



HHS Public Access

Author manuscript

J Health Commun. Author manuscript; available in PMC 2017 January 01.

Published in final edited form as:

J Health Commun. 2016 ; 21(Suppl): 43–50. doi:10.1080/10810730.2015.1131776.

Health Literacy and Access to Care

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Abstract

Despite well-documented links between low health literacy, low rates of health insurance coverage, and poor health outcomes, there has been almost no research on the relationship between low health literacy and self-reported access to care. This study analyzed a large, nationally representative sample of community-dwelling adults ages 50 and older to estimate the relationship between low health literacy and self-reported difficulty obtaining care. We found that individuals with low health literacy were significantly more likely than individuals with adequate health literacy to delay or forego needed care or to report difficulty finding a provider, even after controlling for other factors including health insurance coverage, employment, race/ethnicity, poverty, and general cognitive function. They were also more likely to lack a usual source of care, although this result was only marginally significant after controlling for other factors. The results show that in addition to any obstacles that low health literacy creates within the context of the clinical encounter, low health literacy also reduces the probability that people get in the door of the health care system in a timely way.

Introduction

The importance of health literacy for a wide range of health-related outcomes – including the use of preventive medical services, control of chronic conditions, and, ultimately, mortality – is well established (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011; Paasche-Orlow & Wolf, 2007; White, Chen, & Atchison, 2008). However, the mechanisms through which health literacy may affect health outcomes are not well understood (Paasche-Orlow & Wolf, 2007), and there is surprisingly little empirical evidence on how health literacy affects access to care, despite substantial theoretical attention to this question (Sørensen et al., 2012; Squiers, Peinado, Berkman, Boudewyns, & McCormack, 2012). A recent study establishes that low health literacy is a significant risk factor for lacking health insurance (Sentell, 2012), but almost no research has analyzed whether health literacy is related to self-reported indicators of poor access, including difficulty finding providers, delays in accessing care, or having a usual source of care.

One reason for this omission may be that, with few exceptions, empirical research on health literacy has relied on samples of individuals who already have an established connection to the health care system. For example, studies have used samples of patients presenting for care at a given clinic (D. W. Baker et al., 2007; Miller, Lee, DeWalt, & Vann, 2010); patients with a particular condition (Bennett et al., 1998; Grubbs, Gregorich, Perez-Stable, & Hsu, 2009; Lindau, Basu, & Leitsch, 2006; Mancuso & Rincon, 2006); or enrollees in Medicare managed care plans (David W Baker et al., 2004; Cho, Lee, Arozullah, & Crittenden, 2008; Howard, Gazmararian, & Parker, 2005; Scott, Gazmararian, Williams, & Baker, 2002). The use of such samples may understate the negative association between low health literacy and access to care because they do not consider, by design, obstacles that precede an individual's arrival at a healthcare setting. In a nutshell: if low health literacy keeps individuals from reaching the door of the clinic, then focusing on patients who are already in the door misses a piece of the problem.

The goal of the current study was to explore the relationship between low health literacy and access barriers that arise before individuals get to the clinic door. We used data from a nationally-representative sample of older Americans to estimate the relationship between self-assessed health literacy and four self-reported measures of access to care: (1) delaying care because of cost; (2) delaying care for other reasons; (3) difficulty finding a provider; (4) not having a usual source of care. We also analyzed differences in reported reasons for delaying care and in the nature of difficulty finding a provider.

Study Data and Methods

Data

Data for the study come from the Health and Retirement Study (HRS), an ongoing, longitudinal, biennial study of 22,000 individuals ages 51 and older that was begun in 1992, with new sample cohorts enrolled every 6 years. The basic design of the study has been described elsewhere (Juster & Suzman, 1995; Sonnega et al., 2014a). In addition to the core surveys that are conducted every two years either in person or by telephone to collect information on health, cognition, employment, and economic status, supplemental surveys are administered via US mail or Internet during the off years. We designed such a supplemental survey, with questions on health literacy and access to care, that was administered by mail in fall 2011 to a random subsample of approximately half of the 22,032 individuals who completed the 2010 core survey. We refer to this supplemental survey as the health care mail survey. Most of our key dependent and independent variables came from the health care mail survey, with some covariates drawn from the 2010 core survey.

