

NIH Public Access

Author Manuscript

Health Educ Behav. Author manuscript; available in PMC 2013 February 01.

Published in final edited form as:

Health Educ Behav. 2012 February ; 39(1): 35-44. doi:10.1177/1090198111406538.

Relationship between Self-Reported Racial Composition of High School and Health Literacy among Community Health Center Patients

Kimberly A. Kaphingst, ScD¹, Melody Goodman, PhD², Owen Pyke², Jewel Stafford, MSW², and Christina Lachance, MPH³

¹Washington University School of Medicine

²Graduate Program in Public Health, Health Sciences Center, Stony Brook University

³National Human Genome Research Institute/National Institutes of Health

Abstract

Intervention and policy approaches targeting the societal factors that affect health literacy (e.g., educational systems) could have promise to improve health outcomes, but little research has investigated these factors. This study examined the associations between self-reported racial composition of prior educational and neighborhood contexts and health literacy among 1061 English- and Spanish-speaking adult community health center patients. We found that self-reported racial composition of high school was a significant predictor of health literacy among those who received schooling in the US, controlling for race/ethnicity, education, age, country of birth, and survey language. Black and Hispanic patients had significantly lower health literacy than white patients within educational strata among those schooled in the US. The findings revealed substantial disparities in health literacy. Self-reported racial composition of school context was a significant predictor of health literacy. Transdisciplinary, multi-level intervention approaches are likely to be needed to address the health literacy needs of this population.

Keywords

health literacy; community health centers; health disparities; residential segregation

INTRODUCTION

Health literacy has often been defined in the U.S. 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 (Nielsen-Bohlman, Panzer, & Kindig, 2004). This construct therefore encompasses individuals' capabilities to use and interpret health-related text, documents, oral language, and numbers effectively, skill domains that are distinct but highly correlated (Nielsen-Bohlman et al., 2004; Reder, 1995). Prior clinical research has consistently shown health literacy to be a critical predictor of health outcomes and health care utilization. More specifically, individuals with limited health literacy have, on average, higher rates of hospitalization, lower health knowledge, increased incidence of chronic illness, lower utilization of preventive health services, higher health care costs, and poorer self-reported health, associations that are present even after adjusting for potentially

Address for correspondence: Kimberly A. Kaphingst, ScD, Assistant Professor, Department of Surgery, Campus Box 1009, Washington University School of Medicine, St. Louis, MO 63122, Ph: 314-935-3726, Fax: 314-935-3757.

confounding sociodemographic variables (Baker et al., 1996; Baker, Williams, Parker, Gazmararian, & Nurss, 1999; Berkman, Pignone, DeWalt, & Sheridan, 2004; Gazmararian, Williams, Peel, & Baker, 2003; Nielsen-Bohlman et al., 2004; Parker, Baker, Williams, & Nurss, 1995; Weiss et al., 2005; Weiss, Hart, McGee, & D'Estelle, 1992; Weiss & Palmer, 2004). The development of effective large-scale interventions to mitigate the effects of health literacy on patient outcomes has proved to be challenging (Galliher et al., 2010; Shrank et al., 2009). However, policy and intervention approaches based on an understanding of the societal factors affecting health literacy (e.g., educational systems) could have promise (Nielsen-Bohlman et al., 2004), and, therefore, there is a strong need for investigation of these determinants.

Most research to date investigating the correlates of health literacy has focused on individual-level sociodemographic characteristics. Studies have shown convincingly that patients from underserved groups may face particular health literacy challenges. For example, survey findings based on a nationally representative sample showed that about 36% of U.S. adults have limited health literacy, but this proportion varied substantially across population subgroups (Kutner, Greenberg, Jin, Paulsen, & White, 2006). Compared to Asian/Pacific Islander or White adults, Hispanic, Black and Native American adults had lower health literacy, on average. In addition, older adults, those with lower educational levels, and individuals who live in poverty were shown to have lower average health literacy (Kutner et al., 2006). Other studies conducted among populations of low-income patients have shown higher proportions of individuals with limited health literacy among Spanishspeaking patients compared to English-speaking patients (Gazmararian et al., 1999; Williams et al., 1995). A systematic review of 85 health literacy studies conducted in health care settings found that low health literacy was most consistently related to educational attainment, race/ethnicity, and age (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005).

In contrast to this wealth of studies on individual-level variables associated with health literacy, very limited research has examined community-level or neighborhood-level factors (Martin et al., 2009). Theoretical developments in health literacy suggest the importance of beginning to examine the role of structural-level variables. For example, Nutbeam (2008) describes an "asset" model of health literacy from a public health and health promotion perspective, in which health literacy can be seen as a way to empower individuals to take control of their health and affect personal and social determinants of health. However, the social determinants of health literacy have been largely unexplored in the public health and medical literatures.

