TITLE: 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

Running title: DISTANCE

Date: September 25, 2007

Authors: Howard H. Moffet, MPH, Nancy Adler, PhD, Dean Schillinger, MD, Ameena T. Ahmed, MD, Barbara Laraia, PhD, Joe V. Selby, MD, Romain Neugebauer, PhD, Jennifer Y. Liu, MPH, Melissa M. Parker, MS, Margaret Warton, MPH, Andrew J. Karter, PhD

Affiliations:
Howard H. Moffet MPH, Ameena T. Ahmed, MD, Joe V. Selby, MD, Jennifer Y. Liu, MPH, Melissa M. Parker, MS, Margaret Warton, MPH, Andrew J. Karter, PhD
- Kaiser Permanente – Division of Research, 2000 Broadway, Oakland, CA 94612

Nancy Adler, PhD
- Departments of Psychiatry and Pediatrics and Center for Health and Community, University of California, 3333 California Street, Suite 465, San Francisco, CA 94118

Barbara Laraia, PhD
- Department of Medicine and Center for Health and Community, University of California, 3333 California Street, Suite 465, San Francisco, CA 94118

Dean Schillinger, MD
- University of California, San Francisco School of Medicine, Center for Vulnerable Populations, San Francisco General Hospital, San Francisco, CA 94110

Romain Neugebauer, PhD
- Division of Biostatistics, School of Public Health, University of California, Berkeley, CA 94704

Corresponding author:
Howard H. Moffet
Kaiser Permanente – Division of Research
2000 Broadway
Oakland, CA 94612
510-891-5902
510-891-3606 fax
Howard.H.Moffet@kp.org

Word count: 3,827
Tables: 2

ABSTRACT

Background: The main study hypothesis underlying the *Diabetes Study of Northern California (DISTANCE)* is that social factors, particularly educational attainment and ethnicity, are associated with diabetes-related health outcomes; we will seek to identify potentially modifiable factors that explain or illuminate that association.

Methods: We identified an ethnically-stratified, random sample of 40,735 diabetic members of known (Caucasian, African-American, Latino, Asian) and unknown ethnicity receiving care from Kaiser Permanente Northern California, a pre-paid, managed care setting. We then conducted an extensive survey of candidate social health factors to establish baseline data. . Surveys were completed by 20,188 patients (62% response rate among eligible members). Respondents included 3,420 African Americans (16.9%), 2,312 Asian (11.4%), 4,602 Caucasians (22.8%), 2,404 Filipinos (11.9%), 3,717 Latinos (18.4%), 2,222 multi-racial (11.0%) and 1,511 other (7.5%); respondents varied widely in terms of clinical and behavioral profiles, as well as education, income, wealth, occupation, nativity and neighborhood characteristics. Demographic, clinical, behavioral and census data were obtained for the entire cohort. Few baseline variables differed between respondents and non-respondents, and analysis of associations between race or education and poor glycemic control (A1C>7%) detected no response bias (p=0.55 and 0.28 for survey response interaction with race and education, respectively).

Discussion: We will prospectively follow this large, ethnically-diverse cohort with uniform access to care to test the study hypotheses. The knowledge gained will improve our understanding of social health disparities in managed care settings and help identify factors for targeted interventions designed to reduce social disparities in diabetes-related health.

Background

One of the challenges of the national initiative, *Healthy People 2010*[1], is to support interventions that will reduce social disparities in health. While social disparities such as differences in education, income, race or ethnicity may affect health, they are often not considered to be the responsibility of a medical provider or health plan. However, modifiable factors may exist at the individual, neighborhood or system level that mediate (explain) social disparities in health and which may be suitable targets for interventions aiming to reduce disparities.

We previously reported findings regarding ethnic disparities in the incidence of myocardial infarction, stroke, congestive heart failure, end-stage renal disease, and lower-extremity amputation among diabetic African American, Asian, Latino and Caucasian members of Kaiser Permanente Northern California ("Kaiser") in a population with uniform access to care[2,3]. Socioeconomic disparities in diabetic complications based on educational attainment and income have been reported in other populations[4,5].

At the population level, identifying antecedents and determinants of social differences in disease progression remains a challenge. There are nationally representative surveys (e.g., National Health and Nutrition Examination Survey) that identify members of the general population with diabetes and that can estimate risk factors that are associated with diabetes complications, but these cohorts are often cross-sectional or panel studies and have limited ability to track continuous changes in individual-level health care, outcomes and risk factors over time. Longitudinal, population-based studies often have too few subjects with diabetes to discern racial or ethnic contrasts.