Sample

The 2010 HRS sample represents the US population born in 1959 and earlier. Blacks and Hispanics are oversampled by design; the use of analysis weights that address unequal sampling probabilities as well as response rates that vary by racial and geographic subgroups yields nationally representative estimates (Heeringa & Connor, 1995; Ofstedal, Weir, Chen, & Wagner, 2011). Response rates to recent waves of the core survey have been above 88%

(Sonnega et al., 2014b). Interviews were conducted in English (94% of the core 2010 sample) and Spanish (6%). Although the possibility of nonrandom attrition from the sample is a concern for any longitudinal study, several careful studies have documented that attrition bias in the HRS is not significant (Cheshire, Ofstedal, Scholes, & Schröder, 2011; Weir, Faul, & Langa, 2011).

The 2011 health care mail survey was sent to a subsample of 10,230 respondents randomly drawn from the 22,032 respondents who completed the 2010 HRS core interview. Seventy-five percent ($n = 7,648$) returned a completed mail survey; of these, we kept the 7,258 who were born before 1960 and therefore age-eligible for the study. We further excluded 23 individuals residing in nursing homes and 93 who did not complete key health literacy and/or access items for a final analysis sample of 7,142 community-dwelling individuals ages and older.

Variables

Access/utilization—We used four measures of self-reported access to care from the health care mail survey. Respondents were asked whether there was any time in the last twelve months when they needed medical care but did not get it because they couldn't afford it; they were then asked about whether care was ever delayed in the past 12 months for any other reason, with a list of possible reasons where respondents were asked to mark all that apply. We used these responses to construct two measures of delayed care: first, a variable equal to one if the respondent delayed care because of cost, and second, a variable equal to one if the respondent delayed care for some other reason. The third measure was difficulty finding a provider; respondents were asked whether they had any difficulty in the past 12 months finding a general doctor, specialist, or other provider (dentist, physical therapist, occupational therapist, home care provider, pharmacist, other) who would see them, with a list of possible reasons for the difficulty where respondents were asked to mark all that apply. Fourth, respondents were asked whether there is a place they usually go when they are sick or need advice about health; respondents who said "yes" were asked about what kind of place it is. Respondents who reported that there is not a place they usually go, or who report that the place they usually go is a hospital emergency room, were considered to lack a usual source of care.

Health literacy—We measured health literacy using responses to a question included in the health care mail survey: "How confident are you filling out medical forms by yourself?" Possible responses were: extremely confident; quite confident; somewhat confident; a little confident; not at all confident. Studies validating this measure against well-established measures of health literacy such as the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA) suggest defining low health literacy as a response of "somewhat confident" or less (L. D. Chew, Bradley, & Boyko, 2004; Lisa D. Chew et al., 2008; Powers, Trinh, & Bosworth, 2010; Wallace, Rogers, Roskos, Holiday, & Weiss, 2006) and we followed this convention. This measure has also been validated in Spanish (Sarkar, Schillinger, López, & Sudore, 2011).

Health insurance—The health care mail survey asked respondents to report all sources of health insurance – Medicare, Medicaid, employer-sponsored coverage, individually purchased private coverage, TRICARE/CHAMPUS/CHAMPVA, other public coverage, care through the VA – and we created a binary indicator for those with no coverage. Given the documented relationship between health insurance and problems with access to care (Baicker et al., 2013; D. Card, C. Dobkin, & N. Maestas, 2008; Sommers, Baicker, & Epstein, 2012) and between low health literacy and health insurance (Sentell, 2012), we considered health insurance status to be a very important control variable for multivariate models.

