Published in final edited form as:

J Community Health. 2016 August ; 41(4): 741–752. doi:10.1007/s10900-015-0148-4.

Healthcare Communication Barriers and Self-Rated Health in Older Chinese American Immigrants

Janice Y. Tsoh, PhD^{1,2}, Tetine Sentell, PhD³, Ginny Gildengorin, PhD⁴, Gem M. Le, PhD^{2,4}, Elaine Chan, BA¹, Lei-Chun Fung, MPH, MSW⁶, Rena J. Pasick, DrPH⁷, Susan Stewart, PhD⁸, Ching Wong, BS^{2,4}, Kent Woo, MSW⁵, Adam Burke, PhD, MPH, LAc⁹, Jun Wang, PhD^{2,10}, Stephen J. McPhee, MD^{2,4}, and Tung T. Nguyen, MD^{2,4}

¹Department of Psychiatry, University of California San Francisco, CA

²Asian American Research Center for Health (ARCH), San Francisco, CA

³Office of Public Health Studies, University of Hawaii at Manoa, HI

⁴Department of Medicine, University of California, San Francisco, CA

⁵NICOS Chinese Health Coalition, San Francisco, CA

⁶Health Education Department, Chinatown Public Health Center, San Francisco, CA

⁷Comprehensive Cancer Center, University of California, San Francisco, CA

⁸Division of Biostatistics, University of California, Davis, CA

⁹Health Education/Holistic Health Studies, San Francisco State University, San Francisco, CA

¹⁰ Academy of Chinese Culture and Health Sciences, Oakland, CA

Abstract

Older Chinese immigrants are a growing population in the United States who experience multiple healthcare communication barriers such as limited English proficiency and low health literacy. Each of these obstacles has been associated with poor health outcomes but less is known about their effects in combination. This study examined the association between healthcare communication barriers and self-rated health among older Chinese immigrants. Cross-sectional survey data were obtained from 705 Chinese American immigrants ages 50-75 living in San Francisco, California. Communication barriers examined included spoken English proficiency, medical interpreter needs, and health literacy in written health information. The study sample (81% females, mean age = 62) included 67% who spoke English poorly or not at all, 34% who reported needing a medical interpreter, and 37% who reported “often” or “always” needing assistance to read health information. Two-thirds (66%) reported poor self-rated health; many reported having access to racial-concordant (74%) and language-concordant (86%) healthcare services. Both poor spoken English proficiency and low health literacy were associated with poor

Corresponding Author: Janice Tsoh, PhD, Department of Psychiatry, University of California, San Francisco, 401 Parnassus Ave (TRC-0984), San Francisco, CA 94143. janice.tsoh@ucsf.edu.

COMPLIANCE WITH ETHICAL STANDARDS: The Institutional Review Boards of the University of California San Francisco and San Francisco State University approved all study procedures.

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

self-rated health, independent of other significant correlates (unemployment, chronic health conditions, and having a primary doctor who was ethnic Chinese). Results revealed that spoken English proficiency and print health literacy are independent communication barriers that directly associated with the health status among elderly Chinese American immigrants. Access to racial- or language-concordant health care services did not appear to resolve these barriers. These findings underscore the importance of addressing both spoken and written healthcare communication needs among older Chinese American immigrants.

Keywords

communication barriers; health literacy; limited English proficiency; health status; immigrant health

INTRODUCTION

Self-rated health consistently predicts mortality (Idler & Benyamini, 1997; Jylha, 2009). Ethnic minority groups in the U.S., Asian Americans, Blacks, and Latinos, reportedly have worse self-rated health than the general population (Liao et al., 2011; Remler et al., 2011). From 2000 to 2010, Asian Americans were the fastest-growing racial/ethnic group in the United States (U.S.) (Hoeffel, Rastogi, Kim, & Shahid, 2012). In 2014, there were more than 20 million Asian Americans living in the U.S., constituting 6.2% of the total population (U.S. Bureau of the Census, 2015). Most Asian Americans (74%) are foreign born, and half (48%) have limited English proficiency (LEP) (Pew Social & Demographic Trends, 2012), defined as speaking English less than “very well” (Agency for Healthcare Research and Quality, 2010). Among older Asian Americans, in addition to the known determinants of poor self-rated health such as advancing age, low levels of education, low income, and multiple chronic health conditions (Todorova et al., 2013; Zack, 2013), LEP is independently associated with disparities in both healthcare access and health status (Kim et al., 2011; Ponce, Hays, & Cunningham, 2006).

The largest Asian American sub-group is the Chinese (Hoeffel et al., 2012), 69% of whom are immigrants (U.S. Bureau of the Census, 2014). Most Chinese Americans (81%) speak Chinese at home (predominantly Cantonese and Mandarin). It is estimated that 46% of Chinese Americans have LEP (U.S. Bureau of the Census, 2014). A qualitative study of older Chinese American immigrants with diabetes reported that both LEP and age-related limitations (such as vision and hearing loss, decline in attention span and memory) were common barriers that limited access to needed health information and effective communication with healthcare providers (Leung, Bo, Hsiao, Wang, & Chi, 2014).

Individuals with LEP were often reported to have low health literacy (Sentell & Braun, 2012). Health literacy, as defined by the Institute of Medicine, is “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Institute of Medicine, 2004). Health literacy represents a set of capacities that an individual may lose with aging and declining cognitive abilities (Baker, 2006). A study including 488 older Chinese Americans aged 50 to 75 from the 2007 California Health Interview Survey (CHIS) found that those with LEP had

a much greater rate of low health literacy than those without LEP and that the combination of LEP and low health literacy was associated with non-adherence to both colorectal and breast cancer screening (Sentell, Tsoh, Davis, Davis, & Braun, 2015). These findings suggest that older Chinese immigrants are not only vulnerable to LEP and low health literacy, but may also be more vulnerable to poor health because of these communication barriers, particularly when they are experienced in combination.

