Familiarity, Navigation, and Comprehension: Key Dimensions of Health Literacy in Pap Test Use Among Korean American Women

Hae-Ra Han, PhD, RN, FAAN[*,1], **Kyounghae Kim, PhD, RN**[2], **Joycelyn Cudjoe, RN, BSN**[1], **Miyong T. Kim, PhD, RN, FAAN**[3]

[1]School of Nursing, Johns Hopkins University, Baltimore, MD

[2]School of Nursing, University of Connecticut, Storrs, CT

[3]School of Nursing, University of Texas at Austin, Austin, TX

Abstract

Health literacy consists of multiple dimensions such as print and oral literacy or numeracy. Different dimensions of health literacy may have more salient impact on certain health behaviors and outcomes. Yet, evidence is limited regarding which dimensions particularly affect cervical cancer screening. The objective of this study was to examine the role of different dimensions of health literacy in cervical cancer screening among Korean American women. We used baseline data obtained from 560 Korean American women in a community-based health literacy-focused intervention study. Backward stepwise logistic regression analysis revealed that familiarity (adjusted odds ratio [AOR] = 1.20, 95% confidence interval [CI] = 1.11–1.31) and navigational health literacy (AOR = 1.10, 95% CI = 1.04–1.16) were associated with lifetime Pap test use and comprehension (AOR = 1.08, 95% CI = 1.02–1.14) with triennial Pap test screening. Prior exposure to healthcare settings and knowing how to navigate the healthcare system were more important than other health literacy dimensions for lifetime Pap test use. Understanding cancer screening-related words was most relevant to triennial Pap test use. In addition to addressing system factors such as insurance and physicians' recommendations, interventions to increase Pap test screening targeted at Korean American women are needed to address certain dimensions of health literacy such as familiarity, navigation, and comprehension.

Keywords

Cervical cancer is the fourth most common cancer in women worldwide, and the second leading cause of cancer death in women aged 20 to 39 years (Siegel, Miller, & Jemal, 2018). Despite national statistics indicating the high incidence and late diagnosis of cervical cancer (Innos & Horn-Ross, 2003; Lin et al., 2002; Liu, Zhang, Deapen, Bernstein, & Ross, 2003), Korean American (KA) women in the United States (U.S.) continue to report

[*]**Corresponding author at:** Johns Hopkins University School of Nursing, 525 N. Wolfe Street, Baltimore, MD 21205-2110, Phone: 410-614-2669, hhan3@jhu.edu.

lower cervical cancer screening rates than those of other ethnic groups (American Cancer Society, 2018; Juon, Choi, & Kim, 2000; Maxwell, Bastani, & Warda, 2000; Moskowitz, Kazinets, & Tager, 2003; Ponce, Gatchell, & Brown, 2003; Swan, Breen, Coates, Rimer, & Lee, 2003). Screening for cervical cancer is recommended for women aged 21 to 65 years with a Pap test every three years (U.S. Preventive Services Task Force, 2012). Health literacy —"the degree to which individuals have the capacity to obtain, process, and understand basic health information and services to make appropriate health decisions"—is the key to acquiring access to safe, quality healthcare (U.S. Department of Health and Human Services, 2000). Low health literacy has been identified as a major barrier to effective utilization of cancer screening tests, independent of race or socioeconomic status (Bennett et al., 1998; Lindau et al., 2002). In addition, studies have shown positive correlations between low health literacy and disproportionately higher cancer incidence and mortality (Garbers & Chiasson, 2004; Lindau, Tomori, McCarville, & Bennett, 2001; Lindau et al., 2002).

Several studies have shown significant health literacy challenges **in certain groups such as recent Asian immigrant in the U.S. who often lack English proficiency** (Berger, Huang, & Rubin, 2017; Jun & Nan, 2018; Sentell & Halpin, 2006). KAs, one of the largest Asian populations in the U.S., are predominantly foreign born (92.5%) and monolingual (70% do not speak English well) (Shin, 2003). Patients experiencing language discordance are more likely to have misconceptions and lack appropriate understanding of information provided; these differences negatively affect knowledge, attitude, and self-efficacy with regard to adequate utilization of preventive care (Davis et al., 1996; Lindau et al., 2002; Scott, Gazmararian, Williams, & Baker, 2002; Sentell, Braun, Davis, & Davis, 2015; Sentell & Halpin, 2006). Even highly educated individuals with high English proficiency skills find it difficult to correctly convert and interpret proportions commonly used to report cancer risks, resulting in increased misperceptions and lowered personalization of such risks (Lipkus, Samsa, & Rimer, 2001). This problem is heightened among individuals in the U.S. with low English proficiency who are also predisposed to low health literacy (Fiscella, Franks, Doescher, & Saver, 2002; Jacobson, Hund, & Soto Mas, 2016; Sentell et al., 2015; Sentell & Halpin, 2006).