Health status and chronic conditions—In the mailer survey, respondents reported their health status as excellent, very good, good, fair, or poor; we constructed a binary indicator for fair or poor health. We also used self-reports from the 2010 core HRS to create indicators for respondents who have ever been diagnosed with any of the following chronic conditions: hypertension, diabetes, cancer, lung disease, heart disease, stroke, or psychiatric problems.

Cognition—The core HRS routinely includes a battery of cognition measures, including subtraction (7 from 100 successively; 1 from 20 or 1 from 86, successively), and memory (immediate and delayed recall of a list of common words). These variables provide an observed, rather than self-reported, measure of cognitive ability that has been validated (Langa, Kabeto, & Weir, 2010). Following a previous study, we defined cognitive impairment as a score of 7 or lower on a 27-point cognition scale constructed using these measures from the core 2010 data (Crimmins, Kim, Langa, & Weir, 2011). General cognition is highly correlated with health literacy and, if omitted from multivariate analyses, may yield misleadingly large coefficients on health literacy (David W Baker, Wolf, Feinglass, & Thompson, 2008; Möttus et al., 2014; Serper et al., 2014).

Demographic and socioeconomic characteristics—The core HRS routinely collects information from all core respondents on age, gender, marital status, race, Hispanic ethnicity, educational attainment, and employment status (full-time work; part-time work; unemployed; retired; neither working nor looking for work). We characterized race and ethnicity using four mutually exclusive categories: white non-Hispanic, black non-Hispanic, other non-Hispanic, and Hispanic (any race). We coded educational attainment categorically: less than high school, high school graduate, some college, and education greater than or equal to a four-year college degree. We include these characteristics in our multivariate models because existing research shows that low health literacy is correlated with age, race, and education (Kutner, Greenberg, Jin, Paulsen & White 2006).

Statistical methods and analytic approach: All statistical analyses were performed using Stata version 14 (Stata Corporation, College Station, TX) and are weighted to be nationally representative of community-dwelling Americans aged 50 and older. Our statistical analysis began with calculating the average characteristics of participants in our sample and testing for differences in these characteristics across groups defined by low and adequate health literacy, using adjusted Wald tests that take into account the complex

sampling design of the Health and Retirement Study; we report the p-values associated with these tests. Next, we performed similar tests for differences in the outcomes of interest (access problems; all measured as binary variables) across the two groups, as well as differences in the fraction of participants who reported specific reasons for encountering particular access problems. Our next step was to estimate a multivariate logistic regression for each of the outcomes of interest, modeling these outcomes as function of the covariates described above. The results of the regressions are reported as odds ratios, with associated 95% confidence intervals that take into account the complex survey design. Finally, in order to provide a meaningful interpretation of the odds ratios from the multivariate models, we calculated the average marginal effect of low health literacy on each outcome by subtracting the average predicted value from the model with “low health literacy” set to equal one from the average predicted value with “low health literacy” set equal to zero. For each outcome, we added this marginal effect to the simple mean value of the outcome for individuals with adequate health literacy to obtain a “covariate-adjusted” estimate of the mean value of each outcome for those with low health literacy. These covariate-adjusted estimates are presented graphically in a figure with the unadjusted mean outcomes for both groups, in order to provide a visual summary of the main results of the analysis.

Study Results

Table 1 reports average characteristics for participants in our sample with low versus adequate health literacy. Approximately one-quarter of our sample had low health literacy; exact proportions were 24.20% (weighted) and 26.90% (unweighted). Consistent with previous research (Sentell, 2012), those with low health literacy were more likely to be uninsured, with 10.49% uninsured among those with low health literacy compared with only 7.48% for those with adequate health literacy, a difference that is marginally statistically significant with $p = 0.079$. Individuals with low health literacy were, on average, less educated, more likely to be racial or ethnic minorities, less healthy, older, and more likely to exhibit cognitive impairment than were those with adequate health literacy; these results, too, are also consistent with earlier research (Baker, Gazmararian, Sudan & Patterson 2000; Baker, Wolf, Feinglass & Thompson 2008; Kutner, Greenberg, Jin, Paulsen & White 2006).

