The Health Literacy of Parents in the United States: A Nationally Representative Study

AUTHORS: H. Shonna Yin, MD, MS,[a] Matthew Johnson, PhD,[b] Alan L. Mendelsohn, MD,[a] Mary Ann Abrams, MD, MPH,[c] Lee M. Sanders, MD,[d] and Benard P. Dreyer, MD[a]

[a]*Department of Pediatrics, New York University School of Medicine and Bellevue Hospital Center, New York, New York;* [b]*Department of Human Development, Teacher's College, Columbia University, New York, New York;* [c]*Clinical Performance Improvement, Iowa Health System, Des Moines, Iowa; and* [d]*Department of Pediatrics, University of Miami Miller School of Medicine, Miami, Florida*

KEY WORDS

health literacy, literacy, health care disparities

ABBREVIATIONS

NCES—National Center for Education Statistics
NAAL—National Assessment of Adult Literacy
OTC—over-the-counter
aOR—adjusted odds ratio
CI—confidence interval

The views presented in this article are those of the authors, not the organizations with which they are affiliated.

www.pediatrics.org/cgi/doi/10.1542/peds.2009-1162E

doi:10.1542/peds.2009-1162E

Accepted for publication Jul 20, 2009

Address correspondence to H. Shonna Yin, MD, MS, New York University School of Medicine, Department of Pediatrics, 550 First Ave, NBV 8S4-11, New York, NY 10016. E-mail: yinh02@nyumc.org

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: *The authors have indicated they have no financial relationships relevant to this article to disclose.*

abstract

OBJECTIVE: To assess the health literacy of US parents and explore the role of health literacy in mediating child health disparities.

METHODS: A cross-sectional study was performed for a nationally representative sample of US parents from the 2003 National Assessment of Adult Literacy. Parent performance on 13 child health-related tasks was assessed by simple weighted analyses. Logistic regression analyses were performed to describe factors associated with low parent health literacy and to explore the relationship between health literacy and self-reported child health insurance status, difficulty understanding over-the-counter medication labeling, and use of food labels.

RESULTS: More than 6100 parents made up the sample (representing 72 600 098 US parents); 28.7% of the parents had below-basic/basic health literacy, 68.4% were unable to enter names and birth dates correctly on a health insurance form, 65.9% were unable to calculate the annual cost of a health insurance policy on the basis of family size, and 46.4% were unable to perform at least 1 of 2 medication-related tasks. Parents with below-basic health literacy were more likely to have a child without health insurance in their household (adjusted odds ratio: 2.4 [95% confidence interval: 1.1–4.9]) compared with parents with proficient health literacy. Parents with below-basic health literacy had 3.4 times the odds (95% confidence interval: 1.6–7.4) of reporting difficulty understanding over-the-counter medication labels. Parent health literacy was associated with nutrition label use in unadjusted analyses but did not retain significance in multivariate analyses. Health literacy accounted for some of the effect of education, racial/ethnic, immigrant-status, linguistic, and income-related disparities.

CONCLUSIONS: A large proportion of US parents have limited health-literacy skills. Decreasing literacy demands on parents, including simplification of health insurance and other medical forms, as well as medication and food labels, is needed to decrease health care access barriers for children and allow for informed parent decision-making. Addressing low parent health literacy may ameliorate existing child health disparities. *Pediatrics* 2009;124:S289–S298

Increased national attention has been focused on the issue of health literacy, because a growing body of evidence has linked limited literacy skills to poorer health knowledge, worse health behaviors, and increased health care costs.[1–4] With an estimated $106 to $238 billion dollars in annual health care costs attributable to limited health literacy,[5] organizations including the Agency for Healthcare Research and Quality, the Institute of Medicine, the Joint Commission, the American Medical Association, and the American Academy of Pediatrics have begun to prioritize health literacy as a key quality and patient-safety issue.[1,2,4,6,7]

More than 90 million US adults have limited health literacy. Health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions."[8] Known risk factors for low health literacy include low socioeconomic status, limited English-language proficiency, and racial/ethnic minority-group identification.[9] A number of recent studies have suggested that health literacy may be an important contributor to existing health disparities.[10–12]

In 2003, the National Center for Education Statistics (NCES) included a specific component to measure health literacy within the National Assessment of Adult Literacy (NAAL),[9] which led to the first large-scale national assessment of health literacy.[13] In our study we evaluated parent data in the 2003 NAAL to assess overall parent health-literacy level, parent ability to perform specific child health-related tasks within the health literacy assessment, and the relationship between parent health literacy and self-reported difficulty with child health-related tasks. We also examined the role of parent health literacy as a mediator for education, racial/ethnic, immigrant-status, linguistic, and income-related disparities. For parents, health literacy skills are needed for the performance of everyday tasks required for taking care of their families, including the ability to obtain health insurance, interpret the label of an over-the-counter (OTC) medication, and decode a nutrition label to make informed decisions about food. To our knowledge, no previous study has assessed the health literacy of US parents at a national level.

METHODS

Participants

The 6100 parents with children in the household were among the >18 000 adults who comprised the household sample of the 2003 NAAL (unweighted numbers rounded to the nearest hundred as requested by the NCES). These adults were selected to be nationally representative of US adults aged 16 and older. Details of sample selection, response rate, and interview procedures have been published elsewhere.[9,13,14]

Measures

Parent health literacy, self-report of child health-related issues (child health insurance, difficulty understanding OTC-medication labels, food-label use), and sociodemographic information were obtained.