Related research from other disciplines provides some insight regarding the impact of neighborhood- and school-level variables on educational outcomes. For example, one sociological study showed a significant negative relationship between factors related to deprivation in the home neighborhood (e.g., overcrowding) and educational attainment (Garner & Raudenbush, 1991). Neighborhood characteristics, such as economic deprivation, also predict student achievement test scores in mathematics and reading (Ainsworth, 2002). Other U.S. research has shown that school funding is affected by residential segregation; children from different socioeconomic and racial/ethnic groups experience different schooling environments, with real consequences for educational quality and outcomes (Berger, Smith, & Coelen, 2004; Raudenbush, Cheong, & Fotiu, 1996). Residential segregation may erode the effectiveness of institutions related to health care and education (Blanchard, Cossman, & Levin, 2004; Massey, Gross, & Eggers, 1991). Therefore, differential school quality related to the effects of residential segregation on educational systems may lead to differential health literacy according to individuals' childhood neighborhood and school environment. Although the Institute of Medicine recognized the

importance of educational systems in the development of health literacy in their 2004 report (Nielsen-Bohlman et al., 2004), these issues have not yet received systematic research attention.

In the present study we examined levels of health literacy among a diverse patient population seeking care from a network of community health centers. To address the previously described research gap in the social determinants of health literacy, we investigated the associations of self-reported racial composition of respondents' high school and neighborhood growing up, as well as educational attainment, race/ethnicity, age, and country of birth, with health literacy among this population. Based on the proposed effects of residential segregation described above (Blanchard, Cossman, & Levin, 2004; Massey, Gross, & Eggers, 1991), we hypothesized that individuals who reported attending schools or growing up in neighborhoods that were predominately non-Hispanic white would have higher average levels of health literacy, controlling for individual-level sociodemographic variables. Based on prior studies, we also hypothesized that educational attainment would be positively related to health literacy, and that the association between educational attainment and health literacy would be modified by race/ethnicity.

METHODS

Data Collection

Participants in this study were recruited between August and November 2008. Patients in the waiting rooms of eight community health centers in Suffolk County, New York were approached by trained bilingual data collectors and asked to complete a survey in either English or Spanish. Surveys were administered at each of the health centers on different days of the week and at different times of the day, and data collectors approached all patients in the waiting room while they were at the health center. Suffolk County is a diverse region that encompasses the eastern two thirds of Long Island. The Suffolk County Department of Health Services serves as the safety net provider of health care for county residents accepting Medicaid and provides no/low-cost care on a sliding scale for uninsured/ underinsured patients. It has a network of eight community health centers strategically located throughout the county, typically in medically underserved areas.

Inclusion criteria were that patients be at least 18 years old and speak either English or Spanish. Of the 1,318 patients who agreed to participate, 1,061 (81%) completed all components of the survey. Nine (0.85%) of the surveys were entirely verbally administered at the participants' request. There were no significant differences in demographic characteristics between individuals with complete surveys and those with incomplete surveys. The survey respondents were generally similar to the underlying Suffolk County Department of Health Services patient population with respect to gender and age; however, our sample had larger proportions of whites, blacks, Native Americans and Asians, and a smaller proportion of Hispanics, compared to the underlying population. This study was approved by the Stony Brook University Institutional Review Board, Committee on Research Involving Human Subjects, the Suffolk County Department of Health Services Institutional Review Board, and the National Institutes of Health Office of Human Subjects Research.

Measures

Health literacy—Participants' health literacy was assessed using the Newest Vital Sign (NVS) (Weiss et al., 2005). This six-item measure consists of information contained in a standard food nutrition label, and requires reading comprehension and numeracy skills. The NVS is available in both English and Spanish. The validity and sensitivity of this measure in

detecting limited health literacy, compared with existing measures such as the Rapid Estimate of Adult Literacy in Medicine (REALM; Davis et al., 1993) and the Test of Functional Health Literacy in Adults (TOFHLA; Parker et al., 1995), has been previously reported (Osborn et al., 2007; Weiss et al., 2005). Participants received a NVS score ranging from 0 to 6 based on the number of correct answers. Scores from 0-1 reflect a high likelihood of limited health literacy, 2-3 a possibility of limited health literacy and 4-6 adequate health literacy (Weiss et al., 2005).

Self-reported racial composition—Respondents' self-reports of the racial composition of five environments (i.e., their junior high, high school, neighborhood growing up, current neighborhood, and current place of worship) were assessed using a five-part item adapted from the Behavioral Risk Factor Surveillance System. For each environment, respondents indicated their perceptions of the approximate racial composition (e.g., mostly Whites, some Whites, mostly Blacks, about half Blacks) from among 13 response options based on four racial and ethnic groups (i.e., Whites, Blacks, Hispanics, Asians). For this study, we focused on variables hypothesized to have impacted childhood learning experiences, more specifically, self-reported racial composition of respondents' junior high, high school, and neighborhood growing up.

Sociodemographics—We recorded respondents' educational attainment, age, race/ ethnicity, gender, country of birth, and country of schooling.