Table 2 presents the fraction of individuals who reported having delayed care. About one-third (31.86%) of those with low health literacy reported that they delayed care in the last 12 months, either because of cost (12.77%) or for another reason (26.19%). (Note that these two fractions sum to more than 31.86% because some people report both cost-related and non-cost-related delays.) In contrast, less than one-quarter (22.98%) of those with adequate health literacy reported that they delayed or did not obtain care, a significantly lower fraction than among those with low health literacy. Those with adequate health literacy were significantly less likely than those with low health literacy to report either cost-related or non-cost-related problems.

When we looked at the detailed reasons participants offered for delaying care, we found that these reasons differed for participants with low versus adequate health literacy (bottom panel of Table 2). The commonest reason reported for delay by either group was “I could not afford it,” reported by 40.09% those with low health literacy and 34.75% of those with

adequate health literacy. The second most common reason overall, “I am too busy to go to the doctor,” was reported more than twice as often among respondents with adequate health literacy compared with those who had low health literacy (24.34% versus 10.61%), which likely reflects in part the fact that individuals with low health literacy in our sample were less likely to work than those with adequate health literacy. Three other reasons stand out because they were significantly more likely to be chosen by respondents with low health literacy: not having transportation, having to wait too long at the doctor’s office, and being afraid of what they might find out. Almost three times as many respondents with low health literacy reported having delayed care because they did not have transportation (16.88% versus 6.21%). Respondents with low health literacy were significantly more likely to say they had to wait too long once they got to the doctor’s office (17.63% of respondents with low health literacy compared with 10.99% of those with adequate health literacy). This may have been because they frequented different providers who did, in fact, have longer waiting times or it may have been that individuals with low health literacy had less patience for waiting to see providers, but we could not test those theories using these data. Respondents with low health literacy were also more likely to report that they were afraid of what they might find out. Other reasons for delaying or foregoing care – including not being able to get an appointment soon enough and not being able to get through on the phone – were equally common for respondents with low versus adequate health literacy.

Table 3 presents the fraction of participants who report each of the other access problems we analyze: difficulty finding a provider, not having a usual source of care, and not having had a doctor’s visit in the past year. Individuals with low health literacy were also significantly more likely to report difficulty finding a provider (17.09% for those with low health literacy versus 7.99% for those with adequate health literacy) or to lack a usual source of care (26.93% versus 18.47%). They were also more likely to report not having seen a doctor in the past year, although this difference is not statistically significant at conventional levels ($p = 0.190$). The bottom panel of Table 3 shows reported reasons for difficulty finding a provider, which for the most part were similar for low and adequate health literacy although the prevalence of insurance-related problems – high for both groups – is somewhat higher for individuals with low health literacy (52.77% versus 45.96%; $p = 0.071$). “No appointments available” was the second most common reason for delay, reported by just over 40 percent of those with difficulty regardless of health literacy, and about 20 percent of each group reported not having doctors near where they lived.

For the four access problems that were significantly more likely, in our univariate analyses, to be reported by individuals with low health literacy compared to those with adequate health literacy, we estimated multivariate models to determine whether these differences in reported access could be explained by the differences in other characteristics documented in Table 1. Table 4 presents the results of these multivariate models, which control for insurance status, demographics, socio-economic status, cognitive ability, and health status. Three of the four outcomes – both cost-related and other delays in obtaining care, and difficulty finding a provider – remain significantly more likely among participants with low health literacy compared with participants who have adequate health literacy, after controlling for other characteristics, as indicated in Table 4 by odds ratios and associated 95% confidence intervals on “low health literacy” that are greater than one. The p-values

associated with the coefficient on low health literacy in these three models are 0.024, less than 0.001, and 0.054, respectively. For the fourth outcome, no usual source of care, the effect of health literacy is marginally significant ($p = 0.080$) after controlling for other characteristics. These results confirm the significance of low health literacy as a predictor of access problems, even after multiple other factors correlated with low health literacy have been taken into account, including health insurance.