Determination of Parent Status

A subject was determined to be a parent if he or she was related to a child living in the household (<18 years of age) as a parent, guardian, or step-parent.

Health Literacy–Assessment Tasks

The NAAL literacy assessment included 152 items, 28 of which were part of the health literacy assessment. These health literacy tasks were included in a separate health literacy scale, as previously described.[9] As with the literacy score,[14] health literacy scores were categorized into 4 levels of performance: below basic, basic, intermediate, and proficient.

Each health literacy task was classified as 1 of 3 types: (1) prose (eg, identifying what one can drink on the morning of a radiograph by reading a passage); (2) document (eg, entering name and birth date on a health insurance application); or (3) quantitative (eg, calculating annual cost of an insurance policy). The health literacy assessment included 12 prose, 12 document, and 4 quantitative items.[9,13]

Thirteen of the 28 individual health literacy tasks were specifically selected for additional analysis in this study. Two of the 13 tasks specifically related to children (immunization-related). An additional 11 health literacy tasks were included in this study because they relate to skills that could be applied to, or could affect, the care provided by parents to their children.

For these analyses, subjects were categorized as being correct or incorrect. Those who were incorrect or partially correct, or who omitted the question, were considered to be incorrect. Those subjects categorized as not having reached the assessment question were excluded from analyses for that question.

Parent Report of Child Health-Related Issues

As part of the NAAL, parents were asked to report on 3 issues with implications for child health: child health insurance, difficulty understanding OTC-medication labels, and use of nutrition labels in making food choices for their families.

Child Health Insurance

Child health insurance status was assessed with the question: "Do the children living in this household have any type of medical insurance or health care coverage?" Responses were categorized as "yes," "no," and

"at least one child (but not all the children) has medical insurance." Responses were dichotomized in these analyses, with caregivers who answered no or that at least 1 child in the household did not have health insurance compared with caregivers who responded that all their children had health insurance.

Difficulty Understanding OTC-Medication Labels

Subjects were asked: "How difficult is it for you to understand the dosage information on over-the-counter medicines?" Answer choices were "never tried," "great deal of difficulty," "moderate difficulty," "some difficulty," and "no difficulty." Those who indicated that they had never tried were excluded from the analyses. Responses were dichotomized in these analyses, with caregivers who answered that they had any difficulty compared with caregivers who responded that they had no difficulty. Difficulty understanding OTC-medication labels was only assessed in the NAAL for those who learned at least 1 language other than English before starting school and stated that they did not read English "very well."

Food-Label Use

Food-label use was assessed with the question: "How often do you read the nutritional information on food labels written in English?" Responses were "never," "sometimes," "most of the time," or "every time when I buy a food I never bought before." Responses were dichotomized in analyses, with caregivers who answered that they never read the food label compared with caregivers who responded that they had previously made use of a food label.

Sociodemographic Information

Demographic information obtained on parents included age, gender, educational attainment, race/ethnicity, country of birth (immigrant status), English proficiency, and income.

Statistical Analyses

Analyses were performed to evaluate parent health literacy levels and parent ability to perform specific health literacy–assessment tasks, as well as the relationship between parent health-literacy and child health-related issues. Analyses were conducted by using AM 0.06.00[15] software and the survey package[16] in R 2.71.[17] Both simple and adjusted analyses were performed.

The NAAL uses a balanced incomplete block spiraling design. Each subject was administered ~25% of the assessment tasks in an effort to reduce participant survey burden while at the same time allowing for aggregate estimates of overall performance.[13] We therefore used AM software, which is capable of handling data from large-scale assessments that use complex sampling designs, as recommended by the NCES.[13]

For analyses examining demographic information, parents' abilities to perform specific health literacy–assessments tasks, and parents' self-reported responses to the 3 child health-related questions of interest, we used AM software. The current version of the AM software, however, is unable to perform logistic regressions with the categorical health literacy level (below basic, basic, intermediate, proficient) as either a dependent or independent variable. For such analyses we used multiple imputation, or plausible-value[18] methodology, to account for the fact that the health literacy level is an imperfectly measured latent variable.

The plausible-value method of analysis requires 2 steps: (1) plausible-value generation and (2) statistical analysis with plausible values. An individual's plausible values represent health-literacy scores that are plausible for any individual in the population with the same background characteristics (eg, age, income, race, etc). Generation of plausible values requires a measurement model that relates the health literacy score to the performance on the assessment items and a regression or conditioning model that describes variation in the health literacy score as a function of the covariates of interest. In our analyses, those covariates included age, gender, educational attainment, race/ethnicity, parent status, US-birth status (born in the United States or not), English proficiency, income, region, and metropolitan-statistical-area status.[1,4,9,14]

We used AM software to fit the plausible-value–generation model and to draw plausible values for each individual in the sample. The measurement component of the model was defined by an item-response-theory model called the generalized partial-credit model[19]; the parameters of this measurement model were provided by the NCES. The parameters of the conditioning model were then estimated by marginal maximum likelihood. Given the parameters of the measurement and conditioning models, we sampled 10 plausible values for each individual in the sample.

Because the plausible values were sampled randomly, the final results are also random; that is, a different sample of 10 plausible values for each individual will produce slightly different results. The Monte Carlo error of the results describes the amount of variation that can be expected between different samples of plausible values; large Monte Carlo errors are problematic. Five plausible values are usually considered to be sufficient, but to further reduce Monte Carlo error, we doubled the number of plausible values.