Research examining the relationship between multiple health communication barriers such as LEP and low health literacy with health status among older Chinese adults is limited and results are mixed. Two separate studies using data from the 2007 CHIS with >1,000 Chinese Americans in California found that LEP and low health literacy, both separately (Lee, Rhee, Kim, & Ahluwalia, 2015) and combined (Sentell & Braun, 2012), were associated with poor health, even when adjusted for age and other covariates. However, another bivariate comparison study in an extremely LEP (95% monolingual) sample of 3,159 Chinese Americans aged 60 and older in Chicago found no association between health literacy and self-rated health (Simon, Li, & Dong, 2014). Findings have clearly shown that LEP and low health literacy are often linked, but they should not be conflated as interchangeable constructs. LEP patients with access to language-concordant healthcare services or in-language health materials may not have low health literacy in their native language. Patients with low health literacy, however, may have trouble understanding health education materials even when written in their native language. Taken together, unclear evidence persists as to what extent these communication barriers are associated with self-rated health status among Chinese Americans, which is vital in the design of effective healthcare communications strategies.

The present study examined multiple communication barriers, including limited spoken English proficiency, need for a medical interpreter, and low print health literacy in understanding written health materials in a community sample of older Chinese American immigrants in San Francisco, California. This study aimed to: (1) to determine the association between healthcare communication barriers specifically related to English proficiency and print health literacy, and self-rated health in older Chinese immigrants with consideration of socioeconomic characteristics, acculturation, healthcare access and health conditions; (2) to determine whether the associations between healthcare communication barriers and self-rated health were moderated by having access to racial- and language-concordant healthcare services.

METHODS

This study used cross-sectional data collected at pre-intervention from participants enrolled in a randomized controlled trial (RCT) testing the effectiveness of lay health worker (LHW) education (intervention) versus a brochure (control) on promoting colorectal cancer (CRC) screening by older Chinese Americans. The Institutional Review Boards of the University of California San Francisco and the San Francisco State University approved all study procedures.

Sample

The study sample was drawn from 725 Chinese Americans who met the eligibility criteria for participating in the RCT, which included: 1) aged 50-75 years, 2) self-identified as Chinese or Chinese American, 3) spoke English, Cantonese, and/or Mandarin, 4) lived in San Francisco, California and intended to stay for at least 6 months to complete the study intervention and assessment activities, 5) had no personal history of CRC, and 6) did not live in the same household as other participants. Research staff trained a total of 58 LHWs in participant recruitment. On average, each LHW recruited 12 participants ($SD = 1.9$; range: 4 to 15) from his or her own social network with the use of word-of-mouth and flyers. Because the present study focused on Chinese immigrants, and specifically their healthcare communication barriers in relation to self-rated health, those who were born in the U.S. ($n=4$), or who had missing responses to items regarding English proficiency ($n=2$) or written health literacy ($n=14$), were excluded. The final analytic sample thus included 705 participants.

Data Collection

Participants completed a self-administered survey in Chinese before the RCT procedures were implemented. Each participant received \$20 USD for completing the pre-intervention survey. Data were collected in 4 waves, from 2010 to 2013.

Conceptual Framework

We utilized the Behavioral Model of Health Services Use and Health Outcomes (Andersen, 1995), a commonly used model to understand disparities in healthcare service access and outcomes (Derose, Gresenz, & Ringel, 2011) to conceptualize the key domains of the determinants of self-rated health for inclusion in the examination of the association between healthcare communication barriers and self-rated health. The determinants of self-rated health included Predisposing Factors (sociodemographics and acculturation), Enabling Resources for healthcare access (income, health insurance, and regular source of care), and Perceived Health Needs (self-reported chronic health conditions).

Measures

Healthcare communication barriers assessed included 1) self-rated spoken English proficiency (“not at all,” “poorly,” “so-so,” “well,” or “fluently”); 2) ever having had the need for medical interpretation at their doctor's office (yes versus no); and 3) health literacy. The Single Item Literacy Screener (SILS) (Morris, MacLean, Chew, & Littenberg, 2006), which has been validated against standard literacy measures such as the Rapid Estimate of Adult Literacy in Medicine and the Test of Functional Health Literacy in Adults (Morris et al., 2006; Powers, Trinh, & Bosworth, 2010), was used to assess health literacy as a proxy of written health communication barrier experienced by participants. The SILS asked, “How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?” The 5 response options were: “always,” “often,” “sometimes,” “rarely,” and “never.” Participants were grouped into 3 health literacy levels: “low” (SILS responses, “often” or “always”); “marginal” (SILS response, “sometimes”); and “adequate” (SILS responses, “never” or “rarely”).

The primary outcome was *self-rated health*, as assessed by a well-established single item (Idler & Benyamini, 1997; Jylha, 2009), which has been applied to Asian American and other populations to assess perceived general health status (Kim et al., 2011; Ponce et al., 2006). The item asked, “In general, would you say your health is...?” -- with 5 response options: “excellent”; “very good”; “good”; “fair”; and “poor.” Consistent with the literature, “poor self-rated health” was defined by participants’ rating of their health as “fair” or “poor”.

Covariates included the proposed determinants of self-rated health according to the conceptual model described earlier.

Predisposing Factors included sociodemographic and acculturation characteristics. These were comprised of gender, age, marital status (married versus other), highest education completed (less than high school graduation versus high school graduation or beyond), and employment status (employed, retired, or not employed). Acculturation characteristics assessed were place of birth (Mainland China versus other countries outside of the U.S.), language spoken at home (Cantonese versus other), and years lived in the U.S. (< 10 years versus ≥ 10 years).