Figure 1 summarizes graphically the main results from our analysis. The blue bars and the red bars represent the rates at which four access problems are reported by participants with adequate health literacy and low health literacy, respectively; these results were also reported in Table 1. The green bars reflect the covariate-adjusted rates of these problems for participants with low health literacy, calculated as described above using the average marginal effect of health literacy on each outcome from the multivariate models. This figure shows the bottom line: access problems – delaying care, difficulty finding a provider, and not having a usual source of care – were more prevalent among individuals with low health literacy, and these disparities persisted even after controlling for other factors.

Study Limitations

Our study had both strengths and weaknesses. Strengths included the focus on a topic that has received surprisingly little attention from researchers, the use of a nationally representative sample (in contrast to most studies of health literacy), the use of a validated and widely used measure of self-assessed health literacy, and the availability of a rich set of covariates, including general cognitive ability.

A significant limitation of our study was its cross-sectional, observational nature. Although our multivariate analyses include a wide range of relevant covariates, it is possible that an omitted variable correlated with both health literacy and our measures of access to care was driving the apparent correlation between the two. Patient activation, for example, is not measured in our sample, and has been shown to be correlated with both health literacy and health-related outcomes, prompting a debate about the distinctions between these two constructs and their relative importance (Hibberd, Stockard, Mahoney, & Tusler, 2004; Smith, Curtis, Wardle, von Wagner, & Wolf, 2013). The possibility of an important omitted variable suggests that our results should not be viewed as the final word on the topic of health literacy and access to care (a position we are inclined to agree with under any circumstances), but rather as highlighting an area where further investigation is needed

Another limitation was the fact that the sample was restricted to individuals aged 50 and older; this study therefore does not speak to the relationship between low health literacy and access to care at earlier stages in the life course. Finally, a limitation related to the use of self-reported measures of access was that we could say relatively little about whether the differences in access that we observed for individuals with low versus adequate health literacy were driven by underlying differences in the actual availability of care or by a similar level of availability that individuals with low health literacy perceived or navigated differently.

Discussion

Health literacy matters for access to care. Individuals with low health literacy are more likely to delay getting care and have more difficulty finding providers than their counterparts with adequate health literacy, even after controlling for insurance status and other characteristics. These barriers compound any subsequent difficulties that patients with low health literacy may face in terms of understanding and acting on information from clinical encounters.

Understanding exactly *why* health literacy matters for access, and how this information should inform interventions to improve outcomes for individuals with low health literacy, is the challenge that remains. One promising avenue may focus on how low health literacy affects individuals' ability to choose or navigate insurance plans. We found that even after controlling for insurance status, individuals with low health literacy report more difficulty finding providers who will see them. This may be because they have insurance coverage that is systematically less generous than do individuals with higher health literacy (for example, narrower provider networks); or it may be that, even with identical insurance coverage, those with low health literacy have more difficulty figuring out which type of provider they need to see, which ones are actually taking new patients, etc. – in short, the hassles that anyone who uses the U.S. health care system is familiar with, but that may loom larger for individuals with low health literacy. The relatively new concept of “health insurance literacy” (Kim, Braun, & Williams, 2013; McCormack, Bann, Uhrig, Berkman, & Rudd, 2009; Paez, Mallery, Noel, Pugliese, McSorley, Lucado, & Ganachari, 2014) encompasses both of these mechanisms. Our results suggest that lower rates of health insurance coverage are not the *only* reason individuals with low health literacy experience worse access, but this does not mean that health insurance is irrelevant. The interaction between low health literacy and health insurance offers a promising avenue for understanding why individuals with low health literacy are more likely to experience access problems.

Second, our results suggest that interventions to improve outcomes for health literacy should look beyond the clinical encounter to reach individuals for whom low health literacy represents a fundamental obstacle to accessing the health care system. A recent review of interventions for individuals with low health literacy concluded that there has been progress in the range of endpoints targeted by these interventions, with an increasing number moving beyond comprehension of health information as the outcome of interest and looking instead at more distal outcomes such as health (Sheridan, Halpern, Viera, Berkman, Donahue, & Crotty, 2011). Our results suggest focusing on the middle range as well; can we develop interventions that effectively connect individuals with low health literacy with available providers, and would this then reduce their delays in obtaining care?

