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Ethnic Differences in Quality of LifeAmong Insured Older Adults with Diabetes in an Integrated Delivery System

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Abstract

Background—Racial/ethnic disparities exist in diabetes-related complications. Few studies have examined whether disparities exist in health-related quality of life (HRQL) among older adults with diabetes.

Objectives—To explore racial/ethnic ("ethnic" hereafter) differences in HRQL among older adults with diabetes in an integrated delivery system.

Design—Observational cross-sectional study.

Setting—Kaiser Permanente Northern California.

Participants—Ethnic-stratified, random sample of 6,096 adults with diabetes aged 60-75 who completed a HRQL questionnaire.

Measurements—Physical and mental HRQL were measured based on the Short-Form-8 (ranges: 0-100, means: 50). Age- and gender-adjusted weighted linear regression models estimated associations between ethnicity and HRQL and evaluated potential mediators (socioeconomic status, acculturation, health behaviors, diabetes-related conditions). We tested differences in ethnic-specific, adjusted mean HRQL scores (reference: whites).

Results—Physical HRQL was better for Filipinos (48.3 [95% Confidence Interval (CI) 47.0-49.6], P<.001), Asians (48.1 [95% CI 46.8-49.3], P<.001), Hispanics (45.1 [95% CI 44.2-46.0], P<.001), and blacks (44.2 [95% CI 43.3-45.1], P=.04) compared to whites (42.9 [95% CI 42.6-43.2]). Adjusting for potential mediators did not change these relationships. Mental HRQL was better only for Asians (52.7 [95% CI 51.6-53.7], P=.01) compared to whites (51.0

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[95% CI 50.7-51.3]), but this difference was small and became non-significant after adjustment for socioeconomic status, acculturation, health behaviors, and diabetes-related conditions.

Conclusion—Among older adults with diabetes in a well-established integrated health care delivery system, ethnic minorities had better physical HRQL than whites. Equal access to care in an integrated delivery system may hold promise for reducing health disparities in diabetes-reported patient-reported outcomes.

Keywords

health-related quality of life; patient-reported outcomes; diabetes; race/ethnicity; geriatrics

INTRODUCTION

Health-related quality of life (HRQL) has long been recognized as an important patient-centered outcome, and improving HRQL is a primary objective of major public health initiatives.[1] Reducing racial/ethnic (hereafter "ethnic") health disparities is also a national public health objective.[2]Studies have found that ethnic minorities such as blacks, Hispanics, and Native Americans report lower HRQL than whites in the general population.[3-5] Similar ethnic patterns have been found among disease-specific cohorts such as individuals living with asthma,[6] arthritis,[7] stroke,[8] and coronary heart disease.[9,10]

There is considerable public health interest in the impact of diabetes on quality of life in light of its high prevalence and growth. Older adults and ethnic minorities share a disproportionate burden of the diabetes epidemic. More than one-quarter of older adults in the U.S. have diabetes.[11] Nearly 20% of Non-Hispanic blacks have diabetes as compared to only 10% of non-Hispanic whites,[11] and the prevalence of diabetes among Mexican Americans is also twice that of non-Hispanic whites.[12] Additionally, some Asian subgroups have a markedly increased likelihood of having diabetes compared to their white counterparts.[13,14]Because of the substantial burden of diabetes held by older adults and ethnic minorities, it is important to understand how diabetes affects HRQL among an ethnically diverse population of older adults.

Older patients with diabetes have substantially lower HRQL compared to those without diabetes because of their elevated risk of both diabetes-related complications (e.g. cardiovascular disease and nephropathy) and geriatric conditions (e.g., depression and chronic pain).[15] However little research to date has studied whether ethnic disparities exist in HRQL among older adults with diabetes. A key determinant of whether or not there are ethnic differences in diabetes HRQL is whether or not there are ethnic differences in diabetes-related complications. Surprisingly, even though ethnic minorities often have more health problems than whites, they have not been consistently found to have a higher risk for diabetes-related complications. In a large study of adults with diabetes receiving uniform health care coverage (the same population that is the focus of this study), Asians and Hispanics had significantly lower rates of heart failure, stroke, and myocardial infarctions than whites; blacks, on the other hand, had similar rates of heart failure and stroke to those of whites, but lower rates of myocardial infarction. Additionally, Asians had a much lower rate of amputation than whites, but Asians, blacks, and Hispanics had higher rates of end-stage renal disease compared to whites.[16,17] In contrast, population-based studies have reported that minority groups have higher diabetes-related complication rates and mortality rates.[18] These conflicting results may arise from access to care being typically poorer for ethnic minorities in population-based studies, which likely affects health outcomes.

