts, education) and are more successful in retirement and investment planning (Lusardi and Mitchell, 2011). Therefore, we hypothesize that uninsured consumers with higher health insurance comprehension will make better coverage decisions insofar as they will be more likely to choose a cost minimizing plan given their expected health care needs (Hypothesis 1).

<u>Amount of choice</u>

Choice size has been identified as an important factor affecting consumers' health insurance decisions. The Medicare Prescription Drug Program (Part D) provides the best evidence to date on how individuals deal with health insurance choice. In a series of experiments, both younger and older participants more easily identified the cheapest insurance plan available when there were fewer choices (Barnes et al., 2012; Hanoch et al., 2009 and 2011). This result is consistent with Herbert Simon's (1955) theory of bounded rationality and implies consumers facing information-rich environments often make suboptimal choices due to cognitive overload.

Several studies have also been conducted using "real world" data from the Medicare drug program. Using data from the first four years of the program, Abaluck and Gruber (2013) found that 20% of beneficiaries were choosing the plan that minimized total costs (premiums plus out-of-pocket expenses) in 2006, the first year of the program, and that over the next three years, even fewer did due to inertia. Zhou and Zhang (2012) demonstrated that only five percent of beneficiaries successfully chose the lowest cost plan in 2009, with the typical person spending over $350 more than they had to during the year. From this evidence base we generate several hypotheses. First, health insurance comprehension should be negatively influenced by the amount of information in the decision environment. That is, having more plan options, and hence a more cognitively demanding decision environment, will be associated with lower health insurance comprehension scores (Hypothesis 2). Second, as the number of insurance choices increases, consumers will have more difficulty choosing a cost minimizing plan given their expected health care needs (Hypothesis 3). We further hypothesize that, to the extent that more plan options in the choice set adversely affects the quality of coverage choices, the cognitive

overload effect of having more information in the decision environment will be mediated by health insurance comprehension (Hypothesis 4).

Numeracy

Numeracy—or the ability to understand, use and manipulate numbers—has received much attention from researchers, as it has been shown to play a vital role within the health domain. Researchers have also shown that numeracy is an independent factor, distinct from education and intelligence, that influences medical (Reyna et al., 2009) and health insurance decision-making (Wood et al., 2011). For example, Wood et al. (2011; see also Hanoch et al., 2009; Hanoch et al., 2011) have identified numeracy as a key determinant of both younger and older adults' ability to choose the cheapest Medicare part D plan, and Szrek and Bundorf (2011) reported that high levels of numeracy are directly associated with the likelihood of enrolling in the Medicare Part D program. We hypothesize that more numerate consumers will be more likely to choose a cost minimizing plan (Hypothesis 5).

With regard to health insurance comprehension, Hibbard and colleagues (1998) have demonstrated that numeracy is strongly related to the capability to comprehend and evaluate health insurance plans. In another study, Hibbard and colleagues (2007) found that numeracy is the best predictor for evaluating participants' comprehension levels and capacity to correctly answer questions about measures of hospital quality, costs, and identifying the best hospital from a given list. We therefore predict that consumers with higher numeric ability will have higher health insurance comprehension (Hypothesis 6).

DATA AND METHODS

Participants

Data were collected from two sources: a rural sample of uninsured and an online sample of uninsured.

Rural sample of uninsured

A community sample of uninsured individuals residing in the rural southern and southwestern counties of Virginia was recruited using several media outlets including flyers posted in libraries and clinics, public service announcements aired on the radio, television, and community websites, and through community recruiters. Adults who self-identified as uninsured and were under age 65 were enrolled in the study and asked to complete an online survey. Typically, these surveys were conducted on computers at the local public libraries. Participants were compensated $25 for their time and the study was approved by the institutional review board of the university managing the study. In total, 201 uninsured rural individuals composed the first segment of our participants.

Online sample of uninsured

To collect data from an online sample of uninsured, a single question Human Intelligence Task (HIT) was published on Amazon's Mechanical Turk (Paolacci et al., 2010) asking participants whether they were "covered by health insurance or some other kind of health care plan." All respondents (N=1,771) were compensated $0.25 for answering the eligibility question. Those who self-reported they were uninsured were offered $1.00 to answer the survey (N=309).