Finally, understanding the full implications of low health literacy for access to care will also require a shift in how researchers think about data for studying health literacy. Many studies of health literacy have relied on clinic or disease-based samples, and this approach has yielded important insights into how health literacy affects patient-provider communication in the context of the clinical encounter (Aboumatar, Carson, Beach, Roter, & Cooper, 2013; Barragan et al., 2005; Katz, Jacobson, Veledar, & Kripalani, 2007; Mancuso & Rincon,

2006; Rodríguez et al., 2013). But a full understanding of the impact of health literacy requires a broader view: one that takes into account the importance of health literacy outside the clinical encounter. Theoretical frameworks for understanding the interaction between health literacy, health care access, and health outcomes encompass multiple factors such as culture, social support, and community health care resources (Squiers et al., 2012). Addressing unanswered questions about access barriers that arise even before patients reach the clinic will require integrating measures of health literacy into population-based data collection.

Acknowledgments

Levy acknowledges financial support from the National Institute on Aging (grant number NIA K01AG034232). The data used in this study are from the Health and Retirement Study (HRS), which is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and conducted by the University of Michigan. Preliminary results from this analysis were presented at the 5th Health Literacy Annual Research Conference (HARC V), October 28–29, 2013 in Washington, DC.

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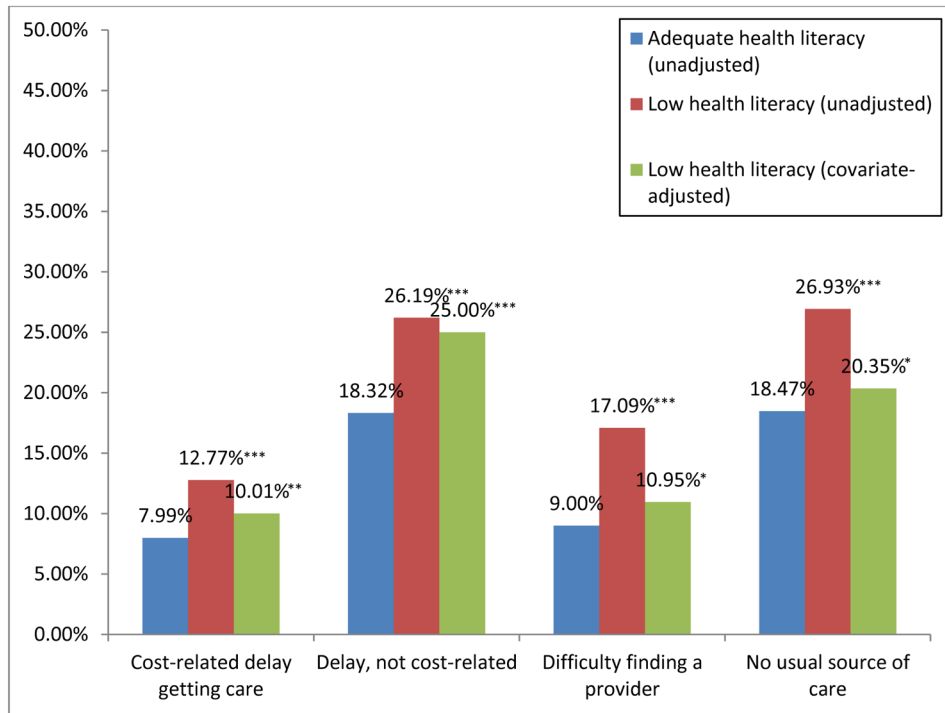


Figure 1. Rates of self-reported access problems among individuals with low versus adequate health literacy, unadjusted and adjusted for covariates
Notes. Asterisks indicate a rate that is significantly different from the rate for individuals with adequate health literacy, with $p < 0.01$ (***), $p < 0.05$ (**), or $p < 0.10$ (*). Please see the text for a description of how covariate-adjusted rates are calculated.