Plausible values were then transformed by a 4-segment linear transformation (1 segment for each

health literacy level) to match the appropriate percentiles of the plausible-value distribution to the 3 cut scores of the health literacy categories (below basic, basic, intermediate, proficient). A multisegment linear transformation was required to match the proportions of individuals in each health literacy category, as reported by the NCES.[9] We chose to match the percentiles of the plausible values to the cut scores rather than mean and SD, because our analyses were focused on categorical health literacy level rather than continuous health literacy score.

Associations between overall health literacy categories and dependent variables of interest were performed by using the 10 plausible values. Because health literacy is measured imperfectly with a balanced incomplete-block-item spiraling design, the statistical methods must account for the measurement error associated with the imperfect measurement. Use of the multiple plausible values accounts for this measurement error. Thus, statistical analyses were performed 10 times, once for each plausible value, and the results were averaged across the 10 analyses to produce final point estimates. Standard errors of the estimates are composed of 2 parts: the error caused by sampling and the error caused by the latency of the health literacy level. The latter can be thought of as the variability of the estimates across the 10 analyses; the former was approximated in the R survey package[16] by using the jackknife replicate weights provided by the NCES.

Two types of statistical analyses were performed. First, 2-way contingency-table analyses were conducted with health literacy categories as 1 of the margins. Tests of independence were performed by using Rao and Scott's corrected χ^2 statistics for complex samples.[20] Second, logistic regression analyses were performed to describe the factors associated with low health literacy (below basic/basic) and to use an individual's health literacy category as an explanatory variable for other factors. Hypothesis tests for the logistic regression analyses used Wald's χ^2 test.[21] For each regression analysis, we report the results of an overall test of fit, which tests whether there is sufficient statistical evidence to conclude that at least 1

TABLE 1 Sociodemographic Characteristics of Parents and Nonparents

Variable	Parents	Nonparents	*P*
Age, %			
16–18 y	0.8	8.9	<.001
19–24 y	7.3	12.4	
25–39 y	50.3	15.6	
40–49 y	32.4	13.5	
50–64 y	9.0	26.9	
≥65 y	0.2	22.7	
Age, mean (SD), y	37.9 (9.0)	47.8 (20.3)	<.001
Gender, %			
Female	54.9	50.0	<.001
Male	45.1	50.0	
No. of children living in home, %			
1	40.2	NA	—
2	38.7	NA	
3	15.8	NA	
≥4	5.3	NA	
Education, %			
In school	0.5	4.9	<.001
<High school	13.7	16.1	
High school/equivalent	29.5	31.3	
>High school	56.3	47.7	
Race/ethnicity, %			
White, non-Hispanic	66.1	72.8	<.001
Black, non-Hispanic	12.1	11.0	
Hispanic	16.1	10.4	
Other	5.7	5.9	
Country of birth, %			
US	81.9	87.8	<.001
Outside of US	18.1	12.2	
English proficiency, %			
Understands very well	83.1	83.3	<.001
Understands well	10.8	12.7	
Understands not well/not at all	6.1	4.0	
Income, %			
Below poverty threshold	18.2	14.3	<.001
100%–175% of poverty threshold	16.2	16.3	
>175% of poverty threshold	58.0	57.4	
Missing	7.6	12.0	
Region, %			
Northeast	19.1	19.4	.1
Midwest	23.3	22.7	
South	34.4	36.8	
West	23.2	21.1	
MSA, %			
Urban	82.0	80.8	.3
Rural	18.0	19.2	
Health literacy, %			
Below basic	11.2	15.2	<.001
Basic	17.5	23.7	
Intermediate	56.3	51.2	
Proficient	15.1	10.0	
Health literacy, mean (SD)	253.8 (51.1)	240.6 (56.3)	<.001

Parents: *n* (weighted) = 72 600 098; nonparents: *n* (weighted) = 141 980 546. NA indicates not applicable; MSA, metropolitan statistical area.

adjusted odds ratio (aOR) is different from 0. For each factor (eg, age, race/ethnicity), we report a *P* value for a test of significance of whether at least 1 category within that factor is different from 0. We also report an aOR for each category compared with the reference group, as well as the 95% confidence interval (CI) for each aOR, to assess its difference from 1 at a significance level of .05.

RESULTS

Parent and nonparent characteristics are described in Table 1. The mean parent health literacy score was 253.8 (SD: 51.1), which was significantly higher than the mean health literacy score of nonparents, which was 240.6 (SD: 56.3) ($P < .001$); 11.2% were categorized as having below-basic health literacy skills, whereas 17.5%, 56.3%, and 15.1% had basic, intermediate, and proficient health literacy skills, respectively. Compared with nonparents, parents were more likely to be younger (mean age: 37.9 years [SD: 9.0] vs 47.8 years [SD: 20.3]; $P < .001$) and more highly educated (percentage with some college or higher education: 56.3% vs 47.7%; $P < .001$). In addition, parents were more likely to be Hispanic, to be born outside of the United States, to have limited English proficiency, and to have an income below the poverty threshold. In multivariate analyses that included the entire population, controlling for a priori potential confounders as previously described, parent status remained statistically significantly associated with health literacy, with nonparents having 1.5 times the odds (95% CI: 1.3–1.7) of being categorized as having below-basic/basic health literacy.