Enabling resources included annual household income (< \$20,000, \$20,000 or not reported), health insurance (yes versus no), had a primary doctor or a regular place to go for Western healthcare (yes versus no).

Perceived health needs were assessed by asking participants if they had ever been told by a doctor that they had heart disease, stroke, diabetes, high blood pressure, or high cholesterol (hyperlipidemia). The number of chronic conditions reported was further coded into 3 categories: “none,” “1,” or “2 or more.”

To determine whether healthcare communication barriers were associated with self-rated health in the context of having access to racial- and language-concordant healthcare services, participants were asked whether their primary doctor was ethnic Chinese (yes versus no) as a proxy indicator of patient-providers racial concordance, and whether the language usually spoken by their health providers (Chinese dialects, English or not reported) as an indicator of accessibility to language-concordant services.

Data Analysis

Descriptive statistics were computed for all of the measures, including means, standard deviations and percentages. Because participants were recruited by LHWs, linear mixed effects models (GLMM) were used to account for clustering of participant responses by LHW in bivariate and multivariable analyses. In these models, the self-rated health response categories were collapsed into “fair or poor” versus “excellent, very good or good” and analyzed as a binary outcome with a logit link. The hypotheses were evaluated using GLMM to determine whether or not healthcare communication barriers were associated with self-rated health. We conducted bivariate analyses to identify correlates that attained p-values < 0.25 in their association with poor self-rated health for inclusion in multivariable analyses (Hosmer & Lemeshow, 1989). Based on documented associations reported with self-rated

health in previous studies on Chinese elderly or immigrant populations, the following *a priori* variables were included as covariates: gender (Teh, Tey, & Ng, 2014), marital status (Krochalk, Li, & Chi, 2008), and years lived in the U.S. (Liao et al., 2011). Collinearity measures, including variance inflation factors and the condition indices, were examined among the selected covariates. Statistical significance was assessed at the 0.05 level (2-sided). Statistical analyses were performed using SAS version 9.3 (SAS Institute, 2012; Cary, N.C.). We conducted a series of three models with selected covariates added in each step.

Model 1 included only the set of healthcare communication barrier variables (English proficiency, need of medical interpreter, and health literacy). Because very few <4% of the study sample reported speaking English well or fluently, we collapse the response categories of spoken English proficient to “not at all or poorly” versus “so-so, well, or fluent.”

Model 2 added predisposing factors, enabling resources and perceived health needs to examine whether healthcare communication barriers have significant associations with self-rated health with consideration of other determinants of self-rated health. Annual income had 19% missing responses, so “not reported” was included as a category for income in the final model. All other selected covariates had < 2% missing response. Regular place of healthcare or having a primary doctor and the number of chronic health conditions were not included due to collinearity with health insurance, and specific chronic health conditions, respectively.

Model 3 added two variables on accessibility to racial- and language-concordant healthcare services to examine whether the associations between healthcare communication barriers were moderated by access to racial- and language-concordant healthcare service.

RESULTS

Sample characteristics (Table 1)

The sample (N=705) included 81% females with a mean age of 62.2 years (SD=6.9). All were immigrants with a mean length of U.S. residency of 17.1 years (SD=11.5), and 71% had educational attainment of less than high school graduation. Over half (60.6%) reported having at least 1 chronic health condition, the most frequently reported were hypertension (36.5%) and hyperlipidemia (35.3%). Most participants (>93%) had health insurance or a regular place of care; among those who had access to a regular care of healthcare, 60.6% received care from federally qualified community health centers or public health systems. In addition, 74.2% reported their primary care physician was ethnic Chinese and 85.7% reported that their healthcare providers usually spoke Chinese with them.

Healthcare communication barriers

Most participants (96%) had LEP (speaking English less than “well”), including 67% speaking English “poorly” or “not at all.” One-third reported ever needing a medical interpreter. Less than one-third (29.1%) reported they “rarely” or “never” needed assistance to read health information from their doctor or pharmacy (i.e., had adequate health literacy). A majority (70.9%) reported at least “sometimes” needing assistance to read health

information from their doctor or pharmacy, which we classified as having either low (36.3%) or marginal (34.6%) levels of health literacy.

Self-rated health

About two-thirds (65.7%, 95% CI: 62.0–69.2) had poor self-rated health. Table 2 presents self-rated health by sample characteristics. In bivariate analysis (Table 2), poor self-rated health was more prevalent (> 70%) among those who spoke no English/spoke English poorly, and among those who had low health literacy ($p < 0.05$). Percentages of poor self-rated health were also high among participants who were age ≥ 65 years, born in mainland China, unemployed, with low income, with any one self-reported chronic health condition, or among those who reported primary doctor was ethnic Chinese (Table 2).

Associations between healthcare communication barriers and self-rated health

Table 3 shows the adjusted odds ratios of the selected covariates for a series of three models with poor self-rated health as the outcome variable. Model 1 only included the 3 healthcare communication barrier variables: spoken English proficiency, need for a medical interpreter, and health literacy for written health information. Model 2 included the 3 healthcare communication barriers plus predisposing factors (sociodemographic and acculturation), enabling resources for healthcare access (insurance and income), and perceived health needs (chronic health conditions). Model 3 included all the variables in Model 2 plus access to healthcare services that are racial-concordant (having an ethnic Chinese primary care physician) or language-concordant (usual spoken language by healthcare providers was Chinese). Both speaking English “poorly” or ‘not at all,’ and “always or often” needing assistance to read health information (low health literacy) were significantly associated with poor self-rated health in all 3 models. The need for a medical interpreter was not associated with self-rated health after adjusting for English proficiency or health literacy. The associations between healthcare communication barriers (spoken English proficiency and health literacy) and poor self-rated health were independent of other significant correlates, which included being unemployed, having any 1 chronic health condition (diabetes, heart disease or stroke, hypertension or hyperlipidemia), and having an ethnic-Chinese primary care physician (Table 3). The interaction between English proficiency and health literacy was not significant ($p = 0.50$; not shown in the table). The associations between English proficiency, health literacy and self-rated health were not moderated by access to racial- or language-concordant healthcare services.