Table 1

Participant characteristics, by health literacy status

Characteristic	Health literacy		<i>p</i> value
	Low	Adequate	
No health insurance	10.49%	7.48%	0.079
Years of education	11.3	13.8	<0.001
White non-Hispanic	71.03%	84.85%	<0.001
African-American non-Hispanic	10.72%	6.70%	<0.001
Other non-Hispanic	3.48%	3.36%	0.888
Hispanic (any race)	14.77%	5.09%	<0.001
Age (years)	66.7	63.8	<0.001
Female	48.92%	56.37%	<0.001
Married	61.36%	69.56%	<0.001
Working	28.37%	45.77%	<0.001
Income less than poverty	16.60%	5.44%	<0.001
Cognitive impairment	7.70%	1.56%	<0.001
Health is fair or poor	48.14%	15.07%	<0.001
Has chronic health condition	81.93%	70.88%	<0.001
Unweighted <i>n</i>	1,921	5,221	7,142

Note. The *p* value reported in the final column is associated with a test of the null hypothesis that the outcome reported in that row is the same for individuals with low versus adequate health literacy.

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Table 2

Delayed/foregone care, by low vs. adequate health literacy status

	Health literacy		
	Low	Adequate	<i>p</i> value
<u>Fraction of participants who reported delaying or not obtaining care...</u>			
...for any reason	31.86%	22.98%	<0.001
...because of cost	12.77%	7.99%	<0.001
...for a reason other than cost	26.19%	18.32%	<0.001
<u>Among those who delayed or did not obtain care, the fraction who reported each of the following reasons:</u>			
Could not afford it	40.09%	34.75%	0.091
I am too busy to go to the doctor	10.61%	24.34%	<0.001
I don't like going to the doctor	27.84%	22.82%	0.153
I couldn't get an appointment soon enough	18.62%	19.38%	0.790
I am afraid of what I might find out	14.37%	9.41%	0.040
Once I get there, I have to wait too long	17.63%	10.99%	0.005
I didn't have transportation	16.88%	6.21%	<0.001
The clinic wasn't open when I could get there	5.84%	6.42%	0.690
I couldn't get through on the telephone	8.77%	7.22%	0.413
I don't believe in going to doctors	2.98%	2.97%	0.988
Unweighted n: all participants	1,921	5,221	
Unweighted n: participants reporting delayed/foregone care	590	1,146	

Notes. Percentages are weighted. The *p* value reported in the final column is associated with a test of the null hypothesis that the outcome reported in that row is the same for individuals with low versus adequate health literacy.

Table 3

Difficulty finding provider, no usual source of care, and no doctor visit in past year, by low vs. adequate health literacy status

	Health literacy		
	Low	Adequate	<i>p</i> value
Fraction of participants who reported...			
...difficulty finding a provider	17.09%	9.00%	<0.001
...no usual source of care	26.93%	18.47%	<0.001
...no doctor visit in past year	10.93%	9.35%	0.190
Among those who reported difficulty finding a provider, the fraction who reported each of the following reasons:			
Insurance-related problem	52.77%	45.96%	0.071
No appointments available	42.66%	40.59%	0.613
No doctors near where I live	23.18%	19.09%	0.256
Other	5.99%	5.51%	0.817
Unweighted n, all participants			
	1,921	5,221	
Unweighted n, participants with difficulty finding a provider			
	361	536	

Notes. Percentages are weighted. The *p* value reported in the final column is associated with a test of the null hypothesis that the outcome reported in that row is the same for individuals with low versus adequate health literacy.