Predictors of Parent Health Literacy: Multivariate Analyses

In multivariate analyses that included only parents (Table 2), the strongest predictors of basic/below-basic health literacy level were education and English proficiency. Parents with less than a high school education had >8 times the odds of being categorized as having low health literacy. Parents who stated that they understood English "not well"/"not at all" had >18 times the odds of being categorized as having basic or below-basic health literacy. Black and Hispanic race/ethnicity, low income, and birth outside of the United States were also significantly associated with low health literacy.

TABLE 2 Predictors of Low Health Literacy (Below Basic/Basic) Among Parents, Multivariate Regression Analysis

	aOR[a]	95% CI[b]	*P*[c]
Age			
16–18 y	1.0	—	.1
19–24 y	1.3	0.2–9.2	
25–39 y	1.3	0.3–6.1	
40–49 y	1.6	0.3–8.3	
50–64 y	2.4	0.5–10.3	
≥65	2.5	0.03–236.30	
Gender			
Female	1.0	—	.4
Male	1.2	0.7–2.1	
Education			
In school	3.2	0.7–15.5	<.001
<High school	8.5[d]	5.2–14.1	
High school/equivalent	2.8[d]	1.8–4.5	
>High school	1.0	—	
Race/ethnicity			
White, non-Hispanic	1.0	—	<.001
Black, non-Hispanic	3.9[d]	2.7–5.6	
Hispanic	2.3[d]	1.8–2.9	
Other	1.1	0.5–2.4	
Country of birth			
US	1.0	—	<.001
Outside of US	1.9[d]	1.4–2.5	
English proficiency			
Understands very well	1.0	—	<.001
Understands well	2.7[d]	1.5–4.8	
Understands not well/not at all	18.4[d]	8.9–37.9	
Income			
Below poverty threshold	2.6[d]	1.8–3.7	<.001
100%–175% of poverty threshold	1.8[d]	1.2–2.8	
>175% of poverty threshold	1.0	—	
Missing	1.6	1.0–2.5	
Region			
Northeast	1.0	—	.9
Midwest	0.9	0.7–1.3	
South	1.0	0.7–1.5	
West	1.0	0.7–1.4	
MSA			
Urban	1.0	—	.8
Rural	1.1	0.6–1.6	

MSA indicates metropolitan statistical area.

[a] aOR for each category within each factor compared to the reference group.

[b] 95% CI for each aOR.

[c] Overall test of fit (Wald's $\chi^2 = 704.1$; $df = 22$; $P < .001$).

[d] Wald's test with aOR significantly different from reference group at a $P < .05$ significance level.

Health Literacy–Assessment Tasks

Parent performance on the health literacy–assessment tasks is shown in Table 3.

Health Insurance

Only 19.3% of the parents were able to correctly perform all 4 document

TABLE 3 Percentage of Parents Who Were Incorrect on Selected Health Literacy–Assessment Tasks

Task	Category	% Incorrect	95% CI
Health insurance			
Enter names and birth dates in a health insurance form.	Document	68.4[a,b]	65.0–71.8
Check the correct box to indicate which person is applying for health insurance.	Document	38.1[a]	34.1–42.1
Check the correct box to indicate gender, marital status, if the person is a student, and what the person's relationship to you is.	Document	34.9[a]	31.4–38.4
Enter social security numbers into a health insurance application.	Document	11.2[a]	9.0–13.4
Calculate the price per year of an insurance policy using a table that shows how the monthly cost varies based on income and family size.	Quantitative	65.9[a]	61.6–70.2
Medication			
Underline the 3 substances that may interact with an over-the-counter drug to cause a side effect, using information on the over-the-counter drug label.	Document	23.1[a]	20.0–26.2
Determine what time a person can take a prescription medication, based on information on the prescription drug label that relates the timing of medication to eating.	Quantitative	36.3[a,c]	33.0–39.6
Nutrition/obesity			
List 3 health risks associated with being overweight or obese.	Prose	8.2[a,d]	6.3–10.1
Determine a healthy weight range for a person who is 5 foot 5 inches, based on a graph that relates height and weight to BMI.	Document	54.1[a]	49.9–58.3
Determine how a person who is 5 foot 8 inches and weighs 175 pounds is categorized.	Document	13.1[a]	10.8–15.4
Immunization			
Determine when children should receive their third hepatitis B vaccination, using a chart that shows all the childhood vaccines and the ages children should receive them.	Document	39.9[a]	36.0–43.8
Determine how many polio vaccinations a child should have by a certain age.	Document	26.6[a]	22.9–30.3
Navigation			
Circle the date of an appointment on a hospital appointment slip.	Document	5.1[e]	4.2–6.0

[a] Percentage incorrect of subset of sample administered health literacy–assessment task.
[b] Percentage considered incorrect (3.2% marked incorrect, 60.1% partially correct, 5.2% omitted).
[c] Percentage considered incorrect (21.9% marked incorrect, 12.8% partially correct, 1.6% omitted).
[d] Percentage considered incorrect (2.2% marked incorrect, 3.4% partially correct, 2.6% omitted).
[e] Percentage incorrect of the entire sample (task part of the subset of health literacy–assessment tasks administered to the entire sample).

tasks related to filling out a health insurance form. More than two thirds of the parents were unable to fill in names and birth dates on a health insurance form correctly. More than 60% of the parents were unable to calculate the annual price of a health insurance policy.

Medications

Forty-six percent of the parents were unable to correctly perform at least 1 of the 2 medication-related tasks.

Nutrition/Obesity

For the nutrition/obesity tasks, 42.7%, 42.7%, 11.6%, and 3.0% of the parents correctly performed 0, 1, 2, or 3 of the tasks, respectively. The document task that involved determining the healthy weight of a person of a specific height was difficult for >50% of the parents.