DISCUSSION

Poor self-rated health was prevalent (66%) in this study sample of predominantly LEP older Chinese immigrants in San Francisco, California, which was much higher than that reported by the general population of older U.S. adults (25%) in the 2010 Behavioral Risk Factor Surveillance System Survey (Zack, 2013). This study found a significant positive association between healthcare communication barriers and poor self-rated health among older Chinese American immigrants. Specifically, poor spoken English proficiency (speaking English poorly or not at all) and low print health literacy (“always” or “often” needing assistance to read health information) were distinct communication barriers, with each having an

independent association with poor self-rated health, even after accounting for individuals' predisposing factors (socioeconomics or acculturation), enabling resources for healthcare access, and perceived health needs (chronic health conditions). Importantly, the associations between these healthcare communication barriers remained consistent after accounting for access to healthcare services that were racial- or language-concordant.

Population-based research on the topic of poor self-rated health in older LEP communities remains limited. One study utilizing data from the National Latino and Asian American Study found native-language dominance and older age were both associated with poor health among some Asian and Latino immigrant groups (Kimbrow, Gorman, & Schachter, 2012). A high prevalence of poor self-rated health (51%) was also reported in a study of 867 Vietnamese Americans aged 50 and 75 who were predominantly (95%) LEP (Nguyen, McPhee, Stewart, & Doan, 2008). These findings, including ours suggest that poor self-rated health is more prevalent among older adults with LEP than in the general population of older adults. While prior research in Latina and Asian elderly has documented that individuals with LEP were more likely to report poor health status than those with English proficiency (Kim et al., 2011; Kimbro et al., 2012), this is among the first study to show that limited spoken English proficiency was independently associated with poor health even after accounting for other individual characteristics and health conditions, including having access to healthcare services provided in Chinese language. Given that poor self-rated health is a strong predictor of higher mortality across languages, ethnicities, and geographic regions, including among elderly Chinese (Ho, 1991; Leung, Tang, & Lue, 1997), healthcare providers who work with older Chinese immigrants with LEP should also be aware of the high prevalence of poor self-rated health in this population and its implications for their clinical practice.

The high rate of inadequate health literacy (71% of the study sample reported needing assistance to read written health information at least "sometimes") was also unexpected, given that a majority of the respondents indicated that their primary doctor was Chinese (74%) and that the usual language spoken with their healthcare providers was Chinese (86%). Consistent with suggestions from other studies, simply providing LEP patients with language concordant or medical interpreter services may not completely address patients' healthcare communication needs (Green et al., 2005; Lor, Xiong, Schwei, Bowers, & Jacobs, 2015). Thus, our findings suggest that providing ethnic- and language-concordant healthcare alone be necessary, but not sufficient to address the health communication barriers experienced by the majority of older Chinese immigrants with low health literacy. Furthermore, the significant association found between self-rated health and health literacy suggests that increasing individuals' capacity to understand written health information or ensuring that health education materials are comprehensible for individuals with low health literacy may improve self-rated health status, potentially lowering morbidity and mortality.

For clinicians, the message is clear: recognizing and addressing the healthcare communication barriers of these patients is essential. Clinicians, health educators, and advocates should fully engage Chinese immigrants in partnership to develop and implement culturally appropriate programs to address both verbal and written communication needs in healthcare settings. One example is the use of lay health workers or community health

workers. Training community members who share the same culture and language background as the targeted patient population to deliver carefully designed health messages or information has been shown to effectively promote both chronic disease management and cancer screening in LEP minority populations (Nguyen, Stewart, Nguyen, Bui-Tong, & McPhee, 2015; Viswanathan et al., 2010; Viswanathan et al., 2009), including among older Chinese immigrants (Nguyen et al., 2010). Another promising strategy to address low health literacy among older Chinese immigrants is the use of digital technologies to deliver culturally and linguistically tailored multi-media health information, helping to reduce the barrier presented by low print health literacy (Jacobs, Lou, Ownby, & Caballero, 2014). Future longitudinal studies can explore the relationship between healthcare communication barriers and self-rated health to see if increasing one's verbal communication capability in the healthcare settings and/or increasing individuals' capacity to understand written health information or ensuring that health education materials are comprehensible for individuals with low health literacy may improve self-rated health status, potentially lowering morbidity and mortality. Regardless of that outcome, recognizing and addressing the healthcare communication barriers, both verbal and written communication needs of older Asian immigrants in clinical practice is important.

Limitations

One limitation of the present study is that the survey data were based on self-report, which could be subject to recall and response biases. This study utilized cross-sectional data, which does not allow inference of causality between self-rated health status and healthcare communication barriers due to limited spoken English literacy and/or low health literacy. The findings may not be generalizable to older Chinese immigrants residing outside of San Francisco or to other minority groups besides Chinese. Because of a long history of Chinese immigration to San Francisco where currently over 21% of the population is Chinese (U.S. Bureau of the Census, 2014), both racial- and language-concordant healthcare services are likely more available than elsewhere in the U.S. Nonetheless, a sizeable proportion of the study sample reported both limited spoken English proficiency and low health literacy, specifically in the domain of difficulty in reading or understanding written health information. The assessment of health literacy in this study using the Single Health Literacy Screener only asked how often one needed assistance to read health information without specifying the language of the print health information that respondents had received. Nonetheless, the Single Health Literacy Screener provided a proxy measure to indicate how often one has experienced written healthcare communication barriers.