Responses from the online and rural sample were then combined into a single data set comprised of 510 responses. Twenty were dropped from the survey because they responded that they were insured. Another 53 observations were not included in the regression analysis due to missing data resulting in a final analytic sample of 437 participants.

<u>Survey</u>

The survey consisted of seven sections: 1) demographics, 2) health status, 3) health services utilization, 4) insurance choice task, 5) numeracy, 6) patient activation, and 7) risk and time preferences (Appendix 2).

<u>Insurance Choice Variables</u>

Eighty-eight single coverage plan quotes were obtained in the summer of 2012 for a hypothetical 35 year old male nonsmoker residing in Virginia from eHealthInsurance.com. eHealthInsurance.com has recently contracted with the Department of Health and Human Services (DHHS) and is expected to enroll millions of Americans in federally-run health insurance marketplaces (Mangan, 2013). Plan quotes from common sellers in the non-group market in Virginia (e.g., Anthem, Aetna, and United) were used to create nine exchange plans across three tiers - three bronze, three silver, and three gold - that varied on cost and coverage.

Participants were asked to read the following prompt:

Think about your health in this past year including how many times you saw your doctor, went to the emergency room, or stayed in the hospital. Also consider your current income. Imagine your health remains exactly the same this year as last year. Which health insurance plan do you think will best meet your individual needs this year?

Then, participants were presented with 3 or 9 insurance plans in random order. Each plan choice included information on ten attributes (e.g. copay, annual deductible). In the three plan condition, one plan from each tier (bronze, silver, and gold) was presented to participants. In the nine plan condition, two additional options were included in each tier (Figure 1). All participants chose a plan in both conditions.

Chose a more costly plan given expected health care needs

Using participants' self-reported health care utilization over the past 12 months as a proxy for expected health care needs, we estimated whether participants chose an insurance plan that minimized their total expected annual costs (i.e. premium plus out-of-pocket expenses). Utilization questions were adapted from the 2009 Medical Expenditure Panel Survey (MEPS) Household Component survey (U.S. Department of Health and Human Services, 2012). Costs of self-reported health care use were approximated using median expenditures for each service in the 2009 MEPS (Appendix 3).

From these data, total annual costs for each plan option were constructed for each individual that included premiums and, if services were used, copays for each service and out-of-pocket costs. For service utilizations that included a range (e.g., 2-3 doctors' visits), the minimum was used. Total annual costs for plans chosen averaged $2,434 (range $864-$15,924). Differences in total costs between the plan chosen and each alternative were calculated, and averaged $597 (range $0- $11,620). A binary variable was constructed to indicate whether individuals chose a plan that was at least $500 more in total annual costs than the lowest cost plan given their expected health care needs. On average, a $500 cost difference represented approximately 20% of total expenditures.

Choice consistency

Respondents were also asked which three of the ten plan attributes were most important in their decisions. To measure the extent to which participants' stated and revealed preferences aligned, we defined choice consistency as whether the attributes that participants indicated were most important (stated preference) matched with whether these attributes were minimized (or maximized) in their plan choice (revealed preference). For example, if a participant indicated premiums were most important in their plan choice, did they choose a plan with the lowest

premium? Since few (3%) respondents were able to align all three preferences, consistent responses on two and three preference categories were combined. Thus, choice consistency was defined as 0, 1, 2 (or 3).

Health insurance comprehension

Four health insurance comprehension questions were asked, including: 1) whether the plan chosen had a lower out-of-pocket max than other available plans, 2) whether the chosen plan had a lower annual deductible than other available plans, 3) which plan would be the lowest cost plan if no health services were needed in a year, and 4) which plan would be the lowest cost plan if $10,000 in health services were needed in a year. Health insurance comprehension scores were the sum of correct responses.

Covariates of interest

Number of plan options

A binary variable was created indicating whether participants were choosing in the 3 or 9 plan condition.

Numeracy

Numeracy was assessed using four items consisting of basic probability calculations from the Lipkus scale (Lipkus, Samsa, and Rimer, 2001).