The findings from the aforementioned population-based studies are examples of the metrics that now come from surveillance systems that have been established to evaluate ethnic

disparities in clinical outcomes and risk factors associated with diabetes. However much less is known about disparities in HRQL among adults with diabetes despite the importance of quality of life in shaping public health initiatives. To date, only one study of rural older adults in North Carolina has examined ethnic differences in HRQL among older adults with diabetes.[19] In this study, Native Americans reported lower HRQL than whites; these differences were largely mediated by physical disability and chronic conditions. Whether these findings are generalizable to other populations is unclear. Moreover, this study included a population with variable access to and quality of care, both of which may affect HRQL as well as health outcomes. Population-based studies rarely fully characterize access and quality of care, both of which can vary considerably by ethnicity and confound disparities in outcomes. Health disparities research in populations receiving uniform access to care provides a unique opportunity to elucidate disparities in ethnic outcomes without concerns of residual confounding by care, and thus complement population-based studies. To fill gaps in understanding regarding ethnic differences in HRQL among patients with diabetes, we examined ethnic differences in HRQL among a large cohort of insured, older adults with diabetes who had uniform access to care.[16,20-27]

METHODS

Study Design, Setting, and Population

We used data from the Kaiser Permanente Northern California Diabetes Registry ("*Registry*"), which is a well-characterized, insured diabetes population receiving health care from *Kaiser Permanente Northern California,*an integrated health care delivery system. Health plan members comprise 25-30% of the San Francisco Bay and Sacramento metropolitan population in northern California, and are ethnically and socioeconomically similar to those living in the region except for having a lower percentage of very low and very high income persons.[28,29] The*Registry* has been maintained continuously since 1993.[30] Registry eligibility is based on multiple data sources including pharmacy (diabetes medication dispensings), laboratory (HbA1c≥7%), and outpatient diagnoses of diabetes, and is 99.5% sensitive for identification of adults with diagnosed diabetes compared with self-report.[31] All clinical information (including outpatient and inpatient pharmacy data, diagnoses, and procedures) is downloaded annually providing comprehensive, longitudinal follow-up of all registry members. An ethnically stratified, random sample of registry members identified prior to January 1, 2005, was selected to receive the *Diabetes Study of Northern California* (DISTANCE) survey (N=40,735). The DISTANCE survey included a wide range of social and behavioral factors that were hypothesized to be associated with social disparities in diabetes-related outcomes.[31] The survey was delivered in several modes, including a computer-assisted telephone interview, web-based, and written survey. All surveys were offered in English and the telephone interview survey was also offered in Spanish, Mandarin, Cantonese or Tagalog. The survey response rate was 62%.[32] Inclusion criteria for this study consisted of adults aged 60 years or older who completed a survey mode that included the HRQL instrument and self-identified their ethnicity (N=6,096). We excluded the 385 who failed to complete the HRQL instrument. There were no ethnic differences in rates of completion of the SF-8 instrument, and physical and mental HRQL scores were similar between respondents who did and did not self-report ethnicity.

Health-related Quality of Life

Quality of life was assessed using items based on the SF-8, which is a well-validated instrument that assesses HRQL. The SF-8 is a brief version of the Medical Outcomes SF-36 quality of life instrument and assesses HRQL using eight questions, one for each domain in the SF-36 instrument (physical functioning, role limitations due to physical health, bodily pain, general health perception, vitality, social functioning, role limitations due to emotional

problems, and mental health). Responses to each question are assigned values based on published methods and are transformed to physical (PCS) and mental component scores (MCS).[33] Component scores can range from 0 (worst) to 100 (best). This instrument is normalized so that the mean PCS and MCS are each 50 points with standard deviations (SD) of 10 points in the general population. In adults 65 to 74 years old, the mean (± SD) PCS is 44.7 (±9.3) and MCS is 52.8 (±8.3) points.[33] At least a one-point difference in SF-36 scores is considered the minimal cutoff point for clinical significance,[34] but differences of 3 to 5 points have also been suggested.[35] To help understand the context for these scores, an example of an approximately 1-point difference in physical HRQL on the SF-8 questionnaire is a response of "very good" vs. "excellent" for the question, "Overall, how you rate your health during the past 4 weeks?" with other responses being held constant. An example of an approximately 3-point difference is a response of "good" vs. "excellent" for the same question.

Main Exposure: Ethnicity

Ethnicity was assessed in the DISTANCE survey using two questions that were able to capture heritage among those with admixed ethnic background. The first question asked respondents "to choose the group or groups that best describe your race or ethnic origin" and to "check ALL that apply"; the second question asked respondents who chose more than one group, "to choose the SINGLE group with which you most strongly identify or that best describes your race or ethnic origin." For both questions, respondents could choose among the following ethnicities: Black/African American, Latino/Hispanic/Latin American, White, Middle Eastern (Arab, Israeli), Chinese, Filipino, Japanese, Korean, Vietnamese, Asian Indian/South Asian, Other Asian, Pacific Islander, Native American/American Indian, Inuit/Eskimo/Aleut, Other, or Don't know. Respondents who answered "Other Asian" or "Other" were asked to specify their ethnicity. For this analysis, ethnicity was collapsed into six groups: non-Hispanic white (white), non-Hispanic black (black), Hispanic, Asian (Chinese, Japanese, Korean, Vietnamese, Other Asian), Filipino, and multiethnic (if more than one ethnicity was chosen). The large sample of Filipinos (n=651) allowed for this ethnicity to be considered separately from Asians. We also considered Filipinos separate from other Asians because they have somewhat different physiologic, behavioral, and socioeconomic risk factors for diabetes and its complications and are at intermediate risk for diabetes complications among Asian subpopulations.[17,36,37] Other Asian subgroups were too small to provide meaningful comparisons (Chinese, n=448; Japanese, n=278; Korean, n=36; Vietnamese, n=36; Other Asian, n=4).

