

Limited Literacy in Older People and Disparities in Health and Healthcare Access

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OBJECTIVES: To determine the relationship between health literacy, demographics, and access to health care.

DESIGN: Cross-sectional study, Health, Aging and Body Composition data (1999/2000).

SETTING: Memphis, Tennessee, and Pittsburgh, Pennsylvania.

PARTICIPANTS: Two thousand five hundred twelve black and white community-dwelling older people who were well functioning at baseline (without functional difficulties or dementia).

MEASUREMENTS: Participants' health literacy was assessed using the Rapid Estimate of Adult Literacy in Medicine. Scores were categorized into 0 to sixth-, seventh- to eighth-, and ninth-grade and higher reading levels (limited health literacy defined as <9th grade). Participants' demographics, socioeconomic status, comorbidities, and three indicators of healthcare access (whether they had a doctor/regular place of medical care, an influenza vaccination within the year, or insurance for medications) were also assessed.

RESULTS: Participants' mean age was 75.6, 52% were female, 38% were black, and 24% had limited health literacy. After adjusting for sociodemographics, associations

remained between limited health literacy and being male, being black, and having low income and education, diabetes mellitus, depressive symptoms, and fair/poor self-rated health ($P < .02$). After adjusting for sociodemographics, health status, and comorbidities, older people with a sixth-grade reading level or lower were twice as likely to have any of the three indicators of poor healthcare access (odds ratio = 1.96, 95% confidence interval = 1.34–2.88).

CONCLUSION: Limited health literacy was prevalent and was associated with low socioeconomic status, comorbidities, and poor access to health care, suggesting that it may be an independent risk factor for health disparities in older people. *J Am Geriatr Soc* 54:770–776, 2006.

Key words: health literacy; aging; disparities; access to care

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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.”¹ Limited health literacy may disproportionately affect the health of older persons because of its high prevalence in older age groups,^{2–5} and because older people have the greatest chronic disease burden and the greatest use of prescription medication. Few literacy studies have focused on older people, and small sample size or inclusion of homogeneous populations and sources of medical care and insurance may limit the generalizability of these studies.^{3,6–8} Little is known about the demographic and specific comorbid conditions associated with health literacy in a heterogeneous population of community-dwelling older people.

Patients with limited health literacy have more hospitalizations and emergency room visits and higher medical expenditures.^{9,10} This may be due, in part, to poor healthcare access, defined by the Institute of Medicine as “the degree to which [patients] are able to obtain needed services from the medical system” and “the timely use of personal health services to achieve the best possible outcome.”¹¹

Although studies have shown that lower socioeconomic status is associated with worse health and poor healthcare access,^{12–14} it is unclear whether health literacy may be associated with healthcare access for older people who may obtain care outside of a managed care environment.^{15,16}

The Health, Aging and Body Composition (Health ABC) Study enrolled well-functioning, community-dwelling black and white participants who were representative of Medicare-eligible persons with multiple sources of medical care. Using data from this cohort, the goals of this study were to assess the prevalence of limited health literacy, determine the demographic characteristics and specific comorbid conditions associated with limited health literacy, and evaluate whether limited health literacy was independently associated with indicators of poor healthcare access.

METHODS

Study Population

Study participants were part of the Health ABC Study. This prospective cohort study, begun in 1997 (Year 1), included 3,075 community-dwelling, Medicare-eligible men and women aged 70 to 79 at baseline. Participants were well functioning at baseline, because exclusion criteria included any self-reported difficulty walking one quarter of a mile, climbing a flight of stairs, performing basic activities of daily living, or clinical dementia.¹⁷ Participants also had to be able to communicate with English-speaking interviewers. Participants were identified from a random sample of white, Medicare beneficiaries and all age-eligible black residents in designated ZIP code areas surrounding the two field centers: the University of Pittsburgh and the University of Tennessee, Memphis. Of baseline participants, 46% of the women and 37% of the men were black. Residents within designated ZIP codes were mailed study brochures and then called on the phone to request study participation and assess functional status.

In the third year of the study (1999/2000), an in-person clinic assessment of health literacy was performed in 2,512 participants. Of the original 3,075 participants, literacy was not assessed in 563 subjects because of lack of an in-person clinic interview ($n = 418$), death ($n = 107$), poor eyesight ($n = 14$), refusal ($n = 13$), withdrawal from the study ($n = 6$), and missing data ($n = 5$). The institutional review boards of the University of California, San Francisco, the University of Tennessee, and the University of Pittsburgh approved this study.