Control variables

The adjusted analyses also controlled for participants' patient activation scores (Hibbard et al., 2005), risk preferences (DOSPERT; Blais and Weber, 2006), discount rates (Khwaja, Silverman, and Sloan, 2007), age, gender, race/ethnicity, education, marital status, income (below federal poverty level), in the online or rural sample, health status (SF-12 V2; Ware et al., 1995), presence of any chronic conditions, and, in health insurance comprehension and choice

consistency regressions, whether participants were "high utilizers" of health services (i.e., had more than one emergency department or inpatient admission in the past year) (Appendix 4).

Statistical Analyses

Descriptive statistics are presented for each study sample and for the overall sample. T-tests and Chi-square tests were used to determine whether any unadjusted differences exist in the means or frequencies of the variables between the two study samples. In the adjusted models, generalized estimating equations were fit assuming a Poisson distribution for health insurance comprehension and choice consistency whereas a binomial distribution was assumed for choice of a more costly plan. Adjusted results are reported as count ratios (CR) in the health insurance comprehension and choice consistency models and as odd ratios (OR) for the model of whether participants chose a cost minimizing plan. In all regression models, robust standard errors are used to correct variance estimates for clustering. Formal mediation analyses were conducted by estimating the indirect effect (i.e. the coefficient for the association between X and Y when mediator M is absent *minus* the coefficient for the association between X and Y when M is present (MacKinnon and Dwyer, 1993)). Percentile method confidence intervals for indirect effects were obtained via bootstrapping using 10,000 replicates (Bollen and Stine, 1990; Lockwood and MacKinnon, 1998, Hayes and Scharkow, 2013). All analyses were conducted in Stata 12 (StataCorp., 2011).

RESULTS

Sample Characteristics

Of the 437 uninsured participants comprising our analytic sample, 276 (63.2%) were from the online sample and the remainder from the rural sample (Table 1). Among all respondents, 40% chose a health plan costing at least $500 more than an available alternative

given their expected health care needs. In our sample, participants had difficulty choosing plans that aligned with their stated preferences (consistency score 1.17, SD 0.78) and could correctly answer around two of the four health insurance comprehension questions (mean 2.61, SD 1.19) as well as two of the four numeracy questions (mean 2.15, SD 1.37).

Unadjusted Associations of Choosing a More Costly Plan

Before adjustment, there was no significant difference in the probability of choosing a plan that was at least $500 more expensive than the cheapest alternative when participants chose from three (37.4%) or nine plans (42.9%) (p=0.11). The average cost difference between the plan chosen and the cheapest alternative was $537 in the three plan condition and $656 in the 9 plan condition. The probability of choosing a more costly plan significantly decreased as consistency score increased (p<0.01). The difference in excess costs for participants with a choice consistency score of two or higher was $529 vs. $656 for participants with a consistency score of zero. The likelihood of choosing a more costly plan decreased significantly as insurance comprehension increased (p<0.01) with participants scoring perfectly on comprehension having $360 in average excess costs and those scoring zero having a difference of $1,109.

Adjusted Associations of Choosing a More Costly Plan, Choice Consistency and Health Insurance Comprehension

Chose a more costly plan given expected health care needs

After adjustment, we found evidence supporting hypothesis 1 that health insurance comprehension was negatively associated with the odds of choosing a plan that was at least $500 more expensive in total estimated annual costs (OR 0.84, p<0.05, Table 2).[1] We also found support for a positive relationship between the number of plans and consumers' choice of a more costly plan (OR 1.31, p<0.05; hypothesis 3) before controlling for health insurance

comprehension. However, after controlling for comprehension, the effect of more plan choice decreased in magnitude and was not significant. Our mediation test indicated the effect of more plan options on choosing a more costly plan may operate indirectly through health insurance comprehension (OR 1.10, p<0.05; hypothesis 4). However, we found no evidence to support hypothesis 5 that higher levels of numeracy were associated with a decreased likelihood of choosing a more costly plan.