Health literacy is a multidimensional concept and is often measured as such (Baker, 2006; Sorensen et al., 2012). The common dimensions of health literacy include print literacy (reading and understanding text), oral or communicative literacy (speaking and listening effectively), and numeracy (ability to use quantitative information) (Baker, 2006; Speros, 2005**). Additional dimensions include critical literacy (critically analyzing information to make health decisions), interactive literacy (actively deriving meaning from different forms of communication and applying this to changing circumstance), cultural literacy (recognizing and using collective beliefs, customs, and social identity to interpret and act on health information), civic literacy (being aware of public issues and becoming involved in the decision making process), or digital literacy (using information and communication technologies to locate, evaluate, create, and communicate digital information) (**American Library Association, 2013; Nutbeam, 2000; Zarcadoolas, Pleasant, & Greer, 2005**). Recent research shows that different dimensions of health literacy may have more salient impact on certain health behaviors and outcomes. For example, numeracy has

been shown to be a key dimension of health literacy for adequate self-management of chronic diseases such as diabetes (Bailey et al., 2014; Osborn, Cavanaugh, Wallston, & Rothman, 2010) and asthma (Apter et al., 2013). Inadequate numeracy was also associated with higher prevalence of comorbidities and prescribed medications in individuals receiving outpatient care at a Veterans Affairs health system (Garcia-Retamero, Andrade, Sharit, & Ruiz, 2015), and more emergency room visits and hospitalizations in a sample of persons with multiple sclerosis (Marrie, Salter, Tyry, Fox, & Cutter, 2014). Oral literacy has been closely associated with dental health outcomes independent of age, gender and socioeconomic status (Batista, Lawrence, & Sousa, 2017; Divaris, Lee, Baker, & Vann, 2011; Lee et al., 2011; Lee, Divaris, Baker, Rozier, & Vann, 2012). No research has investigated how health literacy dimensions are associated with cancer screening behaviors. To address this research gap, the purpose of this study was to examine dimensions of health literacy related to Pap test screening behaviors among Korean immigrant women in the U.S.

Method

Design

This cross-sectional study used baseline data obtained from a community-based health literacy-focused intervention trial to promote breast and cervical cancer screening among 560 KA women in the U.S. (parent study). Detailed information about the parent study can be found in Han et al. (2017). Briefly, KA women 21–65 years of age who were able to read and write English or Korean, had not received age-appropriate mammograms and/or Pap tests for the past two years, and were willing to provide a written consent form to allow the study team to audit medical records for relevant cancer screenings were eligible for the parent study. These women were recruited from Korean ethnic churches **on the east coast (Baltimore-Washington metropolitan area) of the U.S.** This target region is home to the third-largest Korean immigrants in the U.S. (Zong & Batalova, 2014). KA women were recruited by trained community health workers from the respective churches in the target area. Data were collected at baseline, 3-month and 6-month follow-ups. We used baseline data from 560 enrolled participants for this analysis.

Procedures

The Institutional Review Board approved study protocols. Trained bilingual research staff obtained written informed consent following a brief explanation about the study and the verification of participants' eligibility. The staff then administered the study survey which included the Assessment of Health Literacy in Cancer Screening (AHL-C) (Han, Huh, Kim, Kim, & Nguyen, 2014). The AHL-C is based on Baker's conceptualization of health literacy (Baker, 2006) and includes the following domains: print literacy, numeracy, comprehension, and familiarity. Detailed procedures to evaluate a study participant's health literacy in cancer screening using the AHL-C were reported in Han et al. (2014). In short, the AHL-C is a paper-pencil questionnaire; although all instructions and items were written in Korean, all health literacy-related items were written in English. This is because a previous validation study using the Korean version of the two most popular health literacy instruments—Rapid Estimate Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA)—failed to effectively capture KA women's health literacy (Han, Kim,

Kim, & Kim, 2010). Han et al. (2010) highlighted that Korean is phonetic language, which violates the presupposition of popular literacy instruments such as REALM (i.e., a high association between decoding skills and comprehension). Trained staff used a list of cancer-specific words to evaluate their reading skills and used a nutrition label to assess their arithmetic skills. Each woman received $20 as a token of our appreciation.