Other Exposures

We ascertained several patient factors that potentially confound or mediate relationships between ethnicity and HRQL, including age, gender, highest educational degree, income level, marital status, birthplace, English proficiency, smoking history, alcohol history, and physical activity.[38] Highest educational degree was grouped into "no degree", high school diploma or equivalent, associate degree or technical degree, or "college degree or more". Income level was categorized into <$15,000, $15,000-$34,999, $35,000-$64,999, $65,000-$99,999, or ≥$100,000. Birthplace and English proficiency were used as proxies for assessing acculturation.[39,40] Birthplace was dichotomized into U.S. or non-U.S. born. English proficiency was based on two questions: "How often do you have difficulty understanding or speaking English" and "How often do you have difficulty reading or writing English". Respondents who reported "sometimes", "often", or "always" to either question were considered to have difficulty with English. The question: "Have you smoked more than 100 cigarettes in your lifetime?" was used to ascertain smoking history. Respondents who answered "no" were considered "never smokers". Respondents who responded "yes" were asked, "Do you smoke cigarettes now?" Respondents who responded

"yes" to this second question were considered "current smokers" and those who responded "no" were considered "former smokers". Alcohol history was measured using two questions, "How often do you have a drink containing alcohol?" and "How many drinks containing alcohol do you have on a typical day when you are drinking?" Respondents were characterized as never, former, occasional, or heavy alcohol users (>5 drinks per day for men, >3 drinks per day for women). Physical activity was measured using the International Physical Activity Questionnaire (IPAQ), which characterizes respondents into three categories (highly active, sufficiently active, and insufficiently active) based on their activity during the last seven days.[38]

Medical conditions that are associated with lower HRQL in older adults with diabetes were also included.[15] These conditions included the following diabetes-related complications: heart failure, myocardial infarction, stroke, end-stage renal disease, amputation, blindness, foot ulcer, and peripheral neuropathy. Also the following geriatric conditions were included: chronic pain, depression, incontinence, history of falls, and being underweight. All medical conditions, except being underweight, were ascertained based on administrative records during the 12 months prior to each respondent's survey date. Several types of administrative records were used, including diagnostic codes from outpatient and inpatient records, and the Kaiser End-Stage Renal Disease database. Being underweight was defined by a body mass index (BMI) less than 18.5 kg/m^2 calculated from outpatient records or self-reported height and weight.

Statistical Analysis

Descriptive statistics (means and proportions) were used to characterize the cohort population. All variables, except for age, were analyzed as categorical variables. Ethnic differences were calculated using chi-square for categorical data and t-tests for continuous data.

A series of generalized linear regression models were specified for each outcome (physical HRQL and mental HRQL). Groups of exposure variables were sequentially added to the base model (Model 1), which included ethnicity, age, and gender, in order to explore how groups of potentially mediating variables (e.g. socioeconomic status and acculturation (Model 2), and health behaviors (Model 3)) may affect associations between ethnicity and HRQL. Additionally, because of known ethnic disparities in diabetes-related conditions, the full model adjusted for the presence of diabetes-related conditions (Model 4). Categorical variables were included as dummy variables in regression models. Whites were used as the reference group because whites were the majority population represented in this study and for easier comparison with other studies. Expansion weights were applied to all models to account for the complex survey sampling design (ethnic-stratified random sampling). Ethnic-specific, adjusted mean HRQL scores were calculated for each model. Analyses were performed using SAS Version 9.3 (Cary, NC). P-values were based on two-sided tests and considered significant at $P<0.05$. The Institutional Review Boards at Kaiser Permanente Division of Research and University of Chicago approved this study.

RESULTS

The mean age of respondents was 67 years and about half were female (Table 1). Respondents were white (29%), black (19%), Hispanic (15%), Asian (13%), Filipino (11%), or multiethnic (11%). About 70% were married, and 30% had a household income greater than $65,000, had completed college, and were born outside the U.S. About 60% of the population was physically active. Few respondents were heavy alcohol users or current smokers. Asians and Filipinos had higher rates of college graduation than other groups.

Nearly all Filipinos were born outside of the U.S. and about one-third of Hispanics and Asians reported difficulty with English.

Chronic pain (41%) and peripheral neuropathy (25%) were the most frequent diabetes-related conditions. There were significant ethnic differences in rates of heart failure, foot ulcer, peripheral neuropathy, chronic pain, depression and being underweight. Blacks had the highest rate of heart failure (5%), foot ulcer (6%), and peripheral neuropathy (31%). Blacks and Hispanics had the highest rates of chronic pain (both 45%), whereas whites had the highest rate of depression (10%). Asians had the highest rates of being underweight (2%). Asians and Filipinos had the lowest rates of peripheral neuropathy (15-16%), foot ulcer (2-3%), and depression (3-4%). Asians also had the lowest rates of heart failure (1%) and chronic pain (31%).

Physical HRQL

The mean physical HRQL score was 45.1. In models adjusted for age and gender (Model 1), physical HRQL was higher for Filipinos (48.3 [95% Confidence Interval (CI) 47.0-49.6], P<.001), Asians (48.1 [95% CI 46.8-49.3], P<.001), Hispanics (45.1 [95% CI 44.2-46.0], P<.001), and blacks (44.2 [95% CI 43.3-45.1], P=.04) compared to whites (42.9 [95% CI 42.6-43.2]) (Table 2). Physical HRQL did not differ between multiethnics and whites. Accounting for socioeconomic status and acculturation (Model 2), health behaviors (Model 3), and diabetes-related conditions (Model 4) had rather minimal impact on point estimates from the age and sex adjusted model (Model 1). In the fully adjusted model (Model 4), physical HRQL was significantly higher for Filipinos, Asians, Hispanics and Blacks compared to whites, but not significantly different for multiethnics.