Statistical Analysis

Descriptive statistics were first examined for all variables. Bivariate analyses were conducted to examine the associations between health literacy (i.e., NVS score) and each of the self-reported racial composition and sociodemographic variables. We then built a multivariable linear regression model to examine significant predictors of health literacy. In the model, we tested indicators (i.e., mostly White) of self-reported racial composition for high school and neighborhood growing up; the racial composition variable for junior high was not included in the final model due to the high level of collinearity between the two school environment variables. Other variables in the model included gender (male/female), race/ethnicity (Black, White, Hispanic, other), age (dichotomized at the median age of 35), educational attainment (less than high school degree/high school degree or higher), country of birth (born in U.S./born outside U.S.), and language of survey administration (English/ Spanish). In addition, we constructed multivariable models stratified by educational attainment in order to examine the effects of race/ethnicity on health literacy among individuals with similar educational attainment. Data were analyzed using Stata Statistical Software: Release 10 (College Station, TX: StataCorp LP 2007) and SAS/STAT® Software Version 9.1 for Windows (Cary, NC). Statistical significance was assessed as p<0.05.

RESULTS

As shown in Table 1, the majority of patients (75%) were female. About 60% had been born in the United States, and 59% had received their schooling in the United States. Just over one-quarter (26%) self identified as being non-Hispanic White, 31% as non-Hispanic Black, and 35% as Hispanic. Although 83% had at least a high school diploma or GED, only 34% had adequate health literacy as measured by the NVS. Almost one-third of respondents (30%) had a high likelihood of limited health literacy.

In univariate analyses, there was a significant difference between the health literacy of White and non-White patients. The mean NVS score of non-Hispanic White patients was 3.8 \pm 1.8, while the mean score of non-White patients was 2.4 \pm 1.7 (2.5 \pm 1.7 for non-Hispanic

Blacks, 2.1 ± 1.6 for Hispanics, and 2.7 ± 1.8 for patients from other racial and ethnic groups) (p<0.0001).

The distribution of educational attainment was similar between non-Hispanic White and non-White patients (see Figure 1). The mode for educational attainment was the category of high school degree/GED for both groups. In contrast, the distribution of NVS scores differed between non-Hispanic White and non-White patients (see Figure 2). The mode NVS score amongst non-Hispanic White patients was 5, reflecting adequate health literacy. However, the mode score amongst non-White participants was 2, indicating possible limited health literacy.

In the multivariable linear regression model, among those who received schooling in the US, self-reported racial composition of high school was a significant predictor of health literacy, controlling for participant race/ethnicity, educational attainment, age, country of birth, and language of survey administration (see Table 2); however, neighborhood growing up was not a significant predictor of health literacy. Among those who received schooling in the US, individuals who self-reported that their high school had been mostly White had an average NVS score of 0.41 points higher than those who did not (p=0.011). In the model, among those educated in the US, compared to individuals who self identified as non-Hispanic White, those who identified as non-Hispanic Black had an average NVS score one point lower (-1.09, p<.001) and those who self identified as Hispanic had an average NVS score of 0.42 points lower (p=0.012). Among those who received schooling in the US, participants with at least a high school diploma or GED had a NVS score of 0.80 points higher than those who and not attained a high school diploma or GED, on average, controlling for the other variables in the model (p=0.0008). Those 35 years of age or older had an average NVS score -0.47 points lower than participants younger than 35 (p=0.0014)

In contrast, neither self-reported racial composition variable was a significant predictor of health literacy among those who received schooling outside of the US (see Table 2). In this group, the only significant predictors of health literacy were education and language of survey administration. Participants with at least a high school diploma or GED had a NVS score of 0.58 points higher than those who had not attained a high school diploma or GED, on average, controlling for the other variables in the model (p=0.0020). Participants who completed the survey in Spanish had NVS scores of 0.60 points lower, on average, than those who completed the survey in English (p=0.001).

We did not observe a significant interaction between educational attainment and race/ ethnicity in the multivariable model for the overall sample. However, when we conducted a stratified analysis by educational attainment, among those participants who had received schooling in the US, there was a significant association between race/ethnicity and health literacy within each educational strata (see Table 3). In this group, among all strata, non-Hispanic Black patients had significantly lower health literacy than did non-Hispanic White patients, with an average NVS score of more than one point lower among Blacks. Hispanic patients had significantly lower health literacy than non-Hispanic White patients in the high school degree/GED strata (0.85 points lower on NVS; p=0.0079) and the some college or more strata (0.85 points lower on NVS; p=0.017). Those grouped in the "other" category did not have significantly lower health literacy than non-Hispanic White patients.

However, among those participants who had received schooling outside of the US, there was only a significant association between race/ethnicity and health literacy in the some college or more strata (see Table 4). In this strata, non-Hispanic Black patients had significantly lower health literacy than did non-Hispanic White patients (0.93 points lower on NVS; p=0.040). Hispanic patients also had also significantly lower health literacy than non-

Hispanic White patients among those with some college or more (0.93 points lower on NVS; p=0.043).