The 2002 Institute of Medicine report, "Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care"[6], detailed the socioeconomic fragmentation of health care quality and access, and its differential, negative impact on minorities. As access to health care is an important determinant of health outcomes and is in turn associated with

ethnicity and socioeconomic position, it represents a potent source of confounding bias in population-based studies of social health disparities. The relatively uniform access to care in a managed care health plan such as Kaiser provides an advantageous setting in which to study the social disparities in health and future study findings may be compared to population-based studies, where health care access and quality may vary by socioeconomic position.

We established the Kaiser Permanente Northern California Diabetes Registry ("Registry") in 1993 using standardized criteria to identify and prospectively follow members with diabetes, to measure prevalence and incidence of diabetes and its co-morbidities, to understand factors associated with disease progression and complications, and to evaluate health care processes and outcomes. We conducted the first survey of the Registry in 1994-97 (*Diabetes Registry Questionnaire*) among all Registry members over 19 years of age. The primary goal of that survey was to capture individual-level information on the clinical characteristics of diabetes, age at diagnosis, ethnicity, education, health-related behaviors and diabetes family history. There were 77,726 respondents (83% response rate among eligible members) and that survey cohort has been the basis for numerous publications regarding the epidemiologic and health services aspects of diabetes[7-13].

The National Institutes of Health provided funding to the Kaiser Division of Research and the University of California, San Francisco School of Medicine, to conduct the Diabetes Study of Northern California (*DISTANCE*) to identify modifiable factors that are predictive of diabetic complications but which may differ substantively in prevalence or effect size across ethnic groups or educational levels. Our aim was to survey and prospectively follow a large, diverse and well-characterized population and to collect data on risk factors which may affect diabetes health outcomes. We conducted the DISTANCE Survey to establish the cohort and collect baseline data on hypothesized risk factors.

Methods

Study design & setting

We developed and implemented DISTANCE as a cohort study[14] to assess potentially modifiable factors that may explain social disparities in diabetic complications. The DISTANCE Survey was intended to collect baseline data on social factors which may affect diabetes health. The domains included demographics, socioeconomics, clinical profile, health behaviors, treatment adherence, diabetes knowledge, psychosocial characteristics, patient-provider relationship and quality and access to care. The sampling frame sought a random sample of approximately equal numbers of diabetic members of the five largest ethnic groups within the Kaiser integrated care system: African Americans, Asians, Caucasians, Filipinos and Latinos.

This study took place within the Kaiser Foundation Health Plan, the largest not-for-profit managed health care company in the U.S.[15]. Kaiser Permanente Northern California provides comprehensive medical services to over 3.2 million members (as of January, 2005) in Northern California, including the San Francisco Bay and Sacramento metropolitan areas, or 25-30% of the region's population. Care is provided by approximately 65,300 employees and 4,400 physicians of *The Permanente Medical Group* at 17 hospitals and 152 medical offices. Kaiser members are predominantly employed or retired individuals and their families, and closely approximate the general population ethnically and socioeconomically except for the extreme tails of income distribution[16-18].

Study subjects were members of the Kaiser Permanente Northern California Diabetes Registry, which has an estimated sensitivity of 99% based on chart review validation (unpublished report). Inclusion in the Registry is currently based on 1) self-report from Kaiser member health surveys; 2) pharmacy utilization of any insulin or oral hypoglycemic agents; 3) laboratory results of glycosylated hemoglobin A1C (A1C) ≥ 7.0;

4) two or more abnormal glucose values (either fasting glucose ≥ 126 mg/dl or random glucose ≥ 200 mg/dl); 5) outpatient utilization (≥ 2 visits for diabetes); or 6) inpatient hospital utilization (primary hospital discharge ICD9:250.xx). Exclusion criteria are 1) having no diabetes inclusion indicators during a sum total of two years of Kaiser membership after the date they were identified in the Registry; 2) identified only by a ICD9 code of 648.8 (gestational diabetes); or 3) identified due to pharmacy utilization of metformin or thiazolidinedione only (no other indicators) and also diagnosed with polycystic ovary syndrome, HIV lipodystrophy, metabolic syndrome, pre-diabetes or reproductive problems. The Registry is updated annually. This data is available for all subjects, both respondents and non-respondents, and allows for a substantive assessment of survey response bias.