CONCLUSIONS

This study revealed that poor self-rated health was highly prevalent among older Chinese American immigrants with limited English proficiency and many also had also low health literacy (specifically in terms of printed health information). Limited proficiency in spoken English and low health literacy in written health information, were distinct healthcare communication barriers and each was independently associated with poor self-rated health even after adjusting for individual sociodemographic differences, acculturation or health conditions, or access to racial- or language-concordant healthcare services. Importantly,

these findings revealed that healthcare communication barriers due to limited English proficiency and low health literacy could not be completely resolved by providing access to racial- or language-concordant services. These findings underscore the importance of designing and delivering healthcare services and materials for older immigrants that are not only linguistically appropriate, but also comprehensible for those with low health literacy. Additional longitudinal studies are needed to understand if increasing health literacy through culturally appropriate interventions can improve health status specifically among those who have limited English proficiency.

Research Support and Acknowledgment

The authors wish to express their gratitude to Corina Liew, Christina Nip, Ying Wang, and Hy Lam; the Sức Khỏe Là Vàng! — UCSF Vietnamese Community Health Promotion Project; and the Asian American Network for Cancer Awareness, Research and Training-San Francisco (SF-ANNCART) for their valuable contributions in data collection and study implementation. This research was supported by the National Cancer Institute (5R01CA138778, PI: Nguyen, T). Additional support was provided by the National Cancer Institute's Center to Reduce Cancer Health Disparities through grant 1U54153499 to the Asian American Network for Cancer Awareness, Research, and Training. The content is solely the responsibility of the authors and does not reflect the official views of the funders.

REFERENCES

- Agency for Healthcare Research and Quality. Chapter 4: Defining Language Need and Categories for Collection Race, Ethnicity, and Language Data: Standardization for Health Care (Publication # 10-0058-EF ed.). Agency for Healthcare Research and Quality; Rockville, MD: 2010. Retrieved from <http://www.ahrq.gov/research/findings/final-reports/iomracereport/reldata4a.html>
- Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* 1995; 36(1):1–10. [PubMed: 7738325]
- Baker DW. The meaning and the measure of health literacy. *J Gen Intern Med.* 2006; 21(8):878–883. doi: 10.1111/j.1525-1497.2006.00540.x. [PubMed: 16881951]
- Deroose KP, Gresenz CR, Ringel JS. Understanding disparities in health care access--and reducing them--through a focus on public health. *Health Aff (Millwood).* 2011; 30(10):1844–1851. doi: 10.1377/hlthaff.2011.0644. [PubMed: 21976325]
- Green AR, Ngo-Metzger Q, Legedza AT, Massagli MP, Phillips RS, Iezzoni LI. Interpreter services, language concordance, and health care quality. Experiences of Asian Americans with limited English proficiency. *J Gen Intern Med.* 2005; 20(11):1050–1056. doi: 10.1111/j.1525-1497.2005.0223.x. [PubMed: 16307633]
- Ho SC. Health and social predictors of mortality in an elderly Chinese cohort. *Am J Epidemiol.* 1991; 133(9):907–921. [PubMed: 2028980]
- Hoefel, EM.; Rastogi, S.; Kim, MO.; Shahid, H. The Asian Population: 2010 E. a. S. A. U.S. Department of Commerce; 2012. 2010. Census Briefs Retrieved from <http://www.census.gov/prod/cen2010/briefs/c2010br-11.pdf>
- Hosmer, DW.; Lemeshow, S. Applied Logistic Regression. John Wiley & Sons; New York: 1989.
- Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav.* 1997; 38(1):21–37. [PubMed: 9097506]
- Institute of Medicine. Health Literacy: A Prescription to End Confusion. National Academics Press; Washington, DC: 2004.
- Jacobs RJ, Lou JQ, Ownby RL, Caballero J. A systematic review of eHealth interventions to improve health literacy. *Health Informatics J.* 2014 [Epub ahead of print]. doi: 10.1177/1460458214534092.
- Jylha M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Soc Sci Med.* 2009; 69(3):307–316. doi: 10.1016/j.socscimed.2009.05.013. [PubMed: 19520474]