DISCUSSION

A large proportion of the 1061 community health center patients assessed in this study likely have limited health literacy. Only about 34% of patients could be considered to have adequate health literacy. This proportion is higher than has been found in other patient populations using the same instrument (Ryan et al., 2008). These findings suggest the importance of patient education and communication approaches that are effective with patients with limited health literacy due to the greater health literacy needs in this population.

This study is one of the first to examine the impact of neighborhood- and school-level characteristics on patients' health literacy. We observed, among patients who had received schooling in the US, that patients who reported that their high school was mostly White had higher health literacy than those who self-reported a different racial composition for their high school in multivariable models. However, reporting that their neighborhood growing up was mostly White was not an independent predictor of health literacy. In public health research, the effect of neighborhood-level factors such as residential segregation (i.e., segregation with regard to the composition and spatial distribution of a population across neighborhoods; Acevado-Garcia, Lochner, Osypuk, & Subramanian, 2003) on health outcomes including infant and adult mortality has received attention, but much research remains to understand the pathways by which such variables might impact health outcomes (Landrine & Corral, 2009). One possible pathway of particular salience for health literacy is that residential segregation might erode the effectiveness of institutions related to health care and education through less availability of resources, leading to poorer health care and education in predominantly minority communities compared to communities that are predominantly white (Blanchard, Cossman, & Levin, 2004; Massey, Gross, & Eggers, 1991). Notably, among patients who received schooling outside of the US, self-reported racial composition of neighborhood growing up or high school was not related to health literacy. This intriguing finding suggests that contextual factors related to the US educational system might be driving the observed association between self-reported racial composition of high school and health literacy. Such system-level factors might operate differently among patients who received schooling outside of the US, leading to a lack of an association between self-reported racial composition of high school and health literacy. This is an important area for future research.

The setting for this study, Long Island, New York, is the 3rd most residentially segregated suburban region in the nation. Ten out of 917 census tracts account for 60% of Long Island's African American population (U.S. Census Bureau, 2000). Communities of color on Long Island are concentrated in low and moderate income tracks. The lowest income census tracts on Long Island are 40% African American and 45% Hispanic, and low income tracts have median income less than 50% of the county median. Most of the minority students on Long Island are concentrated in 13 of its 127 school districts and attend high poverty schools that often have inadequate resources. African American students on Long Island attend schools where on average 47% of the student body is in poverty and Hispanic students attend schools with an average poverty rate of 13% (U.S. Census Bureau, 2010). Residential segregation shapes socioeconomic conditions not only at the individual and household levels but also at the neighborhood and community levels (Williams & Collins, 2001), and its implications extend further than just the physical isolation of people and may have a strong impact on the health literacy of individuals.

Differential educational quality, or other school factors such as differential drop-out rates, related to the effects of residential segregation on educational systems may be possible explanations for the health literacy differences we observed by race/ethnicity within strata of educational attainment among those who had received schooling in the US. As has been observed in other research (Nielsen-Bohlman et al., 2004), educational attainment substantially overestimated actual health literacy skills in the US. In this study, although over 80% of the patients had obtained at least a high school degree or GED, only about onethird (34%) had adequate levels of health literacy. Furthermore, the same level of educational attainment seemed to have different meanings for individuals from different racial and ethnic groups. While the distributions of educational attainment were similar for non-Hispanic White patients and non-White patients, these two groups had quite different distributions of health literacy. In addition, in multivariable models, among those who had received schooling in the US, non-Hispanic Black patients had significantly lower health literacy within every educational strata compared to non-Hispanic Whites, and Hispanic patients had significantly lower health literacy among the top two educational strata, compared to Whites.

These results are generally consistent with those from a sample of 1,610 primary care patients, which found that average health literacy scores, as assessed by the REALM, were significantly lower for African Americans than for Caucasians within educational strata, except for the college-educated groups (Shea et al., 2004). Our findings add further diversity to these earlier results, in that we were able to examine a greater number of racial and ethnic groups and included both English and Spanish-speaking patients. Education research has previously shown that persons having the same educational attainment can vary in actual level of cognitive skills, possibly due to reasons such as unequal educational opportunities outside of school and unequal quality of schooling (Raudenbush & Kasim, 1998). Taken together, our findings and those from prior research strongly suggest that measurement of actual skills and knowledge, rather than simply asking about the grade that someone completed, is needed to evaluate individuals' ability to function within the health care system. These findings also suggest that further research is needed to examine directly the impact of school quality on health literacy. Research findings so far indicate that policy efforts to develop systemic approaches to ensure quality of educational opportunity across racial and ethnic groups in the US may be critical to improving health literacy over the long term.