Measures

The following sociodemographic characteristics were associated with this study: age, marital status, education, income comfortability, length of stay in the U.S., and English proficiency. Income comfortability was measured on a 5-point Likert scale (1 = *very comfortable* to 5 = *very uncomfortable*). Health care system factors such as insurance status and a provider's recommendation about Pap test use were measured. A provider's recommendation was assessed using one item, "Has your primary care provider recommended Pap test use within the last 2 years?" These variables were selected because they have been shown to be associated with Pap testing. The outcomes were KA women's lifetime and triennial Pap test use. Triennial Pap test use was assessed by subtracting a participant's most recent Pap test use from the date of the baseline data obtained.

The Assessment of Health Literacy in Cancer Screening (AHL-C) was developed to measure health literacy in the context of breast and cervical cancer screening. **While other health literacy instruments are available in the context of breast and cervical cancer (e.g., Breast Cancer Literacy Assessment Tool [B-CLAT] and Cervical Cancer Literacy Assessment Tool [C-CLAT]), the items included in the B-CLAT (**Williams, Templin, & Hines, 2013**) and C-CLAT (**Williams & Templin, 2013**) primarily focus on knowledge (e.g., different exams available to detect breast cancer).** Modeling on the structure of the REALM and TOFHLA, the AHL-C consists of a word recognition test, a numeracy test, and functional literacy items. This 52-item cancer screening-specific health literacy tool (Han et al., 2014) was developed based on Baker's conceptualization of health literacy (Baker, 2006) which encompasses prior knowledge ("an individual's knowledge before reading health-related materials or speaking to a healthcare professional") and reading fluency ("the ability to mentally process written materials and form new knowledge"). The AHL-C represents the following subscales (Han et al., 2014): prior knowledge includes familiarity (12 items) and comprehension (12 items); reading fluency consists of word recognition (12 items), navigational health literacy (12 items), and numeracy (4 items). The AHL-C validation study in KA women reported acceptable to excellent internal consistency reliability, ranging from 0.70 to 0.92 and demonstrated construct validity by correlating with known covariates including age and education ($r = 0.11$ to 0.62) (Han et al., 2014). The concurrent validity with the REALM was also strong ($r = 0.87$) (Han et al., 2014). Total scores ranged from 0 to 52 as responses were coded as correct (1) or incorrect (0).

Statistical analysis

Descriptive statistics were used to summarize means and standard deviations (SDs), and tabulate frequencies and percentages. Following a bivariate analysis, backward stepwise logistic regression model was estimated. Marital status was categorized as married/partnered and separated/divorced/widowed/never married. Education was categorized as   high school

education and some college education or higher. Income comfortability was categorized in two groups: very comfortable/comfortable and neutral/uncomfortable/very uncomfortable. English proficiency was categorized in two groups: not fluent and fluent. Health insurance status was categorized as uninsured and insured (private/Medicare/Medicaid/other). The variables were eliminated from a full model if *p*-value was greater than .10, and the variables were added to the model if *p*-value was less than .05.

Results

Sample characteristics

Sample characteristics are shown in Table 1. All participants were foreign-born Korean immigrants. The sample was middle-aged (mean age±SD=46.1±8.5 years) and mostly married (85.7%), received at least some college education (64.8%, mean education±SD = 14.5±2.7 years), and had stayed in the U.S. for 10 years or more (mean length-of-stay in the U.S.±SD = 15.4±9.7 years). Only 23.4% reported speaking English fluently. About 38% had health insurance and only 15.7% reported that a physician had recommended Pap testing to them in the past two years. The average score on the AHL-C scale was 19.9 (SD = 12.5). About 49% had received a Pap test in their lifetime and 25.4% reported receiving triennial Pap test screening.