Mental HRQL

The mean mental HRQL score was 51.2. In analyses adjusted for age and gender (Model 1), mental HRQL was slightly higher for Asians (52.7 [95% CI 51.6-53.7], P=.01) compared to whites (51.0 [95% CI 50.7-51.3]), but did not differ for blacks, Hispanics, Filipinos, or multiethnics (Table 3). Adjustment for socioeconomic status and acculturation (Model 2), health behaviors (Model 3), and diabetes-related complications and geriatric syndromes (Model 4) had no substantive impact on point estimates from the age and sex adjusted model (Model 1). Mental HRQL remained higher for Asians compared to whites after adjustment for socioeconomic status, acculturation, and health behaviors (Model 3: 51.9 [95% CI 50.7-53.1], P=.01), but differences were no longer present after adjustment for diabetes-related conditions.

DISCUSSION

This study of insured older adults with diabetes in an integrated health care delivery setting found that physical and mental HRQL differed by ethnicity. Surprisingly, physical HRQL was better among blacks, Hispanics, Asians, and Filipinos compared to whites. Ethnic differences in physical HRQL were particularly sizeable for Asians and Filipinos versus white. These differences (relative to whites) were partially accounted for by several mediators (socioeconomic status, acculturation, health behaviors, and diabetes-related conditions), but ethnic differences remained after adjustment. Mental HRQL was better only among Asians compared to whites.[41]However, this difference in mental HRQL became non-significant after accounting for differences in diabetes-related complications and geriatric syndromes.

The ethnic differences in HRQL among older adults with diabetes were frequently quite large. In the fully adjusted models, the difference in physical HRQL between whites and

ethnic minorities was equivalent to whites reporting good to very good health and blacks and Hispanics reporting excellent health, or whites reporting good health and Asians and Filipinos reporting excellent health. For mental HRQL, the difference in age-gender adjusted models was similar to whites reporting very poor health and Asians reporting excellent health. We consider these findings clinically relevant because previous studies have found that good, or poor, self-rated health is associated with a nearly 1.5, or 3, times increased risk of mortality compared to an excellent self-rated health.[41] The marked differences in HRQL decreased substantially after adjustment for potential mediators, which suggest that the better HRQL among older adult ethnic minorities with diabetes is partially explained by a combination of differences in socioeconomic status, acculturation, health behaviors, and diabetes-related conditions across ethnicities.

While previous studies have found that blacks and Hispanics have worse HRQL than whites,[3,4] this study's clinical context may explain why better HRQL was found among ethnic minorities. Because this study was performed within an integrated health care delivery system, this insured population may experience fewer disparities in access and quality,[16,20-27] diabetes complications,[16] and geriatric conditions[42] and thereby report fewer differences in HRQL. We previously reported attenuated ethnic differences in rates of diabetes complications[16] and geriatric syndromes,[42] and specifically found that whites had the highest rates for several of the outcomes in this insured population. Given that diabetes complications and geriatric syndromes are a dominant driver of HRQL,[15] these counter-intuitive ethnic patterns in HRQL (i.e. Whites having lower HRQL compared to ethnic minorities) are not unexpected. Our results suggest that uniform access to care within integrated health care delivery systems may reduce the usual pattern of health care disparities in HRQL for insured older adults with diabetes.

Among specific ethnicities, Asians had the largest advantage in HRQL compared to whites in this study. The difference in HRQL was largely explained by socioeconomic status, acculturation, health behaviors, and rates of diabetes-related conditions, but small differences in physical HRQL still persisted after adjustment. Other studies have also found that Asians have lower rates of specific diabetes-related conditions, like amputation, myocardial infarction, heart failure and stroke, and these different rates of complications persisted despite adjustment for a wide range of potential clinical, socioeconomic, and behavioral mediators.[16,17] In our study, we found that Asians and Filipinos had much lower rates of peripheral neuropathy, depression, and chronic pain than Whites. While the explanation for the different rates of diabetes-related complications between Asians and whites is largely unknown, some studies have suggested that there may be more cultural shame in reporting mental illness among older Asians and Hispanics, which may lead to under-reporting of depressive symptoms to physicians.[43] This would not, however, explain differences in physical HRQL.[44]

This study has limitations. While this is the first study, to our knowledge, to describe differences in HRQL by ethnicity among a large population of older adults with diabetes, an important limitation of this study may be its generalizability since the survey was performed only in members of a well-established integrated health care delivery system in Northern California that serves a lower percentage of low-income, low-education persons than exist in the catchment population. That said, while this select population receives better access to care than the general population, the likelihood that associations between ethnicity and HRQL were confounded by differential access is less plausible. It is also likely that the ethnic groups in Northern California are not representative of the national population. However, one of the major strengths of this study is that several ethnic groups could be studied simultaneously because of the study's location and the survey was performed in multiple languages. Another limitation is that this study may not fully capture the medical

conditions that explain HRQL; however, this study included thirteen chronic conditions which have been associated with important decrements in HRQL among older adults with diabetes[15] and consist of highly prevalent diseases associated with mortality.[45] We also did not specifically look at obesity, which has differential rates across ethnicities, because the association between obesity and lower HRQL has not been established among older adults.