Furthermore, among this patient population, we found that non-whites, those who had lower educational attainment, and were older were more likely to have limited health literacy. These findings are consistent with those from a large nationally representative sample (Kutner et al., 2006), as well as other studies of the correlates of health literacy (Nielsen-Bohlman et al., 2004), and show strong evidence of the disparities in health literacy across patient subgroups within the community health center population. Recent research has suggested that health literacy, as measured by the Short Test of Functional Health Literacy in Adults, and adult literacy, as in the 1992 National Adult Literacy Survey, explain some of observed disparities in health outcomes by education and race (Howard, Sentell, & Gazmararian, 2006; Sentell & Halpin, 2006). These prior studies, together with our findings, suggest that there is a strong need to consider patients' health literacy in their care, especially those patients from minority and medically underserved groups. Since individuals from underserved socioeconomic or racial/ethnic groups are often at increased risk of morbidity and mortality from common diseases (Nielsen-Bohlman et al., 2004), existing studies in this area particularly highlight the importance of developing culturally appropriate, tailored disease prevention and intervention approaches that are effective with patients who have limited health literacy (Hinyard & Kreuter, 2007; Kreuter et al., 2005).

Our findings indicated that there may be particularly significant health literacy needs among Spanish-speaking community health center patients. Among those who had received schooling outside the US, we found that that individuals taking the Spanish language NVS had lower average health literacy than those taking the English language NVS. Our findings are consistent with observations from a systematic review, that participants tested in Spanish generally have lower health literacy than those tested in English (Paasche-Orlow et al., 2005). This may indicate that health literacy instruments in Spanish are less accurate than English-language instruments or may reflect differential access to quality education. This is an important area for future investigation in developing ways to effectively serve Spanishspeaking patients with limited health literacy. Additional studies are needed to clarify whether measures of health literacy are equivalent across languages.

While the results of this analysis are compelling, further investigation needs to be done to address some of the limitations of this study. The observational cross-sectional survey design used in the study does not allow us to make causal inferences. Therefore, while we present interesting and statistically significant associations, other study designs such as longitudinal studies with measurement of possible confounding variables at multiple levels are needed. Direct measures of educational quality in longitudinal studies are also needed to explore further the relationship between years of education completed and health literacy in adulthood within racial and ethnic groups. This community health center sample may not be representative of individuals in these communities who do not seek health care, and in fact might therefore overestimate actual levels of health literacy skills in the underlying population. There is some potential for selection bias based on who agreed to participate in the survey, although all patients in the waiting rooms during scheduled times were approached for participation in order to reduce bias that might result from systematically approaching only some patients. In addition, while the sample was generally representative of the patient population of these community health centers based on age and gender but not race/ethnicity, the results from this population may not be more broadly generalizable and these findings should be explored in other populations and with national data.

The measure of health literacy we used, the NVS, is not as commonly used as others (Davis et al., 1993; Parker et al., 1995), but using the NVS provided substantial advantages in this study. Namely, because the NVS reflects nutritional material that patients are likely to encounter in their daily lives, they might be more familiar with the assessment format than with word lists or other health literacy instruments that seem more like academic tests of reading ability (Baker, 2006), which might have contributed to the high completion rate of the NVS among this population with a high rate of limited health literacy. In addition, the self-reported racial composition variable used here sought to measure the participant's retrospective perception and therefore may not accurately reflect actual racial composition within different contexts. It will be important in future studies to begin to examine both structural- and individual-level predictors of health literacy using hierarchical models.

Implications for practice

The results show important health literacy needs among a population of diverse community health center patients, in which health literacy has not previously been measured. The findings further reveal disparities in health literacy according to education, race/ethnicity, and age in this population. These results are therefore needed by both health care providers and public health practitioners serving this population so that steps can be taken to tailor health education messages and materials accordingly. Prevention and intervention approaches that are both culturally and linguistically appropriate for patients with limited health literacy are needed.

Furthermore, most health literacy interventions to date, even those with multiple components, have focused on the individual level (Clement, Ibrahim, Crichton, Wolf, & Rowlands, 2009). Improving health outcomes among community health center patients will likely require multi-level interventions both to increase the health literacy of patients and interventions to reduce the health literacy demands of the health care system. These findings also point to the importance of practice being informed by continuing research examining the effect of neighborhood and school-level variables. If future research strengthens our finding that school-level variables impact health literacy, it will be important for practitioners to not only consider interventions focused on the health care setting, but also policy-level interventions focused on improving the quality of educational systems across population subgroups. As suggested by the 2004 report on health literacy issued by the Institute of Medicine, community-based adult education and legislation requiring healthrelated curricula in the K-12 system might both be needed as longer-term efforts to improve health literacy in diverse patient populations (Nielsen-Bohlman et al., 2004). Transdisciplinary approaches to address the health literacy needs of individuals through interventions on multiple levels may contribute to improving the health of the community.

Acknowledgments

This research was supported by the Intramural Research Program of the National Human Genome Research Institute, National Institutes of Health. We would like to thank the Suffolk County Department of Health Services, the Health Center Administrators, the data collectors, and the patients who agreed to participate in this study.