Stepwise multiple logistic regression of KA women's Pap test use

In a bivariate analysis, lifetime and triennial Pap test use were associated with all dimensions of health literacy (p<.001) except numeracy. Backward stepwise logistic regression revealed: Lifetime Pap test use was associated with age (adjusted odds ratio [AOR]: 1.04, 95%CI: 1.02–1.07, p = .001), length of residence in the US (AOR: 0.62, 95% CI: 0.41–0.92, p = .018), provider's recommendation (AOR: 15.48, 95% CI: 6.47 to 37.02, p<.001), familiarity (AOR: 1.20, 95% CI: 1.11 to 1.31, p<.001), and navigational health literacy (AOR: 1.10, 95% CI: 1.04 to 1.16, p = .001). Triennial Pap test screening was associated with income comfortability (AOR: 1.70, 95% CI: 1.05–2.74, p = .029), a provider's recommendation (AOR: 13.62, 95% CI: 7.89 to 23.50, p<.001), and comprehension (AOR: 1.08, 95% CI: 1.02 to 1.14, p = .008).

Discussion

In general, the KA women in the study sample had low health literacy in cancer screening. Specifically, familiarity and comprehension subscales were considered particularly challenging with 54% and 36% of the study sample scoring zero on the subscales, respectively. Limited English proficiency was highly relevant to the high prevalence of low health literacy observed among recent immigrants **in the U.S.** (Berger et al., 2017; Jun & Nan, 2018; Sentell & Halpin, 2006). Indeed, despite a high level of education (about 65% having some college+ education) with an average length of stay in the U.S. being 16.5 years, only less than a quarter (23.4%) of the KA sample indicated their English as being fluent. Limited English proficiency noted in the study sample was consistent with national statistics where more than two thirds of the KA population are noted as being monolingual (Shin, 2003). Prior research revealed that even highly educated individuals without any language

barrier are challenged with correctly interpreting numbers and understanding cancer risks and that the challenge becomes even greater for those with limited English proficiency (Fiscella et al., 2002; Jacobson et al., 2016; Lipkus et al., 2001; Sentell et al., 2015; Sentell & Halpin, 2006). The findings suggest that KA women are at high risk for low cancer literacy—**the degree to which individuals have the capacity to obtain, process, and understand health information and services needed to make health decisions across the cancer spectrum including prevention** (Simmons et al., 2017)—which may lead to cervical cancer disparities borne by this predominantly immigrant group (Innos & Horn-Ross, 2003; Lin et al., 2002; Liu et al., 2003).

Less than half (48.8%) of the KA women reported a lifetime Pap test and 25.4% had a triennial Pap test. The triennial screening rate is far below the national recommendation of 93% (Office of Disease Prevention and Health Promotion, 2014). A recent analysis of pooled data from the California Health Interview Survey (Chawla, Breen, Liu, Lee, & Kagawa-Singer, 2015) found that Asian American women consistently had the lowest rates of cervical cancer screening, with 81.2% reporting a Pap test in 2007 and their Pap test rates did not significantly change over time (77.9% in 2001). In contrast, the overall receipt of mammography among Asian American women increased (75.6% in 2001 vs. 81.8% in 2009). Korean and Chinese women represented two Asian subgroups with the lowest rates of Pap test use (78% and 77.5%, respectively, in 2007; Chawla et al., 2015). The results highlight the importance of targeting Asian American women **in the U.S.** including KA women in delivering effective Pap smear promotion programs.

Stepwise logistic regression revealed that familiarity, navigational health literacy, and comprehension were particularly relevant dimensions of health literacy to Pap test screening behaviors in KA women. Specifically, the odds of receiving a lifetime Pap test increased by 20% for each 1-point increase in familiarity (AOR: 1.20, 95% CI: 1.11 to 1.31, $p<.001$) and 10% for each 1-point increase in navigational health literacy (AOR: 1.10, 95% CI: 1.04 to 1.16, $p = .001$) subscale scores, after controlling for covariates. Likewise, the odds of triennial Pap test increased by 8% with every 1-point increase in comprehension subscale scores (AOR: 1.08, 95% CI: 1.02 to 1.14, $p = .008$), after controlling for covariates. It is difficult to explain why different health literacy dimensions were associated with the same behavior—Pap test screening—but in different time frames (lifetime vs. triennial). One possible explanation may be that comprehension (i.e., understanding the meaning of essential medical terminologies used in Pap test screening) might have elicited an immediate benefit on the women's uptake of a recent Pap test even when known covariates of cancer screening (e.g., physician recommendations, insurance) were controlled for. In contrast, one's assessment of her ability to use relevant medical terminologies proficiently (familiarity) and being able to adequately apply relevant medical terminologies throughout the cancer screening navigational trajectory (navigational literacy) were important but insufficient precursors to sustaining cancer screening behaviors because they failed to yield an increase in recent Pap test use. Taken together, the findings suggest that future intervention should address these key dimensions of heath literacy in promoting Pap test screening among recent immigrant women such as KAs. For example, a recent randomized controlled trial (Han et al., 2017) in which a comprehensive health literacy-focused

community health worker intervention was implemented resulted in larger effect sizes than prior community health worker intervention programs using knowledge education with or without navigation assistance (Kim et al., 2016).