Increased choice consistency was associated with lower odds of choosing a more costly plan (OR 0.42, p<0.01). With choice consistency in the model, the health insurance comprehension and 9 plan choice coefficients were no longer significant. Formal mediation tests indicate the effect of health insurance comprehension on choosing a more costly plan was indirect via choice consistency (OR 0.90, p<0.01). We also found weak evidence that the effect increased plan choice on making a more costly coverage choice was mediated by choice consistency (OR 1.11, p<0.10), presumably via health insurance comprehension.

Choice consistency

Higher health insurance comprehension scores were significantly associated with the consistency between stated and revealed preferences in participants' plan choices (CR 1.13, p<0.01, Table 3), providing support for hypothesis 1. In addition, we found evidence in support of hypothesis 3 of an inverse relationship between number of plan options and choice consistency (CR 0.93, p<0.05). We also found support for hypothesis 4 that the effect of the number of plan options on consistency was mediated by health insurance comprehension (CR 1.08, p<0.01).

Health insurance comprehension

We found support for the second hypothesis that increasing the number of insurance plan options was associated with lower health insurance comprehension scores (CR 0.79, p<0.01, Table 4). Supporting hypothesis 6, higher levels of numeracy were also significantly associated with higher health insurance comprehension scores (CR 1.09, p<0.01).

Sensitivity tests

We tested the sensitivity of our main results to empirical definitions of choosing a cost minimizing plan (i.e., dichotomous vs. linear cost difference) and choice consistency, missing data, interactions between the sample indicator and regressors of interest, collinearity, and preferences for plan quality. These are presented in Appendix 5. Broadly, the main results are robust to the alternative model specifications examined.

DISCUSSION

Our study is among the first to explore how uninsured populations are expected to perform in health insurance exchanges. In line with earlier work on Medicare part D (Hanoch et al., 2009; Abaluck and Gruber, 2011), the findings revealed that many consumers did not choose a cost minimizing plan. Furthermore, the younger, more tech savvy uninsured in the online sample, and poorer, more rural uninsured both performed poorly in the coverage decision tasks. Participants in the sample, furthermore, had difficulty choosing plans that aligned with their stated preferences (choice consistency), correctly answering factual questions about health insurance choices (health insurance comprehension) and calculating simple probabilities (numeracy).

These results are not isolated ones. Others have also found that even insured individuals face serious obstacles in answering questions about health insurance (Lowenstein et al., 2013). An investigation by Finucane and colleagues (2005) revealed that young and old participants

have difficulties answering simple questions about health insurance information, such as being able to identify the lowest copayment for an office visit from a grid that included only four different plans. Earlier examinations (Marquis, 1983), likewise, have shown that even families who possess health insurance are unable to respond correctly to questions about their own health care coverage.

Five of our six hypotheses were supported by our data analysis. The results are consistent with the idea that consumers' decision-making abilities, in conjunction with the amount of information in their choice environment, affect the quality of the health insurance choices they make. Two important factors at play in coverage choices are numeracy and health insurance comprehension, and they were statistically significant in the regression analyses. Those who were more numerate showed higher health insurance comprehension; those with more health insurance comprehension made choices of health insurance plans more consistent with their stated preferences; and those who made choices more concordant with their stated preference were less likely to choose a plan that cost more than $500 in excess of the cheapest plan available. The amount of information in the decision environment was also important. Participants facing more plan choices showed lower health insurance comprehension. Further, the results suggest that cognitive overload from too much information in the decision environment operates on choice quality via insurance comprehension.

These findings augment and extend earlier work focusing on Medicare and Medicare Part D. Studies by Hibbard and colleagues (2001) looking at health insurance within Medicare and Hanoch et al. (2009, 2011; Wood et al, 2011), focusing on Medicare Part D, found that individuals encounter difficulties in making health insurance decisions. Indeed, in Hanoch et al. (2009) and Wood et al. (2011), individuals who faced a greater array of prescription drug options

made worse decisions, findings that were later supported by examining real world data (Abaluck and Gruber, 2013). Finally, the results further highlight the importance of numeracy within the medical arena, and especially with regard to understanding insurance. Peters et al., (2007), as well as Szrek and Bundorf (2011; 2013), also found that more numerate individuals make better insurance related decisions.