REFERENCES

- Acevado-Garcia D, Lochner KA, Osypuk TL, Subramanian SV. Future directions in residential segregation and health research: A multilevel approach. American Journal of Public Health. 2003; 93(2):215–221. [PubMed: 12554572]
- Ainsworth JW. Why does it take a village? The mediation of neighborhood effects on educational achievement. Social Forces. 2002; 81(1):117–152.
- Baker DW. The meaning and the measure of health literacy. Journal of General Internal Medicine. 2006; 21:878–883. [PubMed: 16881951]
- Baker DW, Parker RM, Williams MV, Pitkin K, Parikh NS, Coates W, et al. The health care experiences of patients with low literacy. Archives of Family Medicine. 1996; 5:329–334. [PubMed: 8640322]
- Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss JR. Development of a brief test to measure functional health literacy. Patient Education and Counseling. 1999; 38:33–42. [PubMed: 14528569]
- Berger, JB.; Smith, SM.; Coelen, SP. Race and the metropolitan origins of postsecondary access to four year colleges: The case of Greater Boston. The Civil Rights Project, Harvard University; Cambridge, MA: 2004.
- Berkman, N.; Pignone, MP.; DeWalt, D.; Sheridan, S. Health literacy: Impact on health outcomes. AHRQ; Rockville, MD: 2004.
- Blanchard T, Cossman JS, Levin ML. Multiple meanings of minority concentration: Incorporating contextual explanations into the analysis of individual-level U.S. black mortality outcomes. Population Research and Policy Review. 2004; 23:309–326.
- Clement S, Ibrahim S, Crichton N, Wolf M, Rowlands G. Complex interventions to improve the health of people with limited literacy: A systematic review. Patient Education and Counseling. 2009; 75:340–351. [PubMed: 19261426]
- Davis TC, Long SW, Jackson RH, Mayeaux EJ, George RB, Murphy PW, et al. Rapid Estimate of Adult Literacy in Medicine: A shortened screening instrument. Family Medicine. 1993; 25:391– 395. [PubMed: 8349060]

- Galliher JM, Post DM, Weiss BD, Dickinson LM, Manning BK, Staton EW, et al. Patients' questionasking behavior during primary care visits: A report from the AAFP National Research Network. Annals of Family Medicine. 2010; 8:151–159. [PubMed: 20212302]
- Garner CL, Raudenbush SW. Neighborhood effects on educational attainment: A multilevel analysis. Sociology of Education. 1991; 64:251–262.
- Gazmararian JA, Baker DW, Williams MV, Parker RM, Scott TL, Green DC, et al. Health literacy among Medicare enrollees in a managed care organization. JAMA. 1999; 281(6):545–551. [PubMed: 10022111]
- Gazmararian JA, Williams M, Peel J, Baker D. Health literacy and knowledge of chronic disease. Patient Education and Counseling. 2003; 51:267–275. [PubMed: 14630383]
- Hinyard L, Kreuter M. Using narrative communication as a tool for health behavior change: A conceptual, theoretical, and empirical overview. Health Education and Behavior. 2007; 34(5):777– 792. [PubMed: 17200094]
- Howard DH, Sentell T, Gazmararian JA. Impact of health literacy on socioeconomic and racial differences in health in an elderly population. Journal of General Internal Medicine. 2006; 21:857– 861. [PubMed: 16881947]
- Kreuter MW, Sugg-Skinner C, Holt CL, Clark EM, Haire-Joshu D, Fu Q, et al. Cultural tailoring for mammography and fruit and vegetable intake among low-income African-American women in urban public health centers. Prev Med. 2005; 41(1):53–62. [PubMed: 15916993]
- 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. National Center for Education Statistics; Washington, DC: 2006.
- Landrine H, Corral I. Separate and unequal: Residential segregation and Black health disparities. Ethnicity and Disease. 2009; 19:179–184. [PubMed: 19537230]
- Martin LT, Ruder T, Escarce JJ, Ghosh-Dastidar B, Sherman D, Elliott M, et al. Developing predictive models of health literacy. Journal of General Internal Medicine. 2009; 24(11):1211–1216. [PubMed: 19760299]
- Massey D, Gross A, Eggers M. Segregation, the concentration of poverty, and the life chances of individuals. Social Science Research. 1991; 20:397–420.
- Nielsen-Bohlman, L.; Panzer, AM.; Kindig, DA., editors. Health Literacy: A Prescription to End Confusion. National Academies Press; Washington, DC: 2004.
- Nutbeam D. The evolving concept of health literacy. Social Science and Medicine. 2008; 67:2072–2078. [PubMed: 18952344]
- Osborn CY, Weiss BD, Davis TC, Skripkauskas S, Rodrigue C, Bass PF III, et al. Measuring adult literacy in health care: Performance of the Newest Vital Sign. American Journal of Health Behavior. 2007; 31(Suppl 3):S36–S46. [PubMed: 17931135]
- Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd R. The prevalence of limited health literacy. Journal of General Internal Medicine. 2005; 20:175–184. [PubMed: 15836552]
- Parker RM, Baker DW, Williams MV, Nurss JR. The Test of Functional Health Literacy in Adults: A new instrument for measuring patients' literacy skills. Journal of General Internal Medicine. 1995; 10:537–541. [PubMed: 8576769]
- Raudenbush, SW.; Cheong, YF.; Fotiu, RP. Social inequality, social segregation, and their relationship to reading literacy in 22 countries. In: Mullens, JE.; Kasprzyk, D., editors. The Schools and Staffing Survey: Recommendations for the Future. U.S. Department of Education, National Center for Educational Statistics; Washington, DC: 1996.
- Raudenbush SW, Kasim RM. Cognitive skill and economic inequality: Findings from the National Adult Literacy Survey. Harvard Educational Review. 1998; 68(1):33–79.
- Reder, S. What does NALS measure? Issues of dimensionality and construct validity. Portland State University, National Center on Adult Literacy; Portland, OR: 1995.
- Ryan JG, Leguen F, Weiss BD, Albury S, Jennings T, Velez F, et al. Will patients agree to have their literacy skills assessed in clinical practice? Health Education Research. 2008; 23(4):603–611. [PubMed: 17890757]