- Kim G, Worley CB, Allen RS, Vinson L, Crowther MR, Parmelee P, Chiriboga DA. Vulnerability of older Latino and Asian immigrants with limited English proficiency. *J Am Geriatr Soc.* 2011; 59(7):1246–1252. doi: 10.1111/j.1532-5415.2011.03483.x. [PubMed: 21718269]
- Kimbro RT, Gorman BK, Schachter A. Acculturation and self-rated health among Latino and Asian immigrants to the United States. *Soc Probl.* 2012; 59(3):341–363.
- Krochalk PC, Li Y, Chi I. Widowhood and self-rated health among Chinese elders: the effect of economic condition. *Australas J Ageing.* 2008; 27(1):26–32. doi: 10.1111/j.1741-6612.2007.00269.x. [PubMed: 18713212]
- Lee HY, Rhee TG, Kim NK, Ahluwalia JS. Health literacy as a social determinant of health in Asian American immigrants: findings from a population-based survey in California. *J Gen Intern Med.* 2015; 30(8):1118–1124. doi: 10.1007/s11606-015-3217-6. [PubMed: 25715993]
- Leung AY, Bo A, Hsiao HY, Wang SS, Chi I. Health literacy issues in the care of Chinese American immigrants with diabetes: a qualitative study. *BMJ Open.* 2014; 4(11):e005294. doi: 10.1136/bmjopen-2014-005294.
- Leung KK, Tang LY, Lue BH. Self-rated health and mortality in Chinese institutional elderly persons. *J Clin Epidemiol.* 1997; 50(10):1107–1116. [PubMed: 9368518]
- Liao Y, Bang D, Cosgrove S, Dulin R, Harris Z, Taylor A, White S, Yatabe G, Liburd L, Giles W. Surveillance of health status in minority communities - Racial and Ethnic Approaches to Community Health Across the U.S. (REACH U.S.) Risk Factor Survey, United States, 2009. *MMWR Surveill Summ.* 2011; 60(6):1–44. [PubMed: 21597458]
- Lor M, Xiong P, Schwei RJ, Bowers BJ, Jacobs EA. Limited English proficient Hmong- and Spanish-speaking patients' perceptions of the quality of interpreter services. *Int J Nurs Stud.* 2015 doi: 10.1016/j.ijnurstu.2015.03.019.
- Morris NS, MacLean CD, Chew LD, Littenberg B. The Single Item Literacy Screener: evaluation of a brief instrument to identify limited reading ability. *BMC Fam Pract.* 2006; 7:21. doi: 10.1186/1471-2296-7-21. [PubMed: 16563164]
- Nguyen BH, McPhee SJ, Stewart SL, Doan HT. Colorectal cancer screening in Vietnamese Americans. *J Cancer Educ.* 2008; 23(1):37–45. doi: 10.1080/08858190701849395. [PubMed: 18444045]
- Nguyen BH, Stewart SL, Nguyen TT, Bui-Tong N, McPhee SJ. Effectiveness of Lay Health Worker Outreach in Reducing Disparities in Colorectal Cancer Screening in Vietnamese Americans. *Am J Public Health.* 2015; 105(10):2083–2089. doi: 10.2105/AJPH.2015.302713. [PubMed: 26270306]
- Nguyen TT, Love MB, Liang C, Fung LC, Nguyen T, Wong C, Gildengorin G, Woo K. A pilot study of lay health worker outreach and colorectal cancer screening among Chinese Americans. *J Cancer Educ.* 2010; 25(3):405–412. doi: 10.1007/s13187-010-0064-3. [PubMed: 20204570]
- Pew Social & Demographic Trends. The Rise of Asian Americans. 2012. Retrieved from <http://www.pewsocialtrends.org/files/2012/06/SDT-The-Rise-of-Asian-Americans-Full-Report.pdf>
- Ponce NA, Hays RD, Cunningham WE. Linguistic disparities in health care access and health status among older adults. *J Gen Intern Med.* 2006; 21(7):786–791. doi: 10.1111/j.1525-1497.2006.00491.x. [PubMed: 16808783]
- Powers BJ, Trinh JV, Bosworth HB. Can this patient read and understand written health information? *JAMA.* 2010; 304(1):76–84. doi: 10.1001/jama.2010.896. [PubMed: 20606152]
- Remler DK, Teresi JA, Weinstock RS, Ramirez M, Eimicke JP, Silver S, Shea S. Health care utilization and self-care behaviors of Medicare beneficiaries with diabetes: comparison of national and ethnically diverse underserved populations. *Popul Health Manag.* 2011; 14(1):11–20. doi: 10.1089/pop.2010.0003. [PubMed: 21241171]
- Sentell T, Braun KL. Low health literacy, limited English proficiency, and health status in Asians, Latinos, and other racial/ethnic groups in California. *J Health Commun.* 2012; 17(Suppl 3):82–99. doi: 10.1080/10810730.2012.712621. [PubMed: 23030563]
- Sentell TL, Tsoh JY, Davis T, Davis J, Braun KL. Low health literacy and cancer screening among Chinese Americans in California: a cross-sectional analysis. *BMJ Open.* 2015; 5(1):e006104. doi: 10.1136/bmjopen-2014-006104.
- Simon MA, Li Y, Dong X. Levels of health literacy in a community-dwelling population of Chinese older adults. *J Gerontol A Biol Sci Med Sci.* 2014; 69(Suppl 2):S54–60. doi: 10.1093/gerona/glu179. [PubMed: 25378449]

- Teh JK, Tey NP, Ng ST. Ethnic and gender differentials in non-communicable diseases and self-rated health in Malaysia. PLoS ONE. 2014; 9(3):e91328. doi: 10.1371/journal.pone.0091328. [PubMed: 24603609]
- Todorova IL, Tucker KL, Jimenez MP, Lincoln AK, Arevalo S, Falcon LM. Determinants of self-rated health and the role of acculturation: implications for health inequalities. Ethn Health. 2013; 18(6): 563–585. doi: 10.1080/13557858.2013.771147. [PubMed: 23425383]
- U.S. Bureau of the Census. 2011–2013 3-Year American Community Survey. 2014. Retrieved from http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_3YR_S0201&prodType=table
- U.S. Bureau of the Census. Annual Estimates of the Resident Population by Sex, Race Alone or in Combination, and Hispanic Origin for the United States, States, and Counties: April 1, 2010 to July 1, 2014. 2015. Retrieved from <http://www.census.gov/popest/data/index.html>
- Viswanathan M, Kraschnewski JL, Nishikawa B, Morgan LC, Honeycutt AA, Thieda P, Lohr KN, Jonas DE. Outcomes and costs of community health worker interventions: a systematic review. Med Care. 2010; 48(9):792–808. doi: 10.1097/MLR.0b013e3181e35b51. [PubMed: 20706166]
- Viswanathan M, Kraschnewski J, Nishikawa B, Morgan LC, Thieda P, Honeycutt A, Lohr KN, Jonas D. Outcomes of community health worker interventions. Evid Rep Technol Assess (Full Rep). 2009; (181):1–144. A141–142, B141–114. passim. [PubMed: 20804230]
- Zack MM. Health-related quality of life - United States, 2006 and 2010. MMWR Surveill Summ. 2013; 62(Suppl 3):105–111.