LIMITATIONS

Although our data and design have many strengths, several limitations suggest caution should be taken when interpreting our results. Neither the rural nor online sample was representative of uninsured in rural regions of the U.S. or of the entire U.S. population of uninsured. By design, they represent two very different populations who will be enrolling in health insurance marketplaces: younger, healthier, more tech-savvy uninsured and less healthy, rural uninsured who may be less facile with computer technology. The results may also limited by the lack of incentive-compatibility in the choice experiments. Participant compensation was not aligned with performance and so, without "skin in the game", various factors, including self-serving biases, inattention, and strategic motives could cause them to misreport their true preferences, limiting the generalizability of the findings to real-world decision-making (see Camerer and Hogarth, 1999 for a discussion).

Using cost minimization as the choice objective may limit the scope of the findings as well. For example, no particular coverage choice is necessarily a bad choice in the real-world due to differences in provider networks across plan offerings. Furthermore, plans with the same expected costs may have different risk properties, such as the risk of higher maximum out-of-pocket costs. However, earlier evidence suggests that cost is one of the most salient and

important factors in coverage choices (Mechanic, 1989; MedPAC, 2006) and so we empirically

defined our insurance choice outcomes in the experiments to delineate between clear winners

and losers based on costs. In doing so, two sources of measurement error arise from our

empirical treatment of the excess cost outcome. The data do not allow the use of the actual costs

participants faced and, even if they did, participants may not accurately recall their utilization

history. Furthermore, the consistency of the estimates in each of the models may be affected by

omitted variables bias. For example, past experiences with health insurance plan choices (e.g.,

through a previous job) are not controlled for. If such experiences are strongly and positively

correlated with health insurance comprehension and choosing a cost minimizing plan, then we

would expect the insurance comprehension estimate to be biased away from zero.

CONCLUSIONS

The Congressional Budget Office estimates 26 million Americans will be covered in

exchanges by 2020 (Congressional Budget Office, 2013). Our results are among the first to

demonstrate that numeracy and health insurance comprehension will be critical skills in choosing

a health insurance plan that offers consumers adequate risk protection given their expected health

care needs and therefore critical to the successful implementation of the Affordable Care Act.

Further, the relationship between these decision-making skills and the quality of coverage

choices was consistent across a spectrum of uninsured individuals differing in age, income, and

education. Indeed, these findings raise serious concern about consumers' ability to navigate

through the exchanges, as well as compare and choose health insurance plans. Recently, Peters,

Meilleur, and Tompkins (2013) reported that nearly 30% of uninsured adults had a below basic

level of numeracy. The findings regarding fewer plan choices are consistent with much of the

literature that was reviewed earlier in the article. At the time of writing, the number of choices is

not clear and will vary by state, but at a minimum, individuals will have to choose

comprehensiveness of coverage (e.g., gold, silver, or bronze plans) as well as particular

companies within the tier they select.

Admittedly, in the short run it will be exceedingly difficult to improve the population's

numeracy and health insurance comprehension. Nevertheless, other strategies, which focus on

enhancing insurance choices outside of educating decision-makers, are possible. One example is

for the federal and state governments to support a vibrant network of insurance

navigators. These experts will fill vital roles by assisting consumers in understanding health

insurance and comparing plan options. Second, the marketplaces themselves can be designed to

make plan comparisons more salient rather than rely on consumers to be more informed and

engaged in their decision-making (Nease et al., 2013). For example, to reduce reliance on

numeracy in insurance choices, recent work has found using symbols rather than numbers

improves plan choices in Medicare Part D (Barnes et al., 2013). Further, some state-run

exchanges (e.g. California, Massachusetts) are standardizing coverage options within a metal tier

to improve comparability of plan offerings. These purposeful designs to the choice environment

will likely assist consumers in their decision-making and other efforts towards choice

architecture in exchanges should be explored.