In an insured older adult population with diabetes in an integrated health care delivery system, blacks, Hispanics, Asians, and Filipinos had better physical HRQL than whites, even after adjustment for many potential mediators of HRQL. The better HRQL among ethnic minorities is likely due to their lower rates of diabetes-related conditions compared to whites in this health care system.[16] Future studies should consider factors contributing to lower rates of diabetes-related conditions and better HRQL among ethnic minorities. Ethnic patterns of HRQL among older adults with diabetes among the uninsured and those receiving care in other settings and the aspects of integrated health care delivery systems that have improved quality of life and reduced ethnic disparities should also be examined.

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REFERENCES

1. Healthy People 2010: Understanding and Improving Health. US Government Printing Office; Washington, DC: 2000. DHHS Publication No. 017- 001-001-00-550-9
2. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Washington, DC: 2020. Healthy People. Available at http://www.healthypeople.gov/2020/default.aspx [Accessed 9/20/2012]
3. Lubetkin EI, Gold MR. Comprehensibility of measures of health-related quality of life in minority and low-income patients. J Natl Med Assoc. 2002; 94:327–335. [PubMed: 12069212]
4. Jackson-Triche ME, GreerSullivan J, Wells KB, et al. Depression and health-related quality of life in ethnic minorities seeking care in general medical settings. J Affect Disord. 2000; 58:89–97. [PubMed: 10781698]
5. Kim JS, Bramlett MH, Wright LK, et al. Racial differences in health status and health behaviors of older adults. Nurs Res. 1998; 47:243–250. [PubMed: 9683120]
6. Mosen DM, Schatz M, Gold R, M, et al. Medication use, emergency hospital care utilization, and quality-of-life outcome disparities by race/ethnicity among adults with asthma. Am J Manag Care. 2010; 16:821–828. [PubMed: 21348553]
7. Ibrahim SA, Burant CJ, Siminoff LA, et al. Self-assessed global quality of life: a comparison between African-American and white older patients with arthritis. J Clin Epidemiol. 2002; 55:512–517. [PubMed: 12007555]
8. Xie J, Wu EQ, Zheng ZJ, et al. Impact of stroke on health-related quality of life in the noninstitutionalized population in the United States. Stroke. 2006; 37:2567–2572. [PubMed: 16946158]
9. Hayes DK, Greenlund KJ, Denny CH, et al. Racial/Ethnic and socioeconomic disparities in health-related quality of life among people with coronary heart disease, 2007. Prev Chronic Dis. 2011; 8:A78. [PubMed: 21672402]

10. Xie J, Wu EQ, Zheng ZJ, et al. Patient-reported health status in coronary heart disease in the United States: age, sex, racial, and ethnic differences. Circulation. 2008; 118:491–497. [PubMed: 18625894]
11. Centers for Disease Control and Prevention. [Assessed March 12, 2013] National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States. 2011. Available at: www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf
12. Cowie CC, Rust KF, Ford ES, et al. Full accounting of diabetes and pre-diabetes in the U.S. population in 1988-1994 and 2005-2006. Diabetes Care. 2009; 32:287–294. [PubMed: 19017771]
13. Lee JW, Brancati FL, Yeh HC. Trends in the prevalence of type 2 diabetes in Asians versus whites: results from the United States National Health Interview Survey, 1997- 2008. Diabetes Care. 2011; 34:353–357. [PubMed: 21216863]
14. Karter AJ, Schillinger D, Adams AS, et al. Elevated Rates of Diabetes in Pacific Islanders and Asian Subgroups: The Diabetes Study of Northern California (DISTANCE). Diabetes Care. 2013; 36:574–579. [PubMed: 23069837]
15. Laiteerapong N, Karter AJ, Liu JY, et al. Correlates of quality of life in older adults with diabetes: the Diabetes &Aging study. Diabetes Care. 2011; 34:1749–1753. [PubMed: 21636795]
16. Karter AJ, Ferrara A, Liu JY, et al. Ethnic disparities in diabetic complications in an insured population. JAMA. 2002; 287:2519–2527. [PubMed: 12020332]
17. Kanaya AM, Adler N, Moffet HH, et al. Heterogeneity of diabetes outcomes among asians and pacific islanders in the US: The diabetes study of northern california (DISTANCE). Diabetes Care. 2011; 34:930–937. [PubMed: 21350114]
18. Miech RA, Kim J, McConnell C, et al. A growing disparity in diabetes-related mortality U.S. trends, 1989-2005. Am J Prev Med. 2009; 36:126–132. [PubMed: 19062239]
19. Quandt SA, Graham CN, Bell RA, et al. Ethnic disparities in health-related quality of life among older rural adults with diabetes. Ethn Dis. 2007; 17:471–476. [PubMed: 17985500]
20. Martin TL, Selby JV, Zhang D. Physician and patient prevention practices in NIDDM in a large urban managed-care organization. Diabetes Care. 1995; 18:1124–1132. [PubMed: 7587847]
21. Bonds DE, Zaccaro DJ, Karter AJ, et al. Ethnic and racial differences in diabetes care: The Insulin Resistance Atherosclerosis Study. Diabetes Care. 2003; 26:1040–1046. [PubMed: 12663570]
22. Brown AF, Gerzoff RB, Karter AJ, et al. Health behaviors and quality of care among Latinos with diabetes in managed care. Am J Public Health. 2003; 93:1694–1698. [PubMed: 14534224]
23. Duru OK, Bilik D, McEwen LN, et al. Primary language, income and the intensification of anti-glycemic medications in managed care: The (TRIAD) study. J Gen Intern Med. 2011; 26:505–511. [PubMed: 21174165]
24. Lyles CR, Karter AJ, Young BA, et al. Provider factors and patient-reported healthcare discrimination in the Diabetes Study of California (DISTANCE). Patient Educ Couns. 2011; 85:e216–224. [PubMed: 21605956]
25. Moffet HH, Parker MM, Sarkar U, et al. Adherence to laboratory test requests by patients with diabetes: The diabetes study of northern California (DISTANCE). Am J Manag Care. 2011; 17:339–344. [PubMed: 21718081]
26. Lyles CR, Karter AJ, Young BA, et al. Patient-reported racial/ethnic healthcare provider discrimination and medication intensification in the Diabetes Study of Northern California (DISTANCE). J Gen Intern Med. 2011; 26:1138–1144. [PubMed: 21547610]
27. Lyles CR, Karter AJ, Young BA, et al. Correlates of patient-reported racial/ethnic health care discrimination in the Diabetes Study of Northern California (DISTANCE). J Health Care Poor Underserved. 2011; 22:211–225. [PubMed: 21317516]
28. Krieger N. Overcoming the absence of socioeconomic data in medical records: Validation and application of a census-based methodology. Am J Public Health. 1992; 82:703–710. [PubMed: 1566949]
29. Gordon, NP. [Assessed February 23, 2013] How Does the Adult Kaiser Permanente Membership in Northern California Compare with the Larger Community?. Available at: http://www.dor.kaiser.org/external/uploadedFiles/content/research/mhs/Other_Reports/comparison_kaiser_vs_nonKaiser_adults_kpnc.pdf