Other Health Literacy Tasks of Interest

Almost half (48.4%) of the parents were unable to perform at least 1 of the 2 immunization-related tasks. Overall, parents did well with the navigation question, with only 5.1% getting this task incorrect.

Parent Self-Report of Child Health-Related Issues

Child Health Insurance

Unadjusted Analyses

Overall, 8.1% of the households had at least 1 child without health insurance. Lower parent health literacy level was related to having at least 1 child without insurance (below basic: 24.5%; basic: 10.5%; intermediate: 5.5%; proficient 2.7%) ($P < .001$).

Multivariate Analyses: Child Health Insurance Status and Health Literacy

Low health literacy was significantly related to having a child in the home without health insurance (below-basic health literacy, aOR: 2.4 [95% CI: 1.1–4.9]) (Table 4, model 2). In model 2, education was no longer statistically significantly related to lack of child health insurance after inclusion of health literacy ($P = .06$). Similarly, race/ethnicity was no longer statistically significantly related to lack of child health insurance ($P = .08$). The effect estimate of English proficiency diminished 27.4% for those who understood English not well/at all after inclusion of health literacy (model 1 aOR: 2.9 [95% CI: 1.8–4.7]; model 2 aOR: 2.3 [95% CI: 1.3–4.1]). Reduction of effect estimates was small for income (below poverty threshold, diminished 8.7% to an aOR of 2.9 [95% CI: 1.9–4.3]).

Difficulty Understanding OTC Medication Labels

Unadjusted Analyses

Overall, 59.2% of the parents reported difficulty with understanding OTC-medication labels (33.5% reported great or moderate difficulty, 25.7% reported some difficulty). Parents with below-basic and basic health literacy were more likely to report difficulty (below ba-

TABLE 4 Multivariate Regression Analysis for Presence of Child in Household Without Health Insurance, With and Without Health Literacy Level

	Model 1 (Without Health Literacy)[a]			Model 2 (Inclusion of Health Literacy)[b]		
	aOR[c]	95% CI[d]	*P*	aOR[c]	95% CI[d]	*P*
Age						
16–18 y	1.0	—	.96	1.0	—	.98
19–24 y	0.8	0.1–4.2		0.8	0.1–4.1	
25–39 y	0.9	0.2–4.3		0.9	0.2–4.2	
40–49 y	0.9	0.2–4.3		0.8	0.2–4.0	
50–64 y	1.0	0.2–5.5		0.9	0.2–5.0	
≥65 y	1.3	0.2–9.7		1.2	0.2–8.6	
Gender						
Female	1.0	—	.9	1.0	—	.9
Male	1.0	0.8–1.3		1.0	0.7–1.3	
No. of children living in home						
1	1.0	—	.1	1.0	—	.1
2	0.7[e]	0.5–0.9		0.7[e]	0.5–1.0	
3	0.8	0.5–1.1		0.8	0.5–1.1	
≥4	0.8	0.4–1.4		0.8	0.4–1.4	
Education						
In school	2.5	0.6–11.1	.01	2.3	0.5–10.5	.06
<High school	1.4	0.9–2.1		1.2	0.8–1.8	
High school/equivalent	1.7[e]	1.2–2.3		1.5[e]	1.1–2.2	
>High school	1.0	—		1.0	—	
Race/ethnicity						
White, non-Hispanic	1.0	—	.03	1.0	—	.08
Black, non-Hispanic	1.5	0.9–2.4		1.3	0.7–2.2	
Hispanic	1.9[e]	1.2–3.0		1.8[e]	1.1–2.8	
Other	1.2	0.6–2.3		1.1	0.6–2.3	
Country of birth						
US	1.0	—	.7	1.0	—	.97
Outside of US	1.1	0.8–1.5		1.0	0.7–1.4	
English proficiency						
Understands very well	1.0	—	<.001	1.0	—	.02
Understands well	1.4	1.0–1.9		1.3	0.9–1.9	
Understands not well/not at all	2.9[e]	1.8–4.7		2.3[e]	1.3–4.1	
Income						
Below poverty threshold	3.1[e]	2.1–4.6	<.001	2.9[e]	1.9–4.3	<.001
100%–175% of poverty threshold	2.6[e]	1.7–3.9		2.4[e]	1.6–3.7	
>175% of poverty threshold	1.0	—		1.0	—	
Missing	2.1[e]	1.2–3.7		2.1[e]	1.2–3.6	
Region						
Northeast	1.0	—	<.001	1.0	—	<.001
Midwest	1.7[e]	1.1–2.6		1.7[e]	1.1–2.6	
South	2.3[e]	1.5–3.4		2.3[e]	1.5–3.4	
West	2.0[e]	1.3–3.0		2.0[e]	1.3–3.0	
MSA						
Urban	1.0	—	.06	1.0	—	.06
Rural	1.5	1.0–2.3		1.5	1.0–2.3	
Health literacy						
Below basic	—	—	—	2.4[e]	1.1–4.9	.04
Basic	—	—		1.7	0.5–5.7	
Intermediate	—	—		1.4	0.4–4.2	
Proficient	—	—		1.0	—	

MSA indicates metropolitan statistical area.

[a] Overall test of fit for model 1 (Wald's $\chi^2 = 881.4$; $df = 25$; $P < .001$).

[b] Overall test of fit for model 2 (Wald's $\chi^2 = 1511.2$; $df = 28$; $P < .001$).