Health Literacy Assessment

Health literacy was assessed using the Rapid Estimate of Adult Literacy in Medicine (REALM), a word-recognition tool with scoring based on the pronunciation of 66 common health-related terms. The REALM has been found to correlate with other standardized literacy and health literacy tests.^{18,19} In the REALM, the words are presented in order of increasing difficulty and syllable length, with one point given for each word pronounced correctly.¹⁸ REALM scores of 0 to 18 represent a reading level of third grade or less (“may not be able to read most low-literacy materials and may need repeated oral instructions”), scores of 19 to 44 represent a fourth- to sixth-grade reading level (“may need low-literacy materials and may not be able to read

prescription instructions”), scores of 45 to 60 represent a seventh- to eighth-grade reading level (“may struggle with most currently available patient education materials”), and scores higher than 60 represent a ninth-grade reading level or above (“should be able to read most patient education materials”).¹⁸ Participants testing at less than the ninth-grade reading level were considered to have limited health literacy, as has been previously described.²⁰ The 0 to third-grade and fourth- to sixth-grade reading levels were combined into a 0 to sixth-grade reading level because of the small sample size in the lowest reading group ($n = 58$). By convention, limited health literacy was considered in two ways: first, as three separate levels (≤ 6 th grade, 7th–8th grade, and ≥ 9 th grade) to attempt to show a trend and, second, dichotomized into lower than ninth-grade reading level and ninth-grade reading level or higher to simplify the presentation and interpretation of stratified and regression analyses.

Correlates of Health Literacy

Demographic information was obtained at Year 1 and included age, race, sex, years of education, site of clinic assessment, and annual family income less than \$10,000 per year or \$10,000 or more per year. It was assumed that demographic characteristics of the participants would have remained constant at Year 3, when all other study variables were measured.

Health status measures were obtained at Year 3 and included specific comorbid diseases (cardiac disease, stroke, cancer, hypertension, and diabetes mellitus), self-rated health, obesity, and depressive symptoms. Cardiac disease, stroke, cancer, hypertension, and diabetes mellitus were determined using a combination of self-reported physician diagnosis, clinical data obtained at yearly study examinations, and medication use. Participants were asked to rate their overall health as excellent, good, fair, poor, or very poor. Self-rated health was dichotomized into excellent to good and fair to very poor. Body mass index (BMI) was determined from measured weight in kilograms divided by the square of height in meters. Participants were considered obese if their BMI was greater than 30 kg/m². All participants were administered the Center for Epidemiologic Study Depression Scale (CES-D), and high depressive symptomatology suggestive of depression was defined as a score of 16 or higher.²¹ In addition, incident cognitive impairment defined, by convention,²² as a decline of 5 points or more on the 100-point modified Mini-Mental State Examination,²³ was assessed from baseline to Year 3.

Healthcare Access Measures

At Year 3, participants were asked about three indicators of access to health care using standardized items from the Health ABC Study and other epidemiological studies. These indicators of access included whether participants had a regular doctor or place of care (access to primary care),^{15,24} whether they had obtained an influenza vaccination in the previous 12 months (access to preventive services),^{16,24} and whether they had insurance to cover medications (access to medication).^{24–26} To provide an overall indicator of healthcare access, a composite measure was created based on participants lacking any of the aforementioned healthcare access indicators (i.e., whether participants were lacking any domain of healthcare access).

Statistical Analyses

The demographic and health status correlates associated with limited health literacy were first assessed within each literacy level by comparing means and percentages using chi-square for linear trend or analysis of variance across three literacy levels (0–6th, 7th–8th, and \geq 9th grade). To determine the independent association between demographic variables and health status with limited health literacy, a multivariate logistic regression model was constructed. Demographic variables (age, race, sex, income, study site) were included if they were associated with literacy at $P \leq .1$ in bivariate analysis. Literacy level (<9th-grade vs \geq 9th-grade reading level) was the outcome variable.

Then, to evaluate limited health literacy and the interrelationships between race, sex, education, and income, stratified analyses were performed to determine the proportion of older people with limited health literacy (<9th-grade reading level) within each demographic strata.

Finally, the association between limited health literacy and participants' access to health care was assessed within each literacy level by comparing means and percentages using chi-square for linear trend across the three literacy levels. To determine the independent association between health literacy and healthcare access, a multivariate logistic regression model was constructed. Demographic, health status, and comorbidity variables were included in the model if they were associated with health literacy or poor access to health care at $P \leq .1$ in bivariate analysis. In this analysis, the individual and composite measures of healthcare access were the outcome variables, and literacy level (0–6th, 7th–8th, and \geq 9th grade) was included in the model as a predictor variable.