In addition to individual-level measures, we geocoded the home addresses of all respondents and non-respondents, linked their census block group and tract to 2000 Census data, and created contextual indicators describing neighborhood (census block group level) characteristics and a factor-analytically derived deprivation index. Baseline clinical characterizations were obtained from the extensive Kaiser administrative databases including current pharmacotherapy utilization and adherence[19], laboratory findings, history of co-morbid events and procedures, use of emergency room, outpatient and inpatient health services, outpatient and inpatient risk scores based on health care utilization and severity of disease[20] and the end-stage renal disease registry. All follow-up data will be captured from these same sources. Additionally, deaths will be captured annually from the state mortality files.

This survey will be the basis for longitudinal evaluations of a wide range of clinical outcomes associated with diabetes and is powered to evaluate the ethnic and educational disparities in diabetes-related complication rates (e.g., myocardial infarction, stroke, heart failure, kidney failure, amputation) and mortality after a 2.5 year follow-up. This study was approved by the Kaiser Foundation Research Institute Institutional Review Board (IRB).

Subjects

The Registry consisted of 199,123 members as of January 1, 2005, from which we identified 142,331 current health plan members 30 to 75 years of age residing in northern California zip codes 93600 to 96199. Self-reported race/ethnicity was available for 104,117 (73%) prior to the survey based on hospitalization records, prior surveys and administrative databases. We then identified a sampling frame of 58,624 members, over-sampling non-Caucasian members and excluding members known to be of mixed ethnicity: 8,000 African American, 8,000 Caucasian, 8,000 Latino and 14,624 Asian (all known Asians in the sampling frame). Because race/ethnicity data is recorded during hospital admission, members with unknown ethnicity have never been hospitalized in the Kaiser system and thus are likely younger, healthier or more recently diagnosed with diabetes; therefore, an additional 20,000 members of unknown ethnicity were added to the sampling frame to balance the case mix of our sample.

For every patient in the sampling frame, we made a written request to his or her primary care provider for permission to contact the patient for participation in this study, and excluded patients who were inappropriately identified (e.g., physician reported that patient did not have diabetes, was incompetent or not living in the community). After removing patients excluded by their physician, we selected an ethnically-stratified, random sample of 40,735 health plan members to receive the DISTANCE Survey: 6,871 African American (17%), 11,197 Asian (27%), 4,233 Caucasian (10%), 7,018 Latino (17%) and 11,417 members of unknown ethnicity (28%).

Survey content

The survey included 184 questions covering a wide range of social and behavioral factors that we hypothesized to be potentially confounding, moderating or mediating factors associated with social disparities in diabetes-related outcomes (Table 1). Every effort was made to create a survey with language, font and layout that would be accessible to non-

English speakers and persons of low literacy or visual acuity[21,22]. Our two primary exposures/attributes of interest were education (years of education and degrees earned) and self-reported race/ethnicity. Other social factors surveyed included country of birth, acculturation and language fluency, subjective socioeconomic position[23,24] and several objective measures of socioeconomic position: parental educational attainment[25], individual educational attainment[26,27], employment[28,29], income[30], assets[30,31], marital status and family size.

The survey included extensive questions on health behaviors and self-reported symptoms not readily available in administrative data: diet[32], physical activity[33], smoking[28], alcohol consumption[34], self-monitoring of blood glucose (SMBG)[35], oral health[36,37], self-examination of feet[38], medication adherence[39-41], multivitamin use[42], TV watching[25], attitudes and beliefs about diabetes[30], internal versus external locus of control[43,44], social support[30,45-47], health status[48,49], stress[50], depression[29,51-53], sleep quality[54-56], chronic pain[48], personality traits[57-59], health literacy[60-62], diabetes knowledge[63,64], medical and dental coverage, medical costs and ability to pay[65], medical visit travel time[66], language barriers, delayed treatment[67], provider recommendations regarding aspirin[68] and SMBG[69], foot exam by physician[70], quality of care[71], discrimination[72,73], provider communication and interactions[74-76], trust in provider[77,78] and self-reported height, weight[79], symptoms, complications[80], erectile dysfunction or female urinary incontinence. The complete survey is available at http://www.dor.kaiser.org/studies/diabetes/DISTANCE_Survey_FINAL_2006.pdf .