[c] aOR for each category within each factor compared to the reference group.

[d] 95% CI for each aOR.

[e] Wald's test with aOR significantly different from reference group at a $P < .05$ significance level.

sic: 73.6%; basic: 42.7%) compared with parents with intermediate/proficient health literacy (38.3%) ($P < .001$).

Multivariate Analyses: Understanding of OTC Medication Labels and Health Literacy

Subjects with below-basic health literacy had 3.4 times the odds (95% CI: 1.6–7.4) of reporting difficulty understanding OTC-medication labels compared with those with intermediate/proficient health literacy (Table 5, model 2). Intermediate/proficient health literacy levels were categorized together, because only 1.4% of those eligible to answer this question were in the proficient category. In model 2, education, race/ethnicity, and income were no longer statistically significantly related to difficulty understanding OTC medication labels after inclusion of health literacy. With health literacy in the model, the effect estimate of having a less-than-high-school education (compared with having at least some college) diminished 66.3% (model 1 aOR: 2.9 [95% CI: 1.9–4.4]; model 2 aOR: 1.8 [95% CI: 1.02–3.0]). The effect estimate of not being born in the United States diminished 23.4% (model 1 aOR: 8.4 [95% CI: 3.5–20.4]; model 2 aOR: 6.8 [95% CI: 2.6–18.1]). The effect of having an income below the poverty threshold (compared with an income of >175% of the poverty threshold) diminished 21.2% (model 1 aOR: 2.0 [95% CI: 1.3–3.2]; model 2 aOR: 1.7 [95% CI: 1.0–2.7]).

Food-Label Use

Unadjusted Analyses

Overall, 14.9% of the parents reported never using a food label. Parents with lower health literacy skills were more likely to report never using a food label (below basic: 28.3%; basic: 17.8%; intermediate: 12.9%) compared with parents with proficient health literacy skills (of whom 8.8% reported never using a food label) ($P < .001$).

TABLE 5 Multivariate Regression Analysis for Any Difficulty Understanding OTC Medication Labels, With and Without Health Literacy Level

	Model 1 (Without Health Literacy)[a]			Model 2 (Inclusion of Health Literacy)[b]		
	aOR[c]	95% CI[d]	*P*	aOR[c]	95% CI[d]	*P*
Age						
16–18 y	1.0	—	.4	1.0	—	.3
19–24 y	1.4	0.2–13.5		1.0	0.1–12.3	
25–39 y	0.7	0.1–5.7		0.5	0.1–4.7	
40–49 y	0.9	0.1–7.6		0.6	0.1–6.4	
50–64 y	0.7	0.1–5.5		0.4	0.04–4.10	
≥65 y[e]	—	—		—	—	
Gender						
Female	1.0	—	.4	1.0	—	.2
Male	1.1	0.8–1.7		1.2	0.9–1.8	
Education						
In school	3.1[f]	1.0–9.6	<.001	2.0	0.7–5.5	.2
<High school	2.9[f]	1.9–4.4		1.8[f]	1.02–3.00	
High school/equivalent	1.7[f]	1.0–3.0		1.4	0.8–2.7	
>High school	1.0	—		1.0	—	
Race/ethnicity						
White, non-Hispanic	1.0	—	.04	1.0	—	.0501
Black, non-Hispanic	0.5	0.2–1.7		0.5	0.1–1.5	
Hispanic	1.5	0.7–3.1		1.3	0.6–3.0	
Other	2.0	0.8–5.0		2.2	0.7–6.7	
Country of birth						
US	1.0	—	<.001	1.0	—	<.001
Outside of US	8.4[f]	3.5–20.4		6.8[f]	2.6–18.1	
Income						
Below poverty threshold	2.0[f]	1.3–3.2	.02	1.7	1.0–2.7	.08
100%–175% of poverty threshold	1.5	0.9–2.6		1.4	0.8–2.3	
>175% of poverty threshold	1.0	—		1.0	—	
Missing	2.5	0.9–6.5		2.5[f]	1.0–6.2	
Region						
Northeast	1.0	—	.6	1.0	—	.5
Midwest	1.2	0.5–2.9		1.2	0.5–3.1	
South	0.9	0.5–1.5		0.8	0.5–1.4	
West	0.7	0.4–1.3		0.7	0.4–1.3	
MSA						
Urban	1.0	—	.05	1.0	—	.08
Rural	0.4	0.2–1.0		0.4	0.2–1.1	
Health literacy						
Below basic	—	—		3.4[f]	1.6–7.4	<.001
Basic	—	—		1.1	0.4–2.5	
Intermediate/proficient[g]	—	—		1.0	—	

English proficiency was left out of the model because this question only assessed for those who learned at least 1 language other than English before starting school and stated that they do not read English "very well." MSA indicates metropolitan statistical area.

[a] Overall test of fit for model 1 (Wald's $\chi^2 = 132.8$; $df = 19$; $P < .001$).

[b] Overall test of fit for model 2 (Wald's $\chi^2 = 144.2$; $df = 21$; $P < .001$).

[c] aOR for each category within each factor compared to the reference group.

[d] 95% CI for each aOR.

[e] No parents in the ≥65 age group who answered this question.

[f] Wald's test with aOR significantly different from reference group at a $P < .05$ significance level.

[g] Intermediate/proficient categorized together, because only 1.4% of those eligible to answer this question were in the proficient category.

Multivariate Analyses: Food-Label Use and Health Literacy

In multivariate regression analyses, food-label use was not statistically significantly related to health literacy.