Because of the high collinearity between REALM scores and educational attainment (Pearson correlation coefficient = 0.57), multivariate models were calculated with and without adjustment for education. Hosmer-Lemeshow

goodness-of-fit tests were conducted to assess the fit of each logistic regression model.²⁷

Sensitivity analyses were conducted after excluding participants who developed incident cognitive impairment from baseline to Year 3. The purpose of this analysis was to see whether the results were due primarily to cognitive impairment rather than to limited health literacy. It was felt that this was important given the strong relationship between cognitive test performance and literacy level.^{28,29} All analyses were conducted using intercooled Stata, version 8 software (StataCorp, College Station, TX).

RESULTS

Prevalence of Limited Health Literacy

The mean age of the sample was 76 (range 71–82). Forty-eight percent of the sample was male, 38.1% was black, and 11.9% reported yearly family income of less than \$10,000 at baseline (Table 1). Twenty-four percent of the sample had limited health literacy (<9th-grade reading level), and the prevalence was nearly twice as high in Memphis as in Pittsburgh (31.7% vs 16.1%, $P < .001$).

Demographics and Health Status

Participants in the lower literacy categories were more likely to be male and black, have less than a high school education, have less than a \$10,000 annual family income, and reside in Memphis than participants with higher literacy (P for trend $< .001$, Table 1). Mean age did not differ between literacy categories. Participants in the lower literacy categories were also more likely to have fair to poor self-rated health, hypertension, diabetes mellitus, obesity, and high depressive symptoms ($P < .001$).

After adjustment, all demographic variables remained significantly associated with limited health literacy (<9th-grade reading level) as did fair to poor self-rated health,

Table 1. Demographic Characteristics and Health Status of Health, Aging and Body Composition Study Participants by Health Literacy Level (Rapid Estimate of Adult Literacy in Medicine (REALM) Score)*

Characteristic	Overall (n = 2,512)	0–6th Grade (n = 212)	7–8th Grade (n = 383)	\geq 9th Grade (n = 1,917)	P-value [†]
Demographics					
Age, mean \pm SD	75.6 \pm 2.8	75.8 \pm 2.9	75.7 \pm 2.9	75.6 \pm 2.8	.36
Male, %	48.0	55.2	58.0	45.2	< .001
Black, %	38.1	87.7	63.5	27.5	< .001
< High school education, %	22.1	84.8	44.5	10.8	< .001
Annual income < \$10,000, %	11.9	33.5	19.6	6.1	< .001
Memphis site, %	48.6	76.9	58.5	43.5	< .001
Health status, %					
Poor health	17.7	32.6	28.0	13.9	< .001
Hypertension	56.6	61.8	63.2	54.7	< .001
Diabetes mellitus	17.1	24.5	25.6	14.6	< .001
Obesity [‡]	24.9	29.3	32.1	23.0	< .001
Depression [§]	2.1	5.7	2.9	1.6	< .001

* Health literacy level based on REALM score: 0–44 = 0 to sixth-grade reading level, 45–60 = seventh- to eighth-grade reading level, \geq 61 = \geq ninth-grade reading level. Participants scoring <61 (<ninth-grade reading level) are considered to have limited health literacy.

[†] Analysis of variance for continuous variables and chi-square for linear trend for dichotomous variables.

[‡] Body mass index > 30 kg/m².

[§] \geq 16 on the Center for Epidemiology Study Depression Scale.

Table 2. Demographics and Health Status as Predictors of Limited Health Literacy: Unadjusted and Adjusted Models

Characteristic	Limited Health Literacy* Odds Ratios (95% Confidence Interval)	
	Unadjusted	Adjusted†
Demographics		
Aged ≥77	1.00 (0.83–1.22)	1.05 (0.84–1.31)
Male	1.60 (1.33–1.93)	2.78 (2.21–3.49)
Black	6.80 (5.54–8.35)	7.81 (6.19–9.87)
Annual income <\$10,000	5.41 (4.13–7.08)	3.10 (2.24–4.27)
Memphis site	2.42 (2.00–2.93)	3.08 (2.47–3.85)
Health status		
Poor health	2.60 (2.09–3.23)	1.65 (1.27–2.13)
Hypertension	1.39 (1.25–1.68)	1.03 (0.82–1.28)
Diabetes mellitus	1.98 (1.58–2.48)	1.48 (1.14–1.92)
Obesity‡	1.51 (1.23–1.85)	1.13 (0.89–1.44)
Depression§	2.54 (1.47–4.42)	2.37 (1.22–4.60)

* Limited health literacy is defined as a Rapid Estimate of Adult Literacy in Medicine (REALM) score <61 (<ninth-grade reading level). REALM scores 61–66 or ≥ ninth-grade reading level used as a reference in multivariate regression.