Survey modes

The 184-question survey included four modes of administration: 1) a computer-assisted telephone interview (CATI) administered by a third party, 2) a password-enabled, internet-accessible survey ("web survey") maintained on a secure server at the Kaiser Division of Research, 3) a self-administered, written survey or 4) a short version of the

written survey. The content of each survey mode was identical except for slight adjustments in wording and logic patterns as needed and was estimated to take 45-60 minutes to complete; the short written version was abridged and contained 40 questions. The written and web surveys were in English only, but the CATI was available in English, Spanish, Cantonese, Mandarin and Tagalog using certified translations of an English script and was intended to maximize accessibility to those with language barriers or limited English literacy or fluency.

Survey process

Our study logo and name were intended to create an appealing study identity that subjects could easily recognize in follow-up contacts. Beginning in May, 2005, initial contact letters were sent by mail in twelve waves to inform subjects of the study and invite them to participate in the survey or decline. As an incentive to participate, patients were offered a $10 gift card from a major supermarket chain, to be mailed upon completion of a survey. Each contact letter and follow-up mailing provided a unique logon identification and password to allow access to the web survey at any time Members who did not return a reply form or access the web survey were contacted by CATI interviewers with up to 15 call-back attempts before being considered unreachable. Subjects not interviewed were mailed a written survey; we followed-up with non-respondents at approximately four week intervals by sending a reminder letter and up to two copies of the short written version of the survey. Finally, at the end of the survey process, we sent "last request" letters on November 1, 2006 to all remaining non-respondents, informing them that the survey request and gift card incentive offer would expire in four weeks. In summary, after the initial contact by mail and 15 telephone interview attempts, non-respondents received up to five more follow-up contacts by mail in an effort to maximize the response.

The IRB approved all study instruments and scripts and waived the requirement for written informed consent; participation in the survey was accepted as implied consent.

Data quality and processing

Detailed data dictionaries were developed for each of the four survey modes; data from each mode was handled separately and later harmonized and merged into one final data set. If a subject submitted more than one survey, a rule was applied to seek the version with the most complete data and, if more than one complete survey was submitted, the order of acceptance priority was CATI, web, written-long, written-short. Each CATI was conducted by professional interviewers employed, trained and supervised by the Public Health Institute/Survey Research Group in Sacramento, CA, which has its own internal quality controls; additional diabetes-specific training was provided on-site by a Kaiser diabetes health educator. Interviewers entered subject responses into active screens and there were internal checks for valid ranges. Question-specific instructions were provided to insure that interviewers gave the same information to each respondent and supervisors could also listen to calls for quality control.

Written surveys (long- and short-forms) were coded and edited using an extensive data dictionary and detailed coding rules to standardize and clarify responses before being sent to the Data Entry department at the Kaiser Division of Research, which conducted double data entry. The web survey data was entered by the respondents on their own computer and no out-of-range data were accepted. Upon submission, these web data were immediately available for viewing and analysis. For all modes, open-ended text responses were subsequently categorized and coded by staff.

Statistical Methods

We will employ a modeling approach using inverse weighting estimation of marginal structural models[81] to investigate causal relationships in this study. These models will include weights to adjust for the non-proportionate sampling fractions (e.g., over-sampling of the minority ethnic groups) and response bias (e.g., giving greater weight to

respondents who have characteristics more similar to the non-respondents). Thus, the proposed estimating approach will adjust for confounding and selection bias simultaneously[82-86].

Survey Response

The survey was in the field from May 5, 2005 until December 31, 2006. Of the 40,735 members selected for this study, 20,188 completed a survey (Table 2). The participation by ethnicity was 3,420 African Americans (16.9%), 2,312 Asian (11.4%), 4,602 Caucasians (22.8%), 2,404 Filipinos (11.9%), 3,717 Latinos (18.4%), 2,222 multi-racial (11.0%) and 1,511 South Asian, Pacific Islander, Native America, Eskimo or other/unknown (7.5%). The distribution by mode was 10,429 CATI (51.7%), 4,288 written survey (21.2%), 2,393 short version (11.8%) and 3,078 web (15.2%).

Among subjects contacted for the survey, 4,869 members were identified as ineligible because they denied having diabetes (n=2,534), used another health insurance plan for their primary diabetes care (n=336), were no longer enrolled in the Kaiser Permanente Health Plan (n=367), were living in an institution (n=87), were deceased (n=138), did not speak English, Spanish, Mandarin or Cantonese (n=962) and/or were unable or incompetent to participate (n=458). Using an algorithm endorsed by the Council of American Survey Research Organizations (CASRO), if persons unable to be contacted had the same rate of eligibility as those contacted and were counted in the denominator, the survey response rate was 62%. Of the 20,188 respondents to this current survey, 4,524 subjects (22%) had also responded to the prior Diabetes Registry Questionnaire (1994-97).