Table 1**Sample Characteristics (N=705)**

	n (%)^I
<u>Self-rated health</u>	
Poor	53 (7.5)
Fair	410 (58.2)
Good	190 (27.0)
Very Good	39 (5.5)
Excellent	13 (1.8)
<u>Health Communication Barriers</u>	
Self-rated spoken English proficiency	
Not at all/ poorly	473 (67.1)
So-so	205 (29.1)
Well/ fluent like a native English speaker	27 (3.8)
Ever needed a medical interpreter	244 (34.6)
Health literacy level ³	
Low	256 (36.3)
Marginal	244 (34.6)
Adequate	205 (29.1)
<u>Sociodemographics and Acculturation</u>	
Female	572 (81.1)
Age ≥ 65 years	266 (37.7)
Married or living with partner	520 (73.8)
Education in the U.S. or elsewhere: below high school graduation	501 (71.1)
Employment	
Not employed	268 (38.0)
Retired	245 (34.8)
Employed	192 (27.2)
Born in Mainland China	596 (84.5)
Spoke Cantonese at home	649 (92.1)
Years lived in the U.S.: < 10	213 (30.8)
<u>Enabling Resources for Healthcare Access</u>	
Annual household income	
< \$20,000	418 (59.3)
\$20,000	155 (22.0)
Not reported	132 (18.7)
Had health insurance	657 (93.2)
Had regular clinic or primary doctor	659 (93.5)
<u>Perceived Health Needs</u>	

	n (%)¹
Number of self-reported chronic health conditions	
None	278 (39.4)
1 condition	262 (37.2)
2 or more conditions	165 (23.4)
Specific chronic health conditions reported	
Diabetes	109 (15.4)
Heart Disease or Stroke	42 (6.0)
Hyperlipidemia	249 (35.3)
Hypertension	257 (36.5)
<u>Access to Racial/Ethnic- or Language-Concordant Healthcare Services</u>	
Primary doctor was Chinese	523 (74.2)
Language usually spoken by healthcare provider ³	
Chinese (Cantonese, Mandarin, other dialects)	570 (85.7)
English	95 (14.3)

Notes:

²Health literacy level classifications were based on participants' report of how often they needed assistance to read written materials from doctor or pharmacy: low health literacy = "always" or "often" needed assistance; marginal health literacy = "sometimes" needed assistance; adequate health literacy = "rarely" or "never" needed assistance.

¹Percentages were computed based on non-missing responses, except for household income where 19% of the sample had missing data for this variable.

³The percentages of the language usually spoken by healthcare provider variable were based on 665 non-missing responses. There were 40 participants who did not provide a response, which included 31 participants who had no regular clinic or primary doctor, and 9 others who had a primary doctor but did not indicate the language spoken.

Table 2

Self-Rated Health by Individual Characteristics, Healthcare Utilization, and Healthcare System or Provider Factors (N=705)

	Self-Rated Health		p-value ¹
	Poor/Fair n (%)	Excellent/Very Good/Good n (%)	
<u>Healthcare Communication Barriers</u>			
Self-rated spoken English proficiency			<0.001
Not at all/ poorly	340 (71.9)	133 (28.1)	
So-so	112 (54.6)	93 (45.4)	
Well/ fluent like a native English speaker	11 (40.7)	16 (59.3)	
Ever needed a medical interpreter			0.58
Yes	164 (67.2)	80 (32.8)	
No	299 (64.9)	162 (35.1)	
Health literacy level ²			0.03
Low	186 (72.7)	70 (27.3)	
Marginal	158 (64.8)	86 (35.2)	
Adequate	119 (58.0)	86 (41.9)	
<u>Predisposing Factors</u>			
Gender			0.66
Male	85 (63.9)	48 (36.1)	
Female	378 (66.1)	194 (33.9)	
Age			0.003
< 65 years	268 (61.0)	171 (39.0)	
65	195 (73.3)	71 (26.7)	
Marital Status			0.79
Married/partner	340 (65.4)	180 (34.6)	
Single/widowed/separated	123 (66.5)	62 (33.5)	
Education			0.06
Below high school graduation	341 (68.1)	160 (31.9)	
High school graduation or above	117 (59.4)	80 (40.6)	
Employment			0.004
Not employed	192 (71.6)	76 (28.4)	
Retired	169 (69.0)	76 (31.0)	
Employed	102 (53.1)	90 (46.9)	
Place of birth			0.003
Mainland China	406 (68.1)	190 (31.9)	
Other countries outside U.S.	57 (52.3)	52 (47.7)	
Language spoken at home			0.50
Cantonese	225 (34.7)	424 (65.3)	
Others (Mandarin, other Chinese dialects, English)	17 (30.4)	39 (69.6)	

	Self-Rated Health		p-value ¹
	Poor/Fair n (%)	Excellent/Very Good/Good n (%)	
Years lived in the U.S.			0.88
< 10	139 (65.3)	74 (34.7)	
10	314 (65.8)	163 (34.2)	
Enabling Resources			
Annual household income			0.003
< \$20,000	299 (71.5)	119 (28.5)	
\$20,000	79 (51.0)	76 (49.0)	
Not reported	85 (64.4)	47 (35.6)	
Health insurance status			0.09
Uninsured	26 (54.2)	22 (45.8)	
Insured	437 (66.5)	220 (33.5)	
Had regular clinic or primary doctor			0.11
Yes	438 (66.5)	221 (33.5)	
No	25 (54.4)	21 (54.6)	
Perceived Health Needs			
Number of chronic conditions			<0.001
2 or more	134 (81.2)	31 (18.8)	
1	188 (71.8)	74 (28.2)	
None	141 (50.7)	137 (49.3)	
Specific chronic conditions			
Diabetes	95 (87.2)	14 (12.8)	<0.001
Heart Disease or Stroke	35 (83.3)	7 (16.7)	<0.001
Hyperlipidemia	189 (75.9)	60 (24.1)	<0.001
Hypertension	197 (76.7)	60 (24.3)	<0.001
Access to Racial-/ Language-Concordant Healthcare Services			
Primary doctor was Chinese			0.10
Yes	353 (67.5)	170 (32.5)	
No/do not have doctor	110 (60.4)	72 (35.6)	
Language usually spoken by healthcare provider			0.77
Chinese (Cantonese, Mandarin, other dialects)	378 (66.3)	192 (33.68)	
English	60 (63.2)	35 (36.8)	
Not reported	25 (62.5)	15 (37.5)	

Note: Row percentages may not add up to 100.0% due to rounding errors.