30. Huang ES, Karter AJ, Danielson KK, et al. The association between the number of prescription medications and incident falls in a multi-ethnic population of adult type-2 diabetes patients: the diabetes and aging study. J Gen Intern Med. 2010; 25:141–146. [PubMed: 19967465]

31. Moffet HH, Adler N, Schillinger D, et al. Cohort Profile: The Diabetes Study of Northern California (DISTANCE)--objectives and design of a survey follow-up study of social health disparities in a managed care population. Int J Epidemiol. 2009; 38:38–47. [PubMed: 18326513]

32. The American Association for Public Opinion Research. [Accessed April 16, 2012] Standard definitions: Final dispositions of case codes and outcome rates for surveys. Available at: www.aapor.org/AM/Template.cfm?Section=Standard_Definitions2&Template=/cm/contentdisplay.cfm&contentid=3156

33. Ware, JE.; Kosinksi, M.; Dewey, JE., et al. How to Score and Interpret Single-Item Health Status Measures: A Manual for Users of the SF-8 Health Survey. QualityMetric Incorporated; Lincoln, RI: 2001.

34. Ware JE, Kosinski M. Interpreting SF-36 summary health measures: A response. Qual Life Res. 2001; 10:405–413. discussion 415-420. [PubMed: 11763203]

35. Farivar SS, Liu H, Hays RD. Half standard deviation estimate of the minimally important difference in HRQOL scores? Expert Rev Pharmacoecon Outcomes Res. 2004; 4:515–523. [PubMed: 19807545]

36. Araneta MR, Barrett-Connor E. Ethnic differences in visceral adipose tissue and type 2 diabetes: Filipino, African-American, and white women. Obes Res. 2005; 13:1458–1465. [PubMed: 16129729]

37. Ye J, Rust G, Baltrus P, et al. Cardiovascular risk factors among Asian Americans: results from a National Health Survey. Ann Epidemiol. 2009; 19:718–723. [PubMed: 19560369]

38. Craig CL, Marshall AL, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003; 35:1381–1395. [PubMed: 12900694]

39. Gomez SL, Kelsey JL, Glaser SL, et al. Immigration and acculturation in relation to health and health-related risk factors among specific Asian subgroups in a health maintenance organization. Am J Public Health. 2004; 94:1977–1984. [PubMed: 15514240]

40. Arcia E, Skinner M, Bailey D, et al. Models of acculturation and health behaviors among Latino immigrants to the US. Soc Sci Med. 2001; 53:41–53. [PubMed: 11386307]

41. Mossey JM, Shapiro E. Self-rated health: A predictor of mortality among the elderly. Am J Public Health. 1982; 72:800–808. [PubMed: 7091475]

42. Fried TR, Tinetti ME, Iannone L, et al. Health outcome prioritization as a tool for decision making among older persons with multiple chronic conditions. Arch Intern Med. 2011; 171:1854–1856. [PubMed: 21949032]

43. Jimenez DE, Bartels SJ, Cardenas V, et al. Stigmatizing attitudes toward mental illness among racial/ethnic older adults in primary care. Int J Geriatr Psychiatry. 2013:000–000.