Neither reading test (word recognition) nor numeracy were significantly associated with Pap test screening behaviors in the study sample. Prior research seems to support the important role of health literacy—in particular numeracy—in certain chronic care contexts such as diabetes (Bailey et al., 2014; Osborn et al., 2010) and asthma (Apter et al., 2013). A possible explanation for the contrasting finding might be that cancer screening is a relatively simple behavior for which numeracy—though still relevant in adequately interpreting cancer risks and making uptake decisions (Lipkus et al., 2001)—may play a limited role in comparison to other health literacy dimensions. In contrast, both diabetes and asthma require the individual's multistep mathematical skills, such as counting carbohydrates, interpreting blood glucose monitoring, or applying accurate dosing of insulin or bronchodilator (Apter et al., 2013; Shaw, Armin, Torres, Orzech, & Vivian, 2012). Further research using multidimensional health literacy measures such as AHL-C is warranted to better elucidate how different health literacy dimensions relate to salient health behaviors such as cancer screening.

There are several study limitations to note. First, Pap test screening behaviors were self-reported at baseline and these reports may have underestimated or overestimated the true screening rates. We attempted to minimize this potential bias by assuring confidentiality and by using relevant questions (e.g., place where a Pap test was taken or other relevant contexts such as the person, if any, who accompanied, season when the test was taken, or transportation used) to elicit cues to help women remember their past screening behaviors. Second, the data were pulled from a sample in a randomized controlled trial targeting KA women **in the U.S.** whose latest Pap screening was at least two years old at the time of study enrollment; consequently, it is likely that the sample over-represented KA women who were overdue for a Pap test. Similarly, the sample included young and middle-aged KA women with less than 10% of the study sample being 60 years or older. In addition, just slightly more than one third (38%) of the sample had health insurance (as opposed to 74.5% **at the U.S. national level**) (Huang, 2013), thereby limiting the generalizability of the study findings. Last, the analysis data were cross-sectional, prohibiting us from making causal inferences.

Conclusions

Self-assessment of one's ability to use relevant medical terminologies (familiarity) and one's ability to apply relevant medical terminologies throughout the cancer screening navigational trajectory (navigational literacy) were associated with an increased likelihood of KA women's lifetime Pap test screening. On the other hand, understanding of cancer screening-related words was most relevant to triennial Pap test use. Future interventions to increase Pap test screening targeted at KA women should address key dimensions of health literacy such as familiarity, navigation, and comprehension.

References

American Cancer Society. (2018). Cancer prevention and early detection facts and figures. Retrieved 12/11, 2018, from https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-prevention-and-early-detection-facts-and-figures/cancer-prevention-and-early-detection-facts-and-figures-tables-and-figures-2018.pdf.

American Library Association. (2013). Digital literacy, libraries, and public policy: Report of the Office for Information Technology Policy's Digital Literacy Task Force. Retrieved 4/3/2019, from https://districtdispatch.org/wp-content/uploads/2013/01/2012_OITP_digilitreport_1_22_13.pdf.

Apter AJ, Wan F, Reisine S, Bender B, Rand C, Bogen DK, et al. (2013). The association of health literacy with adherence and outcomes in moderate-severe asthma. The Journal of Allergy and Clinical Immunology, 132(2), 321–327. [PubMed: 23591273]

Bailey SC, Brega AG, Crutchfield TM, Elasy T, Herr H, Kaphingst K, et al. (2014). Update on health literacy and diabetes. The Diabetes Educator, 40(5), 581–604. [PubMed: 24947871]

Baker DW (2006). The meaning and the measure of health literacy. Journal of General Internal Medicine, 21(8), 878–883. [PubMed: 16881951]

Batista MJ, Lawrence HP, & Sousa MDLR (2017). Oral health literacy and oral health outcomes in an adult population in brazil. BMC Public Health, 18(1), 60-017-4443-0.