Respondent characteristics

Respondents varied widely in clinical and behavioral profiles, as well as education, income, wealth, occupation, nativity and neighborhood characteristics. We observed some differences in baseline characteristics across the five primary groups.

African American respondents were more likely to be female, have English as their preferred language, have been born in U.S., have experienced poverty, use insulin, have low levels of physical activity, more years since diabetes diagnosis, elevated body mass index (BMI), elevated levels of low-density lipoprotein (LDL), uncontrolled blood pressure, a current smoker, have higher co-morbidity scores and live in a deprived neighborhood.

Asian respondents were more likely to be male, over 60 years of age, to not have English as preferred language, have post-graduate education, very low income (<$10,000) or high income ($\geq$ $80,000), no experience of poverty, continuous insurance coverage, lower BMI, lower levels of LDL, better blood pressure control, lower missed appointment rate, better medication adherence, non-smoker, not practicing self-monitoring of blood glucose (SMBG), have lower co-morbidity scores and not live in an economically deprived or working class neighborhood.

Caucasian respondents were more likely to complete the web survey, to not have very low income (<$10,000), have managerial jobs, use no diabetes medications, to be physically active, have elevated BMI, lower mean A1C, practice SMBG and not live in linguistically isolated neighborhood.

Filipino respondents were more likely to participate via written survey, to be older than 45 years of age, be a college graduate, be immigrants, have technical jobs, use only oral hypoglycemic agents (OHA), have low levels of physical activity, fewer years since diagnosis of diabetes, lower levels of LDL, and lower co-morbidity scores.

Latino respondents were more likely to participate via CATI, to be younger than 45 years of age, not have English as their preferred language, to have the least years of education,

lower income (<$50,000/year), to have had gaps in health plan coverage, have service or labor jobs, have higher mean A1c, higher rates of missed appointments, poorer medication adherence and live in a linguistically isolated or working class neighborhood.

Analysis of response bias

We had pre-baseline reported race data for 29,319 (72%) members of the DISTANCE cohort and observed differences in response rates by race: African Americans 52%, Asians 46%, Caucasians 63%, Latinos 53%, unknown 45% (p<0.0001). We had educational attainment data for 4,524 subjects (22%) who had completed the previous survey in 1994-97 and observed that subjects with a high school education or less participated at a lower rate than those with more than a high school education (54% vs. 60%) (p<0.0001).

A more complete view of response bias was obtained from health plan administrative data and census data which was available for all members of the cohort. We found few notable differences between respondents and non-respondents in demographic, clinical, behavioral or neighborhood characteristics. Compared to respondents, non-respondents had higher mean low-density lipoprotein levels (99.3 vs. 94.3 mg/dL) and were less likely to practice SMBG (32 vs. 46%). However, a portion of these unadjusted differences are likely due to age differences in respondents versus non-respondents.

We conducted an assessment of response bias by comparing A1C differences across ethnic groups separately among respondents and non-respondents. We evaluated whether response bias may impact associations by evaluating social disparities in glycemic control by specifying a logistic regression model of poor glycemic control regressing ethnicity, age and sex and interaction terms (ethnicity x survey response) on the outcome, A1C >7%. Although respondents consistently had higher A1C than non-respondents, ethnic differences in A1C did not differ between respondents and non-respondents (p=0.55). We conducted a similar analysis with the subjects for whom we had

13

educational attainment data from a previous survey and again found no substantive response bias (p=0.28).

Discussion

Repeated contacts with subjects and multiple options for answering the survey (written, telephone interview or web-based) yielded a satisfactory response rate in this survey of social disparities in diabetes. The survey data complement other baseline data from health plan clinical and administrative data, census data on neighborhood characteristics and mortality.

Follow-up data will be obtained from the extensive Kaiser administrative databases including current pharmacotherapy utilization and adherence[87], laboratory findings, history of co-morbid events and procedures, use of emergency room, outpatient and inpatient health services, outpatient and inpatient risk scores based on health care utilization and severity of disease,[88] the end-stage renal disease registry and from the state mortality files. Data from all sources combined may offer insights into how changes in behaviors, type of therapy, intermediate health status and psychosocial factors may affect social disparities in diabetes health and end-stage diabetes complications and mortality.