- Sentell TL, Halpin HA. Importance of adult literacy in understanding health disparities. Journal of General Internal Medicine. 2006; 21:862–866. [PubMed: 16881948]
- Shea JA, Beers BB, McDonald VJ, Quistberg A, Ravenell KL, Asch DA. Assessing health literacy in African American and Caucasian adults: Disparities in Rapid Estimate of Adult Literacy in Medicine (REALM) scores. Family Medicine. 2004; 36(8):575–581. [PubMed: 15343419]
- Shrank WH, Gleason PP, Canning C, Walters C, Heaton AH, Jan S, et al. Can improved prescription medication labeling influence adherence to chronic medications? An evaluation of the Target pharmacy label. Journal of General Internal Medicine. 2009; 24(5):570–578. [PubMed: 19247719]
- U.S. Census Bureau. State and County Quick Facts. 2000. Retrieved 06/06/10, from http:// quickfacts.census.gov/qfd/states/36000.html
- Weiss BD, Hart G, McGee DL, D'Estelle S. Health status of illiterate adults: Relation between literacy and health status among persons with low literacy skills. Journal of the American Board of Family Practice. 1992; 5(3):257–264. [PubMed: 1580173]
- Weiss BD, Mays MZ, Martz W, Castro KM, DeWalt DA, Pignone MP, et al. Quick assessment of literacy in primary care: the Newest Vital Sign. Annals of Family Medicine. 2005; 3(6):514–522. [PubMed: 16338915]
- Weiss BD, Palmer R. Relationship between health care costs and very low literacy skills in a medically needy and indigent Medicaid population. Journal of the American Board of Family Medicine. 2004; 17:44–47.
- Williams DR, Collins C. Racial residential segregation: A fundamental cause of racial disparities in health. Public Health Reports. 2001; 116(5):404–416. [PubMed: 12042604]
- Williams MV, Parker RM, Baker DW, Parikh NS, Pitkin K, Coates WC, et al. Inadequate functional health literacy among patients at two public hospitals. JAMA. 1995; 274(21):1677–1682. [PubMed: 7474271]



Figure 1.

Distribution of educational attainment by categories of race/ethnicity among community health center patients (n=991).

Note: 1=Elementary school, 2=Junior high or some high school, 3=High school degree or GED, 4=Some college or Associate degree, 5=College degree, 6=Graduate degree



Figure 2.

Distribution of Newest Vital Sign scores by categories of race/ethnicity among community health center patients (n=963).

Note: 0-1 items correct=High likelihood of limited literacy, 2-3 items correct=Possible likelihood of limited literacy, 4-6 items correct=Adequate literacy

Table 1

Sociodemographic characteristics of participants (n=1061)

Variable	N (%)
Health literacy (n=1015)	
High likelihood of limited health literacy	307 (30.3)
Possibility of limited health literacy	362 (35.7)
Adequate health literacy	346 (34.1)
Gender (n=1048)	
Male	266 (25.4)
Female	782 (74.6)
Age (n=1016)	
Less than 35	495 (48.7)
35 or greater	521 (51.3)
Education (n=1038)	
Less than high school degree or GED	182 (17.5)
High school degree/GED or higher	856 (82.5)
Race/ethnicity (n=1006)	
White, non-Hispanic	266 (26.4)
Black, non-Hispanic	307 (30.5)
Hispanic	347 (34.5)
Other	86 (8.5)
Country of birth (n=1061)	
USA	637 (60.0)
Outside USA	424 (40.0)
Country of education (n=1061)	
USA	630 (59.4)
Outside USA	431 (40.6)
Language of survey administration (n=1061)	
English	873 (82.3)
Spanish	188 (17.7)