† Adjusted for age, race, sex, income, and site. Adjusted results did not appreciably change after using ordinal logistic regression with 0 to sixth-grade, seventh- to eighth-grade, and ≥ninth-grade literacy level as the outcome.

‡ Body mass index >30 kg/m².

§ ≥16 on the Center for Epidemiology Study Depression Scale.

diabetes mellitus, and high depressive symptoms (Table 2). Adding education to the models did not appreciably change the association between limited health literacy and these variables, except that self-rated health and high depressive symptoms were no longer associated ($P > .05$).

Stratified analyses demonstrate the additive effects of sex, race, education, and income on the rate of limited health literacy (Table 3), with black race having the highest rate in each strata. For example, among high school graduates, blacks had substantially higher rates of limited health literacy (34.0% for men and 21.3% for women) than whites (10% for men and 3.4% for women) ($P < .001$ for all groups). Of those with less than a high school education, only 19.3% of black men and 34.4% of black women had a reading level of ninth-grade or higher, approximately half the proportion observed in whites of similar education ($P < .001$ for all groups). In addition, women uniformly had lower rates of limited health literacy than men ($P < .02$ for all groups). Neither adjusting for comorbidities (cardiac disease, stroke, cancer, hypertension, diabetes mellitus, obesity, high depressive symptoms) or self-rated health in regression analyses nor differing modified Mini-Mental State Examination scores explained the observed differences in sex ($P = .54$).

Healthcare Access

Trend analyses suggest that participants in lower literacy categories were less likely to have a regular doctor or place of care, to have had an influenza vaccination in the previous 12 months, or to have insurance to cover medications than

Table 3. Health Literacy Level by Race, Sex, Education, and Income Strata

Characteristic	Limited Health Literacy*		P-value†
	Blacks	Whites	
Men			
Education			
≥High school	34.0	10.0	<.001
<High school	80.7	46.7	<.001
Annual income, \$			
≥10,000	50.5	14.5	<.001
<10,000	80.3	33.3	.007
Women			
Education			
≥ High school	21.3	3.4	<.001
<High school	65.6	32.9	<.001
Annual income, \$			
≥10,000	30.7	5.5	<.001
<10,000	56.2	19.5	<.001

* Limited health literacy defined as a Rapid Estimate of Adult Literacy in Medicine score <61 (<ninth-grade reading level).

† Calculated across groups (comparing blacks and whites).

those in higher literacy categories (Figure 1). Test for trend was significant ($P < .01$) for all healthcare access variables across the three literacy levels.

In multivariate analysis adjusted for age, race, sex, income, site, self-rated health, and comorbidities (cardiac disease, stroke, cancer, hypertension, diabetes mellitus, obesity, high depressive symptoms) (Table 4), with ninth grade or higher as the reference, the 0 to sixth-grade reading level was independently associated with lacking an influenza vaccination in the previous 12 months (odds ratio (OR) = 1.70, 95% confidence interval (CI) = 1.20–2.41), lacking insurance for medications (OR = 1.73, 95% CI = 1.23–2.43), and with the composite measure of poor healthcare access (OR = 1.95, 95% CI = 1.33–2.85). However, after adjustment, the seventh- to eighth-grade reading level was not associated with any measure of healthcare access ($P > .65$). After the addition of education to the model, there was still an independent association between the lowest literacy level and poor healthcare access (e.g., for the composite measure, OR = 1.55, 95% CI = 1.03–2.34), but not for the seventh- to eighth-grade reading level, $P > .70$. These findings were unchanged if seventh-grade or higher reading level was used as the referent group in the multivariable model. An association was not found between limited health literacy and having a regular doctor or place of care.

Excluding the 400 participants (16% of sample) who had evidence of incident cognitive impairment from baseline to Year 3 did not significantly affect the results.