DISCUSSION

To our knowledge, this study is the first to examine health literacy among a representative population of parents in the United States, revealing that at least 1 in 4 parents, or >21 million US parents, have limited health literacy skills, and only 1 in 7 parents are categorized as having proficient health literacy. Low parent health literacy is an independent predictor of having an uninsured child in the household, as well as difficulty understanding OTC-medication labels, which further underscores the need to address the issue of parent health literacy at a national level.

Significant literacy demands are placed on parents within the current environment of consumer-driven health care in the United States.[22,23] The finding that almost 70% of parents have difficulty filling out a health insurance form is consistent with a recent study that revealed that State Children's Health Insurance Program (SCHIP) enrollment forms are too complex for the majority of US adults.[24] Our study, showing that >60% of parents have difficulty performing the quantitative literacy task of calculating the price per year of a health insurance policy on the basis of family size, has further implications for informed decision-making and access to care.

Our results also have implications for pediatric outpatient medication errors and pediatric patient safety. The finding that parents have difficulty understanding medication labels is consistent with a number of recent studies that have documented that a large proportion of adults misinterpret prescription medication label instructions and associated warning labels and that those with low health literacy skills are disproportionately affected.[25–27] In addition to the suboptimal design of medication labeling,[28,29] other written drug information given to patients and their families (such as consumer medication-information leaflets and US Food and Drug Administration medication guides) are written at, on average, a reading level (10th grade or

higher)[30,31] that is too high for the majority of US adults. Significant variability in the content and format of medication instructions also exists[28] because of minimal standards in the regulation of drug labeling and associated written materials in the United States.[25,31] Simplification and standardization of medication labels and associated written information is necessary for both OTC and prescription medications if improvements in patient and parent understanding of medication instructions is to be achieved.[29]

Although use of food labels was associated with parent health literacy in unadjusted analyses, statistical significance was lost in adjusted analyses. This may be because general food-label use was assessed by self-report rather than use of specific food-label components or food-label comprehension. It is also possible that although health literacy is likely to play a role in the use of food labels, other factors, including education, country of origin, or other unmeasured factors related to culture, may play a primary role.

Our findings suggest that parent health literacy serves as a potential mediating factor in education and language proficiency-related disparities in child health insurance acquisition and may also mediate education, immigrant status, and income-related disparities in reported understanding of OTC-medication labels. These findings are consistent with a growing number of published studies that have suggested that health literacy may serve as an important factor in mediating health disparities.[11,12,32] Additional research is needed to fully examine how health literacy mediates health disparities and whether addressing health literacy issues is a strategy than can be effective in ameliorating existing health disparities.

It was interesting to find that parent health literacy was higher than the health literacy of nonparents, even after controlling for age, race, English proficiency, and other confounders. It is possible that most parents have experienced managing the health maintenance and health problems of their children, whereas a subset of nonparents may have little interaction with the health care system. The reason for this finding should be explored further in future studies.

This study has several limitations. Parents' ability to perform health-related tasks was assessed under testing conditions in English and may not reflect their true ability to perform these tasks in real life or if the assessment were administered in their language of preference. In addition, information on child health insurance, use of nutrition labels, and difficulty with understanding OTC-medication labels was assessed by self-report, and the assessment of understanding of OTC-medication labels was asked only of the subset of patients for whom English was not their first language and those who could not read English "very well." It is also unclear whether the health literacy assessment used as part of the NAAL fully measures the domains of health literacy. The NAAL measures health literacy as part of a written assessment, whereas oral comprehension, an important component of health literacy, was not assessed. The NAAL sampling strategies may have also limited power in some of the analyses.

CONCLUSIONS

This study demonstrates that a large proportion of parents in the United States have limited health literacy. Parent health literacy issues seem to be closely linked to children's health, and efforts should be made to reduce the literacy demands on parents as they seek to address the health needs of their children. Additional research is needed to determine how to best redesign written materials such as health insurance forms and medication labels, including examining the role of document and quantitative literacy skills. Additional research is also needed to explore the mechanisms through which health literacy may serve as a mediator for existing health disparities.

ACKNOWLEDGMENTS

Dr Yin is supported by the Pfizer Fellowship in Health Literacy/Clear Health Communication.

We acknowledge Jing Chen, PhD (senior research analyst, Federal Statistics Program of the American Institutes for Research, Washington, DC), and Andreas Oranje, PhD (associate project director of psychometrics, Research and Development, Educational Testing Service, National Assessment of Educational Progress), for critical reviews of our statistical methods.

REFERENCES

1. Schwartzberg JG, Van Geest JB, Wang CC, eds. *Understanding Health Literacy: Implications for Medicine and Public Health*. Chicago, IL: AMA Press; 2005
2. Berkman ND, DeWalt DA, Pignone MP, Sheridan SL, Lohr KN, Lux L, Sutton SF, Swinson T, Bonito AJ. *Literacy and Health Outcomes*. Rockville, MD: Agency for Healthcare Research and Quality; 2004
3. Baker DW, Wolf MS, Feinglass J, Thompson JA, Gazmararian JA, Huang J. Health literacy and mortality among elderly persons. *Arch Intern Med*. 2007;167(14):1503–1509
4. Nielson-Bohlman L, Panzer A, Kindig D, eds. *Health Literacy: A Prescription to End Confusion*. Washington, DC: Institute of Medicine, National Academies Press; 2004
5. Vernon JA, Trujillo A, Rosenbaum S, DeBuono B. Low health literacy: implications for national health policy. Available at: http://npsf.org/askme3/pdfs/Case_Report_10_07.pdf. Accessed August 15, 2008
6. Joint Commission on Accreditation of Healthcare Organizations. *"What Did the Doctor Say?:" Improving Health Literacy to Protect Patient Safety*. Oakbrook Terrace,