Table 2

Predictors of health literacy in a multivariable linear regression model (n=949)

	Educated (n=55	in US (4)	Educated outsic (n=35	de of the US (4)
Variable	Beta coefficient (standard error)	p-value	Beta coefficient (standard error)	p-value
Intercept	2.80 (0.00)	0.002	2.07 (0.38)	< 0.0001
Racial composition				
High school mostly White	0.41 (0.16)	0.011	0.09 (0.25)	0.70
Neighborhood growing up mostly White	0.30 (0.18)	0.096	0.43 (0.26)	0.10
Race/ethnicity *				
Black	-1.09 (0.19)	< 0.0001	-0.32 (0.35)	0.37
Hispanic	-0.58 (0.23)	0.012	-0.37 (0.34)	0.29
Other	-0.26 (0.29)	0.37	0.16 (0.38)	0.67
Age [†]	-0.47 (0.15)	0.0014	-0.09 (0.16)	0.55
Educational attainment ^{\ddagger}	0.80 (0.24)	0.0008	0.58 (0.19)	0.0020
Country of birth $^{\delta}$	0.34 (0.85)	0.69	0.80 (0.45)	0.076
Language of survey administration $/\!\!/$	-0.51 (0.77)	0.51	-0.60 (0.22)	0.0061

*White is comparison category

 $^{\dagger}35$ or older compared to less than 35 years of age

 $\vec{\tau}_{\rm High}$ school degree/GED or higher compared to less than high school degree/GED

[§]Born in US compared to born outside US

Spanish compared to English

Table 3

Effect of race/ethnicity on health literacy, stratified by educational attainment, for those educated in the US (n=630)

	Less than hig degree (n	gh school 1=59)	High school (GEI (n=23	legree or 5)	Some college (n=26	s or more 5)
Variable	Beta coefficient (standard error)	p-value	Beta coefficient (standard error)	p-value	Beta coefficient (standard error)	p-value
Intercept	3.55 (0.48)	<0.0001	3.03 (1.59)	0.058	3.67 (0.24)	0.0001
Race/ethnicity*						
Black	-1.27 (0.52)	0.0014	-1.32 (0.31)	<0.0001	-1.22 (0.21)	<0.0001
Hispanic	-0.41 (0.73)	0.20	-0.85 (0.32)	0.0079	-0.85 (0.25)	0.017
Other	-1.70 (0.97)	0.066	-0.67 (0.44)	0.13	-0.58 (0.29)	0.36
$\operatorname{Age}^{\not{\tau}}$	-0.05 (0.50)	0.92	-0.71 (0.21)	0.0007	$-0.26\ (0.16)$	0.19
Country of birth‡	//		0.96 (1.57)	0.54	1.01 (0.19)	0.49
Survey language [§]	-1.52 (1.31)	0.25	-2.15 (1.59)	0.18	-0.92 (0.31)	0.49
* White is compari	son category					
$\dot{\tau}_{35}$ or older comp	ared to less than	35 years of	age			
$t_{ m Born\ in\ US\ comp}$	pared to born out	side US				
${}^{\mathscr{S}}_{\operatorname{Spanish}}$ compare	d to English					
$''_{\rm All}$ individuals in	this group were	born in the	SU			

Table 4

Effect of race/ethnicity on health literacy, stratified by educational attainment, for those educated outside of the US (n=431)

	Less than hig degree (r	gh school 1=96)	High school c GEL (n=10	legree or 5)	Some college (n=16	e or more 4)
Variable	Beta coefficient (standard error)	p-value	Beta coefficient (standard error)	p-value	Beta coefficient (standard error)	p-value
Intercept	1.09 (0.67)	0.10	2.05 (0.52)	0.0001	3.63 (0.41)	<0.0001
Race/ethnicity*						
Black	0.20 (0.71)	0.78	0.48 (0.63)	0.45	-0.93 (0.45)	0.040
Hispanic	0.66 (0.73)	0.37	0.29 (0.58)	0.66	-0.93 (0.46)	0.045
Other	0.09 (0.86)	0.30	1.30 (0.68)	0.058	-0.81 (0.51)	0.11
$\operatorname{Age}^{\not{\tau}}$	-0.19 (0.20)	0.33	-0.51 (0.30)	0.63	-0.22 (0.27)	0.41
Country of ${ m birth}^{\sharp}$	0.28 (0.50)	0.57	-0.33 (1.47)	0.82	1.28 (0.71)	0.070
Survey language [§]	-0.40 (0.33)	0.23	-0.87 (0.35)	0.014	-0.91 (0.36)	0.011
* White is compar	ison category					
$rac{t}{35}$ or older comp	bared to less than	35 years of	age			
${}^{\sharp}_{ m Born \ in \ US \ com_{ m I}}$	pared to born out	side US				

Health Educ Behav. Author manuscript; available in PMC 2013 February 01.

 \S Spanish compared to English