Bennett CL, Ferreira MR, Davis TC, Kaplan J, Weinberger M, Kuzel T, et al. (1998). Relation between literacy, race, and stage of presentation among low-income patients with prostate cancer. Journal of Clinical Oncology : Official Journal of the American Society of Clinical Oncology, 16(9), 3101–3104. [PubMed: 9738581]

Berger S, Huang CC, & Rubin CL (2017). The role of community education in increasing knowledge of breast health and cancer: Findings from the Asian breast cancer project in Boston, Massachusetts. Journal of Cancer Education : The Official Journal of the American Association for Cancer Education, 32(1), 16–23. [PubMed: 26373418]

Chawla N, Breen N, Liu B, Lee R, & Kagawa-Singer M (2015). Asian American women in California: A pooled analysis of predictors for breast and cervical cancer screening. American Journal of Public Health, 105(2), e98–e109.

Davis TC, Arnold C, Berkel HJ, Nandy I, Jackson RH, & Glass J (1996). Knowledge and attitude on screening mammography among low-literate, low-income women. Cancer, 78(9), 1912–1920. [PubMed: 8909311]

Divaris K, Lee JY, Baker AD, & Vann WF Jr. (2011). The relationship of oral health literacy with oral health-related quality of life in a multi-racial sample of low-income female caregivers. Health and Quality of Life Outcomes, 9, 108-7525-9-108.

Fiscella K, Franks P, Doescher MP, & Saver BG (2002). Disparities in health care by race, ethnicity, and language among the insured: Findings from a national sample. Medical Care, 40(1), 52–59. [PubMed: 11748426]

Garbers S, & Chiasson MA (2004). Inadequate functional health literacy in Spanish as a barrier to cervical cancer screening among immigrant Latinas in New York City. Preventing Chronic Disease, 1(4), A07.

Garcia-Retamero R, Andrade A, Sharit J, & Ruiz JG (2015). Is patients' numeracy related to physical and mental health? Medical Decision Making : An International Journal of the Society for Medical Decision Making, 35(4), 501–511. [PubMed: 25943579]

Han HR, Kim J, Kim MT, & Kim KB (2011). Measuring health literacy among immigrants with a phonetic primary language: A case of Korean American women. Journal of Immigrant and Minority Health, 13(2), 253–259. [PubMed: 20585985]

Han HR, Huh B, Kim MT, Kim J, & Nguyen T (2014). Development and validation of the assessment of health literacy in breast and cervical cancer screening. Journal of Health Communication, 19 Suppl 2, 267–284. [PubMed: 25315598]

Han HR, Song Y, Kim M, Hedlin HK, Kim K, Ben Lee H, et al. (2017). Breast and cervical cancer screening literacy among Korean American women: A community health worker-led intervention. American Journal of Public Health, 107(1), 159–165. [PubMed: 27854539]

Huang A (2013). Disparities in health insurance coverage among Asian Americans. Retrieved 12/17, 2018, from http://aapr.hkspublications.org/2013/11/12/disparities-in-health-insurance-coverage-among-asian-americans/

Innos K, & Horn-Ross PL (2003). Recent trends and racial/ethnic differences in the incidence and treatment of ductal carcinoma in situ of the breast in California women. Cancer, 97(4), 1099–1106. [PubMed: 12569612]

Jacobson HE, Hund L, & Soto Mas F (2016). Predictors of English health literacy among U.S. Hispanic immigrants: The importance of language, bilingualism and sociolinguistic environment. Literacy & Numeracy Studies : An International Journal in the Education and Training of Adults, 24(1), 43–64. [PubMed: 27127416]

Jun J, & Nan X (2018). Determinants of cancer screening disparities among Asian Americans: A systematic review of public health surveys. Journal of Cancer Education: The Official Journal of the American Association for Cancer Education, 33(4), 757–768. [PubMed: 28378200]

Juon HS, Choi Y, & Kim MT (2000). Cancer screening behaviors among Korean-American women. Cancer Detection and Prevention, 24(6), 589–601. [PubMed: 11198273]

Kim K, Choi JS, Choi E, Nieman CL, Joo JH, Lin FR, et al. (2016). Effects of community-based health worker interventions to improve chronic disease management and care among vulnerable populations: A systematic review. American Journal of Public Health, 106(4), e3–e28.