DISCUSSION

Almost one in four community-dwelling older persons participating in the Health ABC Study had limited health literacy. These rates were higher in the more traditionally

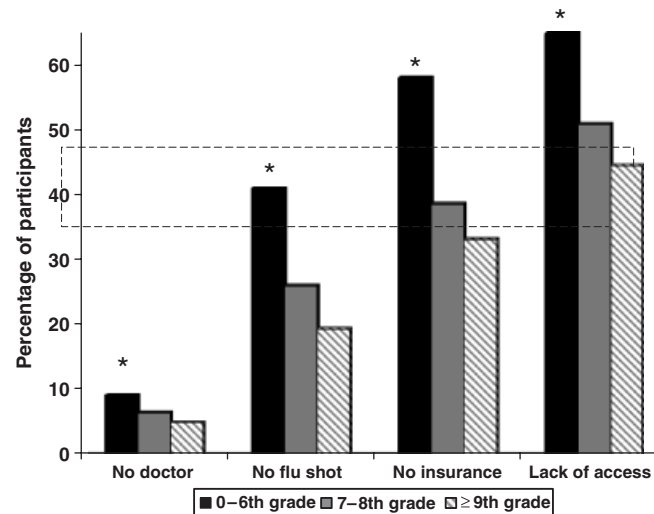


Figure 1. Healthcare access measures by literacy level. *Chi-square for linear trend, all $P < .01$. Lack of access is a composite variable of any of the following healthcare access measures: lack of a regular doctor or clinic, no influenza vaccination within the previous 12 months, and no insurance to cover medications.

disadvantaged groups (e.g., poorly educated, impoverished, black men). Limited health literacy was also more common in older people with chronic medical conditions, including hypertension, diabetes mellitus, obesity, and depression, and in those who reported worse self-rated health. Despite the need for accessible health care for older people with limited health literacy, especially for those with chronic medical conditions, older people with limited health literacy were also more likely to lack a regular doctor or source of care, lack insurance to cover medications, and to not have had an influenza vaccination within the previous 12 months than older people with adequate health literacy.

Effective management of chronic health problems requires a level of understanding of physician and medication instructions and appropriate access and close follow-up care. The association between limited health literacy and poor healthcare access in older people may explain, in part, the greater association between limited health literacy and chronic disease observed in this sample. Older people in the lowest reading groups were at greatest risk for these disparities in health status.

The prevalence of limited health literacy in the overall sample (24%) was lower than that found in a pooled

prevalence study of subjects aged 50 and older (38%),⁵ but the current study included only well-functioning, older persons at baseline who may have higher health literacy than a population that included frailer persons. The Memphis site had a higher prevalence of limited health literacy than Pittsburgh, which is consistent with other studies showing regional differences.^{2,3} The difference in prevalence between the two study sites persisted after adjusting for other sociodemographic factors and level of education, suggesting that prevalence may be related to other unmeasured differences in these two areas of the United States. Furthermore, an association between limited health literacy and increasing age may not have been observed, in contrast to other studies have,²⁻⁴ because the current study recruited participants within a 10-year age range.

Although health literacy level and educational attainment were strongly related, literacy level varied greatly within educational strata by race and sex. These findings argue strongly for attention to literacy level as well as educational attainment in studies of health disparities regardless of sex or race. This is consistent with other studies showing that years of schooling do not equate to literacy skill.^{2,30,31} These results also suggest that inadequate liter-

Table 4 Access to Health Care by Literacy Level

Access	Unadjusted		Adjusted*	
	7-8th Grade	0-6th Grade	7-8th Grade	0-6th Grade
	Odds Ratio (95% Confidence Interval)			
No doctor/clinic	1.34 (0.85-2.14)	1.97 (1.18-3.31)	1.11 (0.67-1.86)	1.27 (0.69-2.33)
No influenza shot in 12 months	1.46 (1.13-1.89)	2.91 (2.16-3.92)	1.06 (0.80-1.41)	1.70 (1.20-2.41)
No insurance for medications	1.27 (1.01-1.60)	2.80 (2.09-3.76)	1.03 (0.80-1.33)	1.73 (1.23-2.43)
Composite access measure	1.29 (1.03-1.63)	3.56 (2.53-5.01)	0.95 (0.74-1.23)	1.95 (1.33-2.85)

Note: \geq ninth-grade reading level is the referent group.