IL: Joint Commission; 2007. Available at: www.jointcommission.org/NR/rdonlyres/D5248B2E-E7E6-4121-8874-99C7B4888301/0/improving_health_literacy.pdf. Accessed August 17, 2009

7. Yin HS, Forbis S, Dreyer BP. Health literacy and pediatric health. *Curr Probl Pediatr Adolesc Health Care*. 2007;37(7):258–286
8. US Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*. 2nd ed. Washington, DC: US Government Printing Office; 2000
9. Kutner M, Greenberg E, Jin Y, Paulsen C, White S. *The Health Literacy of America's Adults: Results From the 2003 National Assessment of Adult Literacy*. (NCES 2006-483): US Department of Education, National Center for Education Statistics; 2006
10. Sentell TL, Halpin HA. Importance of adult literacy in understanding health disparities. *J Gen Intern Med*. 2006;21(8):862–866
11. Osborn CY, Paasche-Orlow MK, Davis TC, Wolf MS. Health literacy: an overlooked factor in understanding HIV health disparities. *Am J Prev Med*. 2007;33(5):374–378
12. Howard DH, Sentell T, Gazmararian JA. Impact of health literacy on socioeconomic and racial differences in health in an elderly population. *J Gen Intern Med*. 2006;21(8):857–861
13. White S, Chen J, Atchison R. Relationship of preventive health practices and health literacy: a national study. *Am J Health Behav*. 2008;32(3):227–242
14. Kutner M, Greenberg E, Baer J. *First Look at the Literacy of America's Adults in the 21st Century*. Washington, DC: US Department of Education, National Center for Education Statistics; 2005
15. Cohen J. AM statistical software: online manual/help system. Available: http://am.air.org/help/JSTree/MainFrame.asp. Accessed August 28, 2008
16. Lumley T. Analysis of complex survey samples. *J Stat Softw*. 2004;9(8):1–19
17. R Development Core. The R project for statistical computing. Available at: www.R-project.org. Accessed August 1, 2008
18. Mislevy RJ, Johnson EG, Muraki E. Scaling procedures in NAEP. *J Educ Stat*. 1992;17(2):131–154
19. Muraki E. A generalized partial credit model: application of an EM algorithm. *Appl Psychol Meas*. 1992;16(2):159–176
20. Rao JNK, Scott AJ. The analysis of categorical data from complex sample surveys. *J Am Stat Assoc*. 1981;76(374):221–230
21. Wald A. Tests of statistical hypotheses concerning several parameters when the number of observations is large. *Trans Am Math Soc*. 1945;54(3):426–482
22. Bach P. Cost sharing for health care: whose skin? Which game? *New Engl J Med*. 2008;358(4):411–413
23. Steinbrook R. Imposing personal responsibility for health. *New Engl J Med*. 2006;355(8):753–756
24. Sanders L, Federico S, Abrams M, et al. Readability and suitability of enrollment forms for the State Children's Health Insurance Program. *E-PAS*. 2007:616515.2
25. Wolf MS, Davis TC, Shrank W, et al. To err is human: patient misinterpretations of prescription drug label instructions. *Patient Educ Couns*. 2007;67(3):293–300
26. Davis TC, Wolf MS, Bass PF 3rd, et al. Low literacy impairs comprehension of prescription drug warning labels. *J Gen Intern Med*. 2006;21(8):847–851
27. Wolf MS, Davis TC, Tilson HH, Bass PF 3rd, Parker RM. Misunderstanding of prescription drug warning labels among patients with low literacy. *Am J Health Syst Pharm*. 2006;63(11):1048–1055
28. Shrank WH, Agnew-Blais J, Choudhry NK, et al. The variability and quality of medication container labels. *Arch Intern Med*. 2007;167(16):1760–1765
29. American College of Physicians Foundation. *Improving Prescription Drug Container Labeling in the United States: A Health Literacy and Medication Safety Initiative*. 2007; Available at: http://foundation.acponline.org/files/medlabel/acpfwhitepaper.pdf.
30. Wolf MS, Davis TC, Shrank WH, Neuberger M, Parker RM. A critical review of FDA-approved medication guides. *Patient Educ Couns*. 2006;62(3):316–322
31. Shrank WH, Avorn J. Educating patients about their medications: the potential and limitations of written drug information. *HealthAff (Millwood)*.2007;26(3):731–740
32. Sudore RL, Mehta KM, Simonsick EM, et al. Limited literacy in older people and disparities in health and healthcare access. *J Am Geriatr Soc*. 2006;54(5):770–776

The Health Literacy of Parents in the United States: A Nationally Representative Study

H. Shonna Yin, Matthew Johnson, Alan L. Mendelsohn, Mary Ann Abrams, Lee M. Sanders and Benard P. Dreyer

Pediatrics 2009;124;S289
DOI: 10.1542/peds.2009-1162E

PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

The Health Literacy of Parents in the United States: A Nationally Representative Study

H. Shonna Yin, Matthew Johnson, Alan L. Mendelsohn, Mary Ann Abrams, Lee M. Sanders and Benard P. Dreyer

Pediatrics 2009;124;S289
DOI: 10.1542/peds.2009-1162E