Speaking about the Affordable Care Act, former U.S. President Bill Clinton stated that

"the health of our people, the security and stability of our families, and the strength of our

economy are all riding on getting health care reform right and doing it well." He also noted that

he was "still amazed at how much misunderstanding there is about the current system of health

care" (Goodnough and Chosick, 2013). Indeed, awareness of these marketplaces among those

expected to enroll in them is low and many who are aware of them fear they will be too complicated (Commonwealth Fund, 2013). The health insurance choices made in exchanges in the coming years will have major financial and health ramifications for consumers, for the broader health care system and, ultimately, for the success of the most sweeping health reform since the enactment of Medicare and Medicaid. Whether the policy goals of the Affordable Care Act are achieved will be shaped in no small part by the extent Americans become engaged consumers of health insurance. To do so, our findings suggest they will need a great deal of help understanding and comparing coverage options when making these important decisions.

ENDNOTES

1. Excess health plan costs given expected health care needs may arise from over- or underinsurance (i.e., choosing too much coverage if healthy or too little if sick). Both sources of decision error should be affected health insurance comprehension. To test whether this was the case, we first created rough indicators for over- and underinsurance. Recall that the variable "high-utilizer" is defined as having more than one emergency department visit and/or any hospital stay in the past year. Underinsurance was defined being a high utilizer and choosing a "Bronze" plan. Overinsurance was defined as choosing a "Silver" or "Gold" plan but not being a "high-utilizer." We then tested for differences in health insurance comprehension across these groups. We found that participants who were over- or underinsured had significantly lower unadjusted insurance comprehension than those who were "adequately" insured. Specifically, those who were adequately insured had comprehension scores of 2.69 vs. 2.45 for those who were over-insured ($p<0.01$). Likewise, those who were adequately insured had comprehension scores that were 2.65 vs. 1.96 for those who were underinsured ($p<0.01$).

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Figure 1. Three and nine plan choice condition

Plan Name	A*	B	C	D*	E	F	G*	H	I
Plan Level	**Bronze**	**Bronze**	**Bronze**	**Silver**	**Silver**	**Silver**	**Gold**	**Gold**	**Gold**
Monthly premium cost	$72	$73	$77	$115	$117	$121	$192	$195	$203
Annual deductible	$5,000	$10,000	$10,000	$750	$2,000	$1,250	$500	$0	$1,000
Annual Out-of-Pocket max (includes deductible)	$10,000	$10,000	$15,000	$4,250	$5,000	$5,500	$2,000	$3,000	$2,500
Doctor visit copay	$20	$35	$35	$35	$20	$25	$30	$25	$25
Generic prescription drug copay	$20	$15	$15	$15	$20	$15	$15	$15	$15
Emergency room copay	40% after deductible	0% after deductible	30% after deductible	30% after deductible	25% after deductible	30% after deductible	20% after deductible	35% after deductible	20% after deductible
Hospitals copay	40% after deductible	0% after deductible	30% after deductible	30% after deductible	25% after deductible	30% after deductible	20% after deductible	35% after deductible	20% after deductible
Insurance plan quality rating	4.1 out of 5	4.0 out of 5	3.5 out of 5	4.2 out of 5	4.0 out of 5	3.9 out of 5	4.2 out of 5	4.1 out of 5	3.8 out of 5
Total you pay to manage your diabetes	$4,100	$4,100	$4,100	$1,821	$2,450	$2,116	$1,292	$1,445	$1,632
Total you pay to give birth in a hospital	$5,992	$7,450	$7,450	$2,770	$3,378	$3,121	$1,902	$2,617	$2,302

Notes: Plans with (*) were included in the three plan condition. Plan attributes were based on DHHS guidelines and definitions of terms from the DHHS Glossary of Health Coverage and Medical Terms were provided to all participants (Center for Consumer Information and Insurance Oversight, 2012). All plan comparison information was provided to individuals throughout the study to minimize working memory load (Wood et al., 2011) and letters of the alphabet were used instead of plan names to minimize brand effects (Barnes et al., 2012).