Limitations & Strengths

There are some limitations and strengths worth noting. Written and web surveys were only offered in English. However, telephone interviewers made the initial efforts to contact subjects who had the opportunity to complete interviews in Spanish, Mandarin, Cantonese or Tagalog. Offering the survey by oral interview in multiple languages was intended to mitigate the language and/or literacy barriers, but we observed lower participation rates by those with less education and modest response differences by race.

On a more favorable note, 84% of non-respondents were identified by the health plan as having English as their preferred language, suggesting that language alone was not a major barrier to participation.

The response rate was, as expected, lower than our previous Diabetes Research Questionnaire (1994-97). A recent survey conducted in the Translating Research Into Action for Diabetes (TRIAD) study among managed care populations across the United States, including Kaiser[89], had a response rate of approximately 50%. The Behavioral Risk Factor Surveillance System also experienced a decline in median response rates, from 63.2% in 1996 to 53.5% in 2001[90]. Privacy concerns and competition from telemarketing have probably played a role in declining response rates. However, if generally lower response rates have been observed in minority populations, the response rate for this survey may be considered favorable given that 77% of our sample were racial or ethnic minority health plan members.

Response bias is a concern in any survey. Surveys are subject to response bias if participation is associated with the risk factors (exposures) and/or diseases (outcomes) under investigation. In this study population we have substantial data on non-respondents, including Kaiser administrative data, co-morbidity and census data on neighborhood characteristics, allowing us to compare hypothesized relationships in respondents versus non-respondents and adjust for this potential response bias[91]. While participation was somewhat lower among minorities and those with less education, overall, respondents and non-respondents were quite similar.

For this survey, we provided an example of an assessment of response bias by comparing A1C differences across ethnic groups separately among respondents and non-respondents, and observed little evidence of response bias. Although descriptions of populations may be biased when characteristics differ between respondents and non-respondents (response bias), associations (slopes) are typically less vulnerable to such bias[92,93]. Analyses of DISTANCE data will focus on associations rather than descriptive characterization and the use of marginal structural models described above

will re-weight our sample to adjust for differences in characteristics among respondents and non-respondents.

Conclusion

The diversity, size and wealth of data included in the DISTANCE cohort make it suitable for the prospective study of a wide range of social disparities in the processes and outcomes of diabetes health care. Information about childhood socioeconomic position and educational attainment will facilitate a life course approach[94,95]. This survey will be the basis for longitudinal evaluations of a wide range of clinical outcomes associated with diabetes and is powered to evaluate the ethnic and educational disparities in diabetes-related complication rates and mortality after a 2.5 year follow-up.

Acknowledgements

Table 1: Clinical, behavioral, psychosocial and quality and access indicators.

Domain	Survey scales or variables
Demographic	Age Sex Race Nativity Language
Socioeconomic	Education • years of school • highest degree attained • quality-weighted attainment • functional health literacy Income Occupation
Clinical Profile	Laboratory Values Blood Pressure Body Mass Index Inpatient And Outpatient Utilization Pharmacy Utilization Type Of Diabetes Co-morbidity Index Self-reported clinical characteristics
Health Behaviors, Adherence, Knowledge	Self-Care Behaviors • smoking • alcohol • exercise • medication refill adherence & discontinuation • self-monitoring of blood glucose • insulin injection frequency • appointment-keeping adherence • health screening adherence • sleep adequacy Diabetes Knowledge
Psychosocial Characteristics	Big Five Personality facets of conscientiousness and neuroticism Perceived Stress Depressive And Anxiety Disorders Social Support And Social Networks Discrimination
Socioeconomic Position (SEP)	Individual-Level Socioeconomic Indicators Neighborhood SEP Contextual Variables Subjective Measures Of SEP Financial Barriers
Patient-Provider Relationship	Patient-Provider Communication Primary Care Provider Characteristics
Quality And Access To Care	Processes Of Care Referrals For Specialty Care