Lee JY, Divaris K, Baker AD, Rozier RG, Lee SY, & Vann WF Jr. (2011). Oral health literacy levels among a low-income WIC population. Journal of Public Health Dentistry, 71(2), 152–160. [PubMed: 21774139]

Lee JY, Divaris K, Baker AD, Rozier RG, & Vann WF Jr. (2012). The relationship of oral health literacy and self-efficacy with oral health status and dental neglect. American Journal of Public Health, 102(5), 923–929. [PubMed: 22021320]

Lin SS, Clarke CA, Prehn AW, Glaser SL, West DW, & O'Malley CD (2002). Survival differences among Asian subpopulations in the United States after prostate, colorectal, breast, and cervical carcinomas. Cancer, 94(4), 1175–1182. [PubMed: 11920489]

Lindau ST, Tomori C, Lyons T, Langseth L, Bennett CL, & Garcia P (2002). The association of health literacy with cervical cancer prevention knowledge and health behaviors in a multiethnic cohort of women. American Journal of Obstetrics and Gynecology, 186(5), 938–943. [PubMed: 12015518]

Lindau ST, Tomori C, McCarville MA, & Bennett CL (2001). Improving rates of cervical cancer screening and Pap smear follow-up for low-income women with limited health literacy. Cancer Investigation, 19(3), 316–323. [PubMed: 11338888]

Lipkus IM, Samsa G, & Rimer BK (2001). General performance on a numeracy scale among highly educated samples. Medical Decision Making : An International Journal of the Society for Medical Decision Making, 21(1), 37–44. [PubMed: 11206945]

Liu L, Zhang J, Deapen D, Bernstein L, & Ross RK (2003). Cancer in Los Angeles county: Incidence and mortality by race/ethnicity 1988–2000. Los Angeles, CA: Los Angeles County Cancer Surveillance Program, University of Southern California.

Marrie RA, Salter A, Tyry T, Fox RJ, & Cutter GR (2014). Health literacy association with health behaviors and health care utilization in multiple sclerosis: A cross-sectional study. Interactive Journal of Medical Research, 3(1), e3. [PubMed: 24513479]

Maxwell AE, Bastani R, & Warda US (2000). Demographic predictors of cancer screening among Filipino and Korean immigrants in the United States. American Journal of Preventive Medicine, 18(1), 62–68. [PubMed: 10808984]

Moskowitz JM, Kazinets G, & Tager IB (2003). Breast- and cervical-cancer screening among Korean women–Santa Clara county, California, 1994 and 2002. Morbidity and mortality weekly report, 53, 765–767.

Nutbeam D (2000). Health literacy as a public goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International, 15(3), 259–267.

Office of Disease Prevention and Health Promotion. (2014). Healthy people 2020 topics and objectives: Cancer. Retrieved 12/12, 2018, from https://www.healthypeople.gov/2020/topics-objectives/topic/cancer/objectives.

Osborn CY, Cavanaugh K, Wallston KA, & Rothman RL (2010). Self-efficacy links health literacy and numeracy to glycemic control. Journal of Health Communication, 15 Suppl 2, 146–158. [PubMed: 20845200]

Ponce N, Gatchell M, & Brown ER (2003). Cancer screening rates among Asian ethnic groups . Los Angeles, CA: UCLA Center for Health Policy Research.

Scott TL, Gazmararian JA, Williams MV, & Baker DW (2002). Health literacy and preventive health care use among Medicare enrollees in a managed care organization. Medical Care, 40(5), 395–404. [PubMed: 11961474]

Sentell T, Braun KL, Davis J, & Davis T (2015). Health literacy and meeting breast and cervical cancer screening guidelines among Asians and Whites in California. Springerplus, 4, 432-015-1225-y. eCollection 2015.

Sentell TL, & Halpin HA (2006). Importance of adult literacy in understanding health disparities. Journal of General Internal Medicine, 21(8), 862–866. [PubMed: 16881948]

Shaw SJ, Armin J, Torres CH, Orzech KM, & Vivian J (2012). Chronic disease self-management and health literacy in four ethnic groups. Journal of Health Communication, 17 Suppl 3, 67–81.

Shin HBR (2003). Language use and English-speaking ability: 2000. Retrieved February 23, 2009, from http://www.census.gov/prod/2003pubs/c2kbr-29.pdf.

Siegel RL, Miller KD, & Jemal A (2018). Cancer statistics, 2018. CA: Cancer Journal for Clinicians, 68(1), 7–30.

Simmons RA, Cosgrove SC, Romney MC, Plumb JD, Brawer RO, Gonzalez ET, et al. (2017). Health Literacy: Cancer Prevention Strategies for Early Adults. American Journal of Preventive Medicine, 53(3S1), S73–S77. [PubMed: 28818249]

Sorensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. (2012). Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health, 12, 80-2458-12-80.