Table 1 Sample Characteristics

		Overall (n=437)	Online (n=276)	Rural (n=161)
Outcomes	Chose plan costing at least $500 more than the lowest cost plan	40%	34%	52%*
	Choice consistency (range 0-2)	1.17	1.20	1.13
	(SD)	(0.78)	(0.77)	(0.79)
	Health insurance comprehension (range 0-4)	2.61	2.97	1.99*
	(SD)	(1.19)	(1.06)	(1.15)
Regressors of interest	9 plan condition	50%	50%	50%[NA]
	Numeracy (range 0-4)	2.15	2.76	1.10*
	(SD)	(1.37)	(1.18)	(0.96)
Covariates	Patient activation (range 0-100)	79.80	78.90	81.27*
	(SD)	(10.23)	(10.00)	(10.18)
	Missing patient activation	36%	48%	19%*
	DOSPERT (range 1-7)			
	Health risk	2.76	2.94	2.44*
	(SD)	(1.06)	(1.04)	(1.01)
	Financial investment	3.19	3.24	3.10
	(SD)	(1.52)	(1.39)	(1.73)
	Financial risk	1.62	1.66	1.55
	(SD)	(1.09)	(1.12)	(1.03)
	Time discounting	2.11	2.13	2.09
	(range 0-4)	(1.45)	(1.45)	(1.42)
	Age	33.52	29.60	40.31*
	(SD)	(11.72)	(8.96)	(12.80)
	Male	54%	65%	34%*
	Non-Hispanic White	60%	82%	22%*
	Non-Hispanic African American (NHAA)	30%	4%	75%*
	Other ethnicity	10%	14%	3%*
	High school or less	36%	21%	56%*
	Some college	38%	42%	31%*
	College or more	28%	37%	13%*
	Currently employed	57%	61%	51%*
	Federal poverty level (FPL)	36%	24%	57%*
	Rural sample	37%	0%	100%[NA]
	Fair or poor health	24%	21%	28%*
	Any chronic disease	42%	34%	54%*
	High utilizer	14%	6%	28%*

Note: * indicates bivariate test (t-test or Chi-square) of differences between online and rural sample characteristics significant at p<0.05.

Table 2 Correlates of Choice of a Plan at Least \$500 more than the Lowest Cost Plan Given Expected Health Care Needs[1]

		Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Regressors of interest	Choice consistency	--	--	0.42***
				(0.05)
	Health insurance comprehension	--	0.84**	0.94
			(0.06)	(0.07)
	9 plan condition	1.31**	1.19	1.18
		(0.16)	(0.16)	(0.17)
	Numeracy	0.96	0.99	0.99
		(0.08)	(0.08)	(0.09)
Covariates	Patient activation	1.00	1.00	1.00
		(0.01)	(0.01)	(0.01)
	Missing patient activation	0.52**	0.54***	0.60**
		(0.10)	(0.11)	(0.11)
	Health risk	0.83**	0.84*	0.86
		(0.08)	(0.08)	(0.08)
	Financial investment	1.08	1.09	1.06
		(0.07)	(0.07)	(0.07)
	Financial risk	1.17*	1.16*	1.15*
		(0.09)	(0.09)	(0.09)
	Time discounting	1.05	1.06	1.04
		(0.06)	(0.06)	(0.06)
	Age	1.01	1.01	1.00
		(0.01)	(0.01)	(0.01)
	Male	1.04	1.03	0.92
		(0.21)	(0.21)	(0.18)
	NHAA	1.06	1.00	1.18
		(0.29)	(0.27)	(0.34)
	Other race	0.73	0.71	0.80
		(0.22)	(0.20)	(0.21)
	Some college	0.65**	0.65**	0.57**
		(0.13)	(0.13)	(0.12)
	College or more	1.06	1.03	0.82
		(0.27)	(0.26)	(0.22)
	Employed	1.11	1.11	0.98
		(0.19)	(0.19)	(0.18)
	FPL	1.33	1.33	1.30
		(0.25)	(0.25)	(0.26)
	Rural	1.16	1.09	1.05
		(0.34)	(0.32)	(0.31)
	Fair or poor health	1.04	1.04	0.83
		(0.24)	(0.24)	(0.19)
	Any chronic disease	1.23	1.24	1.43*
		(0.25)	(0.25)	(0.29)

	Constant	0.67	0.91	2.30
		(0.62)	(0.86)	(2.33)
Indirect effects[4]	9 plans	----	1.10**	1.10*
(mediation)			(0.05)	(0.07)
	Health insurance comprehension	----	----	0.90***
				(0.03)
Observations		852	852	848
Number of individuals		437	437	437