¹ P-values account for lay health worker clusters.

² Health literacy level classifications were based on participants' report of how often they needed assistance to read written materials from doctor or pharmacy: low health literacy = "always" or "often" needed assistance; marginal health literacy = "sometimes" needed assistance; adequate health literacy = "rarely" or "never."

Table 3

Multivariable Logistic Regression Analyses: Correlates with Poor Self-Rated Health

Correlates	Model 1 (Healthcare Communication Barriers only) Adjusted Odds Ratio (95% CI)	P-value	Model 2 (Model 1 + predisposing, enabling resources, and needs factors) Adjusted Odds Ratio (95% CI)	P-value	Model 3 (Model 2 + access to ethnic-/ language- concordant services) Adjusted Odds Ratio (95% CI)	P-value
<u>Health communication Barriers</u>						
* Spoken English proficiency:						
Not at all/poorly (Ref: So-so/Well/Fluent)	2.13 (1.55 – 2.94)	<0.001	1.61 (1.03 – 2.54)	0.04	1.70 (1.07 – 2.70)	0.02
Ever needed medical interpreter (Ref: No)	0.99 (0.67 - 1.45)	0.95	1.20 (0.78 - 1.85)	0.41	1.26 (0.81 - 1.98)	0.31
* Written health literacy:						
Low	1.64 (1.03 – 2.61)	0.03	1.69 (1.04 – 2.74)	0.03	1.64 (1.003 - 2.68)	0.04
Moderate (Ref: Adequate)	1.31 (0.91 – 1.88)	0.14	1.31 (0.87 – 1.96)	0.20	1.28 (0.85 – 1.90)	0.22
<u>Sociodemographics and Acculturation</u>						
Male (Ref: Female)	Not Included		0.83 (0.50 – 1.365)	0.45	0.84 (0.52 - 1.34)	0.46
Age ≥ 65 years (Ref: <65)	Not Included		1.25 (0.82 – 1.91)	0.30	1.24 (0.81 - 1.93)	0.32
Married/living with partner (Ref: Single/widowed/separated)	Not Included		1.00 (0.67 – 1.48)	0.98	1.02 (0.68 - 1.53)	0.92
Education below high school graduation (Ref: High school graduation or above)	Not Included		1.00 (0.67 – 1.51)	0.98	1.03 (0.68 - 1.56)	0.88
* Employment status: Not employed	Not Included		1.96 (1.28 – 3.00)	<0.002	1.96 (1.26 – 3.05)	0.003
Retired (Ref: Employed)			1.33 (0.73 – 2.43)	0.34	1.27 (0.69 - 2.32)	0.44
Born in Mainland China (Ref: Other countries)	Not Included		1.32 (0.80 – 2.17)	0.27	1.34 (0.81 - 2.23)	0.26
Years living in U.S.: >10 years (Ref: ≤ 10 years)	Not Included		1.03 (0.68 – 1.57)	0.89	1.02 (0.66 - 1.56)	0.94
<u>Enabling Factors</u>						
Had health insurance (Ref: Uninsured)	Not Included		1.60 (0.85 - 3.00)	0.14	1.29 (0.62 – 2.68)	0.49
Annual household income >\$20,000	Not Included		0.66 (0.40 – 1.05)	0.10	0.65 (0.39 - 1.07)	0.09
Not reported (Ref: ≤\$20,000)			0.67 (0.43 – 1.05)	0.20	0.73 (0.45 - 1.18)	0.20
<u>Perceived Health Needs</u>						
* Heart disease or stroke (Ref: No)	Not Included		2.62 (1.10 – 6.37)	0.03	2.57 (1.08 – 6.10)	0.03
* Diabetes (Ref: No)			3.37 (1.81 – 6.30)	<0.001	3.32 (1.79 – 6.18)	<0.001

Correlates	Model 1 (Healthcare Communication Barriers only) Adjusted Odds Ratio (95% CI)	P-value	Model 2 (Model 1 + predisposing, enabling resources, and needs factors) Adjusted Odds Ratio (95% CI)	P-value	Model 3 (Model 2 + access to ethnic-/ language- concordant services) Adjusted Odds Ratio (95% CI)	P-value
* Hypertension (Ref: No)			1.54 (1.04 – 2.28)	0.03	1.58 (1.06 – 2.36)	0.02
* Hyperlipidemia (Ref: No)			1.58 (1.04 – 2.41)	0.03	1.60 (1.05 – 2.45)	0.03
<u>Access to Racial-/Language-Concordant Services</u>						
* Primary doctor ethnicity: Chinese	Not Included		Not Included		1.81 (1.06 – 3.10)	0.03
No Doctor (Ref: Non-Chinese)					0.79 (0.29 – 2.11)	0.63
Language provider usually spoke: English					0.59 (0.27 – 1.29)	0.19
Unknown/no doctor (Ref: Chinese)					0.57 (0.19 – 1.71)	0.32

Note: Self-rated health classifications were based on participants' rating of their general health: poor self-rated health = participants rated their health as "fair" or "poor;" good self-rated health = participants rated their health as "good," "very good," or "excellent." Analyses accounted for lay health worker clusters and data collection waves.

* Asterisk, bolded items denote significant correlates in the full model (Model 3).