Table 4

Weighted multivariate logistic regression predicting a “yes” response to problems accessing health care

Characteristic	Delay because of cost		Delay for a reason other than cost		Difficulty finding a provider		No usual source of care	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Low health literacy	1.32	[1.04, 1.67]	1.52	[1.23, 1.88]	1.24	[1.00, 1.54]	1.13	[0.98, 1.30]
No health insurance	5.53	[4.01, 7.63]	0.99	[0.74, 1.32]	1.84	[1.31, 2.60]	3.81	[2.89, 5.03]
Education								
< High school degree	1.15	[0.72, 1.83]	0.85	[0.62, 1.16]	1.29	[0.82, 2.02]	1.49	[1.13, 1.96]
High school degree	1.29	[0.95, 1.75]	0.72	[0.58, 0.91]	0.98	[0.66, 1.44]	1.37	[1.09, 1.72]
Some college	1.15	[0.85, 1.55]	0.91	[0.74, 1.12]	1.20	[0.85, 1.70]	1.20	[0.97, 1.49]
Coll. degree or more	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Race/ethnicity								
White non-Hispanic	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Black non-Hispanic	1.44	[1.12, 1.85]	0.95	[0.77, 1.18]	1.98	[1.53, 2.57]	1.84	[1.50, 2.26]
Other non-Hispanic	1.54	[1.03, 2.30]	0.86	[0.57, 1.29]	2.59	[1.77, 3.79]	1.84	[1.34, 2.52]
Hispanic	0.70	[0.50, 1.00]	1.17	[0.91, 1.52]	1.49	[1.03, 2.16]	1.46	[1.12, 1.89]
Other characteristics								
Age	0.92	[0.91, 0.94]	0.96	[0.95, 0.97]	0.97	[0.96, 0.99]	1.02	[1.01, 1.03]
Female	1.05	[0.81, 1.38]	1.09	[0.93, 1.28]	0.94	[0.77, 1.15]	0.92	[0.78, 1.09]
Married	0.71	[0.56, 0.89]	0.85	[0.71, 1.01]	0.65	[0.52, 0.80]	0.72	[0.62, 0.83]
Working	0.99	[0.73, 1.34]	1.45	[1.25, 1.69]	0.64	[0.48, 0.85]	0.84	[0.69, 1.01]
Income 100% of FPL	1.22	[0.73, 2.02]	1.29	[1.01, 1.65]	1.75	[1.26, 2.43]	1.31	[0.95, 1.80]
Cognitive impairment	0.86	[0.43, 1.70]	1.52	[1.03, 2.26]	2.28	[1.50, 3.47]	1.64	[1.08, 2.48]
Health is fair or poor	1.83	[1.36, 2.48]	1.93	[1.52, 2.46]	1.57	[1.22, 2.03]	1.19	[0.96, 1.49]
Chronic conditions								
Hypertension	1.14	[0.91, 1.42]	0.90	[0.74, 1.09]	0.95	[0.76, 1.19]	0.75	[0.63, 0.89]
Diabetes	1.03	[0.75, 1.42]	1.00	[0.82, 1.22]	0.94	[0.75, 1.19]	0.91	[0.75, 1.11]
Cancer	0.89	[0.61, 1.29]	0.90	[0.72, 1.13]	1.17	[0.87, 1.57]	0.73	[0.59, 0.89]
Lung disease	1.42	[0.95, 2.12]	1.06	[0.82, 1.37]	1.13	[0.87, 1.46]	0.98	[0.76, 1.26]

Characteristic	Delay because of cost		Delay for a reason other than cost		Difficulty finding a provider		No usual source of care	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Heart disease	0.97	[0.71, 1.32]	1.00	[0.79, 1.26]	1.04	[0.76, 1.42]	1.16	[0.95, 1.43]
Stroke	1.30	[0.73, 2.31]	0.81	[0.52, 1.24]	1.27	[0.84, 1.92]	0.87	[0.64, 1.19]
Psychiatric problems	2.12	[1.52, 2.94]	1.37	[1.12, 1.67]	1.61	[1.26, 2.04]	0.72	[0.58, 0.89]

Note. OR=odds ratio; CI=confidence interval; FPL=federal poverty level.