1Correlates of choosing a more costly plan modeled using GEE assuming a binomial distribution for the outcomes. Robust standard errors were used. 2 Controls for health insurance comprehension. 3 Controls for health insurance comprehension and choice consistency. 4 Indirect effects were calculated by subtracting the unexponentiated coefficient of interest in the model controlling for the mediator from the same coefficient in the model without the mediator. Standard errors and percentile method confidence intervals for indirect effects were obtained by bootstrapping using 10,000 replicates. *p<0.10, **p<0.05, ***p<0.01

Table 3 Correlates of Choice Consistency[1]

Regressors of interest		Count Ratio (SE)	Count Ratio[2] (SE)
Regressors of interest	Health insurance comprehension	--	1.13*** (0.03)
	9 plan condition	0.93** (0.03)	1.00 (0.04)
	Numeracy	1.01 (0.03)	0.99 (0.02)
Covariates	Patient activation	1.00 (0.01)	1.00 (0.01)
	Missing patient activation	1.15** (0.07)	1.13* (0.07)
	Health risk	1.05* (0.03)	1.04 (0.03)
	Financial investment	0.97 (0.01)	0.97 (0.02)
	Financial risk	0.98 (0.03)	0.99 (0.03)
	Time discounting	0.99 (0.02)	0.98 (0.02)
	Age	1.00 (0.01)	1.00 (0.01)
	Male	0.90* (0.05)	0.91 (0.05)
	NHAA	1.10 (0.09)	1.15 (0.09)
	Other race	1.11 (0.10)	1.13 (0.10)
	Some college	0.93 (0.06)	0.92 (0.05)
	College or more	0.81*** (0.06)	0.82*** (0.06)
	Employed	0.89** (0.05)	0.89** (0.04)
	FPL	0.96 (0.06)	0.97 (0.06)
	Rural	0.91 (0.09)	0.95 (0.09)
	Fair or poor health	0.81*** (0.06)	0.81** (0.06)
	Any chronic disease	1.08 (0.07)	1.08 (0.06)
	High utilization	1.07 (0.09)	1.09 (0.08)
	Constant	1.31	1.03

			(0.37)	(0.28)
Indirect effects[3]	9 plans		--	1.08***
(mediation)				(0.02)
Observations			848	848
Number of individuals			437	437

1Correlates of choice consistency modeled using GEE assuming a Poisson distribution for the outcome. Robust standard errors were used. 2 Controls for health insurance comprehension. 3 Indirect effects were calculated by subtracting the coefficient of interest in the model controlling for the mediator from the same unexponentiated coefficient in the model without the mediator. Standard errors and percentile method confidence intervals for indirect effects were obtained by bootstrapping using 10,000 replicates.*p<0.10, **p<0.05, ***p<0.01

Table 4 Correlates of Health Insurance Comprehension[1]

		Count Ratio (SE)
Regressors of interest	9 plan condition	0.79***
		(0.02)
	Numeracy	1.09***
		(0.02)
Covariates	Patient activation	1.00
		(0.01)
	Missing patient activation	1.06
		(0.04)
	Health risk	1.03*
		(0.02)
	Financial investment	1.02*
		(0.01)
	Financial risk	0.96**
		(0.01)
	Time discounting	1.02*
		(0.01)
	Age	1.00**
		(0.01)
	Male	0.97
		(0.04)
	NHAA	0.84***
		(0.05)
	Other race	0.97
		(0.04)
	Some college	1.01
		(0.04)
	College or more	0.94
		(0.04)
	Employed	1.00
		(0.03)
	FPL	0.98
		(0.04)
	Rural	0.86**
		(0.05)
	Fair or poor health	1.01
		(0.04)
	Any chronic disease	1.01
		(0.04)
	High utilization	0.93
		(0.05)
	Constant	1.94***
		(0.34)
Observations		852

1Correlates of health insurance comprehension were modeled using generalized estimating equations (GEE) assuming a Poisson distribution for the outcome. Robust standard errors were used.*p<0.10, **p<0.05, ***p<0.01