44. Hudson DL, Karter AJ, Fernandez A, et al. Differences in the Clinical Recognition of Depression in Diabetes Patients: The Diabetes Study of Northern California (DISTANCE). Am J Manage Care. 000-000.

45. Gu K, Cowie CC, Harris MI. Mortality in adults with and without diabetes in a national cohort of the U.S. population, 1971-1993. Diabetes Care. 1998; 21:1138–1145. [PubMed: 9653609]

Table 1

Descriptive Characteristics of the DISTANCE Survey Respondents Aged 60 Years and Older by Ethnicity (N=6,096) *

	All	White	Black	Hispanic	Asian	Filipino	Multiethnic
N, %	6,096	1811 (29)	1196 (19)	937 (15)	802 (13)	651 (10)	699 (11)
Age, y, mean (±SD) **	67.1 (±4.7)	67.2 (±4.8)	67.3 (±4.6)	67.4 (±4.6)	67.7 (±5.0)	66.4 (±4.6)	66.6 (±4.8)
Female **	2999 (49)	811 (45)	694 (58)	465 (50)	353 (44)	341 (52)	335 (48)
Married **	4182 (69)	1294 (71)	622 (52)	666 (71)	633 (79)	492 (76)	475 (68)
Income **							
<$15,000	715 (13)	132 (8)	152 (14)	173 (21)	95 (14)	77 (13)	86 (14)
$15,000-34,999	1398 (26)	406 (26)	276 (26)	263 (32)	135 (19)	142 (24)	176 (28)
$35,000-64,999	1639 (30)	503 (32)	340 (32)	245 (29)	195 (28)	172 (30)	184 (29)
$65,000-99,999	984 (18)	318 (20)	187 (18)	100 (12)	140 (20)	115 (20)	124 (20)
≥$100,000	655 (12)	233 (15)	102 (10)	51 (6)	128 (18)	75 (13)	66 (10)
Highest education **							
No degree	955 (16)	232 (13)	156 (13)	336 (38)	84 (11)	29 (5)	118 (17)
HS degree or equivalent	1755 (29)	600 (34)	411 (35)	249 (28)	176 (22)	87 (14)	232 (34)
AD or technical school	1480 (25)	436 (24)	347 (30)	203 (23)	190 (24)	120 (19)	184 (27)
College degree or more	1773 (30)	520 (29)	256 (22)	102 (11)	342 (43)	398 (63)	155 (23)
Born outside U.S. **	1810 (30)	147 (8)	23 (2)	396 (42)	428 (53)	624 (96)	192 (27)
Difficulty with English **	1196 (20)	146 (8)	135 (11)	331 (36)	293 (37)	132 (20)	159 (23)
Physical activity **							
Insufficient	2555 (42)	755 (42)	583 (49)	382 (41)	293 (37)	254 (39)	288 (41)
Sufficient	1251 (21)	335 (18)	239 (20)	176 (19)	208 (26)	148 (23)	145 (21)
Highly active	2290 (38)	721 (40)	374 (31)	379 (40)	301 (38)	249 (38)	266 (38)
Alcohol use **							
Never	1698 (29)	273 (16)	323 (28)	254 (29)	333 (44)	341 (56)	174 (26)
Former	1651 (28)	485 (28)	411 (36)	274 (31)	155 (21)	126 (21)	200 (30)
Occasional	2152 (37)	884 (51)	372 (32)	278 (31)	244 (33)	124 (20)	250 (37)
Heavy	308 (5)	97 (6)	46 (4)	82 (9)	18 (2)	16 (3)	49 (7)
Smoking history **							
Never	3060 (50)	734 (41)	534 (45)	533 (57)	477 (59)	434 (67)	348 (50)
Current	352 (6)	113 (6)	103 (9)	40 (4)	26 (3)	28 (4)	42 (6)
Former	2677 (44)	961 (53)	559 (47)	362 (39)	299 (37)	187 (29)	309 (44)
Body mass index, kg/m^2, mean (±SD)	29.9 (±6.5)	31.5 (±6.8)	31.3 ±(7.2)	30.6 (±5.9)	25.7 (±4.2)	25.9 (±3.9)	60.1 (±6.1)
Diabetes-related conditions							
HF **	188 (3)	60 (3)	58 (5)	26 (3)	8 (1)	10 (2)	26 (4)
MI	131 (2)	45 (2)	31 (3)	14 (1)	11 (1)	13 (2)	17 (2)
Stroke	38 (1)	14 (1)	7 (1)	7 (1)	3 (0.4)	2 (0.3)	5 (1)
ESRD	92 (2)	14 (1)	24 (2)	17 (2)	16 (2)	9 (1)	12 (2)