Speros C (2005). Health literacy: concept analysis. Journal of Advanced Nursing, 50, 633–640. [PubMed: 15926968]

Swan J, Breen N, Coates RJ, Rimer BK, & Lee NC (2003). Progress in cancer screening practices in the united states: Results from the 2000 national health interview survey. Cancer, 97(6), 1528–1540. [PubMed: 12627518]

U.S. Department of Health and Human Services. (2000). Health literacy definition. Washington, DC: U.S. Department of Health and Human Services.

U.S. Preventive Services Task Force. (2012). Screening for cervical cancer, recommendation statement. Retrieved 12/12, 2018, from http://www.uspreventiveservicestaskforce.org/uspstf/uspscerv.htm.

Williams KP, Templin TN, & Hines RD (2013). Answering the call: A tool that measures functional breast cancer literacy. Journal of Health Communication, 18, 1310–1325. [PubMed: 23905580]

Williams KP, & Templin TN (2013). Bringing the real world to psychometric evaluation of cervical cancer literacy assessments with Black, Latina, and Arab women in real-world settings. Journal of Cancer Education, 28, 738–743. [PubMed: 24072456]

Zarcadoolas C, Pleasant A, Greer DS (2005). Understanding health literacy: an expanded model. Health Promotion International, 20(2), 195–203. [PubMed: 15788526]

Zong J, & Batalova J (2014). Korean immigrants in the United States. Retrieved 12/11, 2018, from http://www.migrationpolicy.org/article/korean-immigrants-united-states.

Table 1

Sample characteristics ($N = 560$)

Characteristics	n (%)	Mean±SD
Age (range = 21–65), years	137 (24.5)	46.0 ± 8.6
<40	205 (36.6)	
40–49	185 (33.0)	
50–59	33 (5.9)	
60+		
Married/Partnered	480 (85.7)	
Years of education (range = 4–24)	363 (64.8)	14.5 ± 2.7
Some college+		
Income comfortability	412 (73.6)	2.9 ± 1.0
Very uncomfortable/neutral	148 (26.4)	
Comfortable/very comfortable		
Years in the US (range = 0.1–62.3)	230 (41.1)	15.4 ± 9.7
<25% of lifetime	330 (58.9)	
25% of lifetime		
English proficiency (range=1–4)	429 (76.6)	2.7 ± 0.9
Not at all/Poor/Fair	131 (23.4)	
Fluent		
Having health insurance	212 (37.9)	
Receiving physician recommendation	88 (15.7)	
Health literacy (range=0–52)		19.9 ± 12.5
Familiarity (range=0–12)		2.1 ± 2.9
Comprehension (range=0–12)		3.2 ± 3.7
Word recognition (range=0–12)		5.4 ± 3.8
Navigational health literacy (range=0–12)		7.1 ± 4.0
Numeracy (range=0–4)		2.2 ± 1.4
Lifetime Pap test use	273 (48.8)	
Triennial Pap test use	142 (25.4)	

Table 2

Stepwise multiple regression analysis to predict Pap test use[+]

Characteristics	Lifetime Pap test use Odds ratio (95% CI)	Triennial Pap test use Odds ratio (95% CI)
Age	1.04 (1.02–1.07)[**]	--
Marital status	--	--
Education	--	--
English proficiency	--	--
Income comfortability	--	1.70 (1.05–2.74)[*]
Residence in the US	0.62 (0.41–0.92)[*]	--
Health insurance	--	--
Provider's recommendation	15.48 (6.47–37.02)[***]	13.62 (7.89–23.50)[***]
Familiarity	1.20 (1.11–1.31)[***]	--
Comprehension	--	1.08 (1.02 to 1.14)[**]
Word recognition	--	--
Navigational health literacy	1.10 (1.04–1.16)[**]	--
Numeracy	--	--
Pseudo R^2 (%)	18.58	19.79

[+]Variables were added if p-value was less than 0.05. Variables were eliminated from the full model if p-value was greater than 0.1. Reference groups were as follows: unmarried (separated/widowed/divorced/never married), low education (high school graduate or less), poor English proficiency (not at all/poor/fair); low income comfortability (very uncomfortable/neutral), shorter residence in the US (<25% of lifetime), uninsured, and no provider recommendation.

[*]$p<.05$,

[**]$p<.01$,

[***]$p<.001$.