*Adjusted for age, race, sex, income, study site, self-rated health, and comorbidities (cardiac disease, stroke, cancer, hypertension, diabetes mellitus, obesity, high depressive symptoms).

acy skills may be a marker for poor-quality education or access to education, especially for minority groups.^{1,2} Given this, health literacy may be a better measure than educational attainment of elderly patients' ability to understand healthcare instructions and to successfully interact with the healthcare environment.¹⁶

Women of both races had higher health literacy levels than men; differences in cognitive impairment, educational attainment, other sociodemographic factors, regional variation, or comorbidities did not explain this sex difference. Although this is consistent with one small, community-based study,³⁰ sex differences have not been found in other population-based literacy or health literacy studies.²⁻⁴ Women are more likely to provide care to sick family members than men³²⁻³⁴ and thus have more contact with the healthcare environment. This may explain, in part, why women had higher health literacy skills than men.

This study also demonstrated that participants who scored in the lowest health literacy level were at greatest risk for disparities in measures of healthcare access. After adjusting for sociodemographic factors, self-rated health, and comorbidities, the 0 to sixth-grade reading level was associated with lacking an influenza vaccination in the previous 12 months (consistent with a managed-care cohort¹⁶) and lacking insurance to cover medications. The association between limited health literacy and poor healthcare access in older people is plausible, given that persons with limited health literacy often delay seeking care for medical problems and have higher hospitalization rates, emergency room utilization, and healthcare expenditures.^{10,15,35} Furthermore, in this study, many chronic illnesses were associated with limited health literacy. Therefore, it may be that having poor healthcare access may act as a mediator between limited health literacy and these poor health outcomes.

The disparities observed in access to preventive services and medications for older people with limited health literacy may be due to poor understanding of their importance or of instructions given to them by their providers,³⁶⁻³⁸ poor communication between the healthcare establishment and the patient,³⁸ mistrust,^{39,40} fear or intimidation,⁴¹ or lack of self-efficacy navigating the healthcare system.⁴² In addition, patients with limited health literacy often have difficulty reading or filling out forms needed to obtain services, such as insurance and medication.^{3,43} There also may be other socioeconomic measures that could not be adjusted for in this study that would preclude participants from accessing medications (e.g., purchasing insurance).

After adjustment, limited health literacy was not associated with lacking a regular doctor or place of care. Given the small number of participants who did not have a doctor or place of care at baseline (5%), the study may have lacked power to detect a difference. Nevertheless, similar results were found in a study of younger patients and in an elderly managed-care cohort.^{15,44} Yet studies show that patients with limited health literacy are less likely to find interactions with their primary care physicians understandable or empowering.³⁸ Therefore, having access to primary care services for older people with limited health literacy may not mitigate the observed disparities in poor health outcomes.⁴⁵

Older persons not only have a greater need for complex disease management and decision-making, but are also at

risk for normal cognitive slowing and functional decline. These factors, coupled with poor access to health care, place older people with limited health literacy at particularly high risk for poor health outcomes. Limited health literacy in older people is also associated with many comorbid conditions and with other sociodemographic variables known to be related to poor health and healthcare access, such as black race, low educational attainment, and low income.^{13,46} Additional research should be conducted to identify creative and multidisciplinary interventions to help older people with limited health literacy access the healthcare system to obtain the services they need. Interventions will likely need to combine multidisciplinary case management approaches that have been successful in geriatric^{47,48} and low-literacy populations.^{49,50}

The inclusion of a large sample of racially diverse, community-dwelling older people with multiple sources of medical care and insurance was a strength of this study, but the study had a number of limitations. The cross-sectional, observational design did not allow for true causal relationships to be defined, and there may have been unmeasured confounders that would explain the associations. The reliance on self-report for indicators of healthcare access may have also introduced recall bias. In addition, the sample was well functioning at baseline, which may have led to a lower approximation of the prevalence of limited health literacy in the population and may have attenuated some of the statistical findings. Furthermore, because only well-functioning older people from two U.S. cities who could communicate in English were included, and because of the extra sampling strategies employed to obtain the race composition of this sample, these results may not be broadly generalizable to other regions of the country or to other patient populations. In addition, the indicators of healthcare access used in this study, although significantly associated with limited health literacy, likely describe only a small portion of the healthcare needs that older people with limited health literacy are likely to have.⁴⁵

In summary, limited health literacy is prevalent in community-dwelling older people. It is associated with disparities in health and healthcare access, and therefore, older people with limited health literacy may be at greater risk for worse clinical outcomes. Further research is needed to delineate the best ways to identify older people at risk of limited health literacy and to help develop geriatric and low-literacy-focused interventions that will help narrow disparities in health in this vulnerable patient group.

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