	All	White	Black	Hispanic	Asian	Filipino	Multiethnic
Amputation	13 (0.2)	5 (0.3)	2 (0.2)	2 (0.2)	0 (0)	1 (0.2)	3 (0.4)
Blindness	23 (0.4)	2 (0.1)	6 (1)	5 (1)	1 (0.1)	3 (0.5)	6 (1)
Foot ulcer ***	263 (4)	79 (4)	67 (6)	45 (5)	17 (2)	18 (3)	37 (5)
Neuropathy **	1544 (25)	516 (28)	371 (31)	240 (26)	128 (16)	100 (15)	189 (27)
Chronic pain **	2510 (41)	765 (42)	539 (45)	422 (45)	249 (31)	245 (38)	290 (41)
Depression **	454 (7)	188 (10)	82 (7)	79 (8)	30 (4)	20 (3)	55 (8)
Incontinence	95 (2)	33 (2)	18 (2)	14 (1)	13 (2)	2 (0.3)	15 (2)
History of falls	81 (1)	25 (1)	14 (1)	15 (2)	11 (1)	9 (1)	7 (1)
Being underweight **	38 (1)	3 (0.2)	8 (1)	1 (0.1)	16 (2)	7 (1)	3 (0.4)
Physical HRQL, mean (±SD) **	45.0 (±10.4)	43.6 (±11.0)	43.8 (±10.9)	44.9 (±10.0)	48.1 (±8.5)	48.2 (±8.4)	44.2 (±10.7)
Mental HRQL, mean (±SD) **	51.2 (±8.7)	51.4 (±8.7)	50.8 (±9.4)	50.3 (±8.7)	52.8 (±7.2)	51.7 (±8.0)	50.2 (±9.0)

Abbreviations: AD, Associate degree; ESRD, end-stage renal disease; HF, heart failure; HS, high school; MI, myocardial infarction; SD, standard deviation

* Results are reported as N (%) unless otherwise noted.

** P<0.001

*** P<0.01

Table 2

Adjusted Mean Physical HRQL Scores among DISTANCE Survey Respondents Aged 60 Years and Older (N=6,096)

	Model 1*	P-value	Model 2**	P-value	Model 3***	P-value	Model 4****	P-value
White	42.9 (42.6-43.2)	-	42.8 (42.2-43.5)	-	43.4 (42.6-44.1)	-	43.7 (43.0-44.4)	-
Black	44.2 (43.3-45.1)	0.04	44.8 (43.7-45.8)	<.001	45.7 (44.6-46.9)	<.001	45.8 (44.8-46.9)	<.001
Hispanic	45.1 (44.2-46.0)	<.001	45.7 (44.6-46.7)	<.001	46.0 (44.9-47.1)	<.001	46.1 (45.1-47.2)	<.001
Asian	48.1 (46.8-49.3)	<.001	47.1 (45.8-48.5)	<.001	47.8 (46.4-49.2)	<.001	46.4 (45.1-47.7)	<.001
Filipino	48.3 (47.0-49.6)	<.001	46.3 (44.7-47.8)	<.001	47.3 (45.7-48.9)	<.001	46.4 (44.9-47.9)	<.001
Multiethnic	42.8 (42.0-43.7)	1.00	43.5 (42.5-44.5)	0.70	44.1 (43.0-45.1)	0.57	43.8 (42.8-44.8)	1.00

*Adjusted for age and gender

**Adjusted for age, gender, socioeconomic status (marital status, education, income), acculturation (birthplace and English proficiency)

***Adjusted for age, gender, socioeconomic status, acculturation, health behaviors (alcohol use, smoking history and physical activity)

****Adjusted for age, gender, socioeconomic status, acculturation, health behaviors, diabetes complications (heart failure, myocardial infarction, stroke, end-stage renal disease, amputation, blindness, foot ulcer, neuropathy), and geriatric conditions (fall history, underweight, chronic pain, depression, incontinence)

Table 3

Adjusted Mean Mental HRQL Scores among DISTANCE Survey Respondents Aged 60 years and Older (N=6,096)

	Model 1*	P-value	Model 2**	P-value	Model 3***	P-value	Model 4****	P-value
White	51.0 (50.7-51.3)	-	50.0 (49.4-50.5)	-	49.9 (49.3-50.6)	-	50.2 (49.6-50.8)	-
Black	51.0 (50.3-51.8)	1.00	50.1 (49.2-51.0)	1.00	50.3 (49.3-51.2)	0.98	50.1 (49.2-51.1)	1.00
Hispanic	50.2 (49.4-50.9)	0.23	50.2 (49.3-51.0)	1.00	50.0 (49.1-50.9)	1.00	50.0 (49.2-50.9)	1.00
Asian	52.7 (51.6-53.7)	0.01	52.1 (51.0-53.2)	0.003	51.9 (50.7-53.1)	0.01	51.5 (50.3-52.6)	0.19
Filipino	51.8 (50.7-52.9)	0.66	50.5 (49.2-51.8)	0.96	50.7 (49.3-52.0)	0.91	50.0 (48.7-51.4)	1.00
Multiethnic	50.6 (49.9-51.3)	0.91	50.1 (49.3-50.9)	1.00	49.9 (49.0-50.8)	1.00	49.8 (48.9-50.6)	0.88

*Adjusted for age and gender

**Adjusted for age, gender, socioeconomic status (marital status, education, income), acculturation (birthplace and English proficiency)

***Adjusted for age, gender, socioeconomic status, acculturation, health behaviors (alcohol use, smoking history and physical activity)

****Adjusted for age, gender, socioeconomic status, acculturation, health behaviors, diabetes complications (heart failure, myocardial infarction, stroke, end-stage renal disease, amputation, blindness, foot ulcer, neuropathy), and geriatric conditions (fall history, underweight, chronic pain, depression, incontinence)