Table 2. Characteristics of survey respondents and non-respondents

	Respondents Number (%) or Mean±(SD)								Non-respondents
	African American	Asian (Chinese, Korean, Vietnamese, Japanese)	Caucasian	Filipino	Latino	Multiracial	Other*/ unknown	All respondents	Non respondents Number (%) or Mean±(SD)
Survey data									
N (row %)	3,420 (16.9)	2,312 (11.4)	4,602 (22.8)	2,404 (11.9)	3,717 (18.4)	2,222 (11.0)	1,511 (7.5)	20,188 (100)	20,547 (100)
Survey Mode									
Telephone Interview	1,806 (52.8)	971 (42.0)	2,051 (44.6)	846 (35.2)	2,229 (60.0)	1,566 (70.5)	960 (63.5)	10,429 (51.7)	0
Written-long	771 (22.5)	575 (24.9)	973 (21.1)	723 (30.1)	676 (18.2)	346 (15.6)	224 (14.8)	4,288 (21.2)	0
Written-short	439 (12.8)	259 (11.2)	469 (10.2)	516 (21.5)	448 (12.0)	108 (4.9)	154 (10.2)	2,393 (11.8)	0
Web	404 (11.8)	507 (21.9)	1,109 (24.1)	319 (13.3)	364 (9.8)	202 (9.1)	173 (11.4)	3,078 (15.2)	0
Educational attainment									
Did not graduate HS	389 (11.6)	300 (13.2)	502 (11.0)	105 (4.4)	1,287 (35.9)	378 (17.2)	348 (24.3)	3,309 (16.7)	Not available
High school grad/GED	1,156 (34.3)	505 (22.2)	1,539 (33.9)	406 (17.2)	1,092 (30.4)	696 (31.6)	337 (23.5)	5,731 (29.0)	
Some college	1,063 (31.6)	482 (21.2)	1,162 (25.6)	518 (21.9)	844 (23.5)	622 (28.2)	238 (16.6)	4,929 (24.9)	
College graduate	463 (13.8)	611 (26.9)	828 (18.2)	1,173 (49.5)	236 (6.6)	358 (16.2)	271 (18.9)	3,940 (19.9)	
Post-graduate	296 (8.8)	375 (16.5)	512 (11.3)	166 (7.0)	129 (3.6)	149 (6.8)	239 (16.7)	1,866 (9.4)	
Education (years)	15.0±(3.1)	15.1±(4.7)	15.1±(3.4)	15.1±(3.9)	11.8±(4.8)	14.2±(4.3)	12.8±(7.0)	14.2±(4.5)	Not available
Born in the US	3,290 (96.5)	877 (38.0)	4,210 (91.6)	121 (5.1)	1,920 (51.8)	1,469 (66.2)	203 (23.6)	12,090 (62.0)	Not available
Annual Household Income									
<$10,000	201 (6.7)	155 (8.0)	113 (2.8)	123 (6.0)	232 (7.1)	131 (6.7)	35 (4.4)	990 (5.8)	Not available
$10,000-$24,999	416 (13.9)	250 (12.9)	467 (11.4)	244 (11.8)	625 (19.2)	273 (14.0)	97 (12.3)	2,372 (13.9)	
$25,000-$49,999	933 (31.2)	409 (21.1)	1145 (28.0)	561 (27.1)	1,140 (35.0)	593 (30.4)	193 (24.5)	4,974 (29.1)	
$50,000-$79,999	782 (26.1)	439 (22.6)	1072 (26.2)	512 (24.8)	738 (22.6)	483 (24.7)	182 (23.1)	4,208 (24.6)	
$80,000-149,999	541 (18.1)	544 (28.1)	1021 (25.0)	510 (24.7)	455 (14.0)	385 (19.7)	204 (25.9)	3,660 (21.4)	
$150,000 or more	119 (4.0)	142 (7.3)	275 (6.7)	118 (5.7)	70 (2.2)	89 (4.6)	77 (9.8)	8,90 (5.2)	
"Poverty" †	335 (10.2)	79 (3.6)	209 (4.7)	163 (7.2)	345 (9.7)	201 (9.5)	68 (7.8)	1,400 (7.5)	Not available
"Underinsurance" ‡	103 (3.7)	57 (3.1)	254 (6.2)	67 (3.5)	272 (9.3)	115 (6.8)	45 (6.1)	913 (5.7)	Not available

Occupation class									Not available
Managerial	1,099 (32.6)	898 (39.3)	1,875 (41.2)	640 (27.0)	696 (19.0)	641 (29.0)	452 (38.9)	6,301 (32.1)	
Technical	1,074 (31.9)	609 (26.6)	1,330 (29.2)	887 (37.4)	880 (24.0)	696 (31.5)	281 (24.2)	5,757 (29.4)	
Service	451 (13.4)	302 (13.2)	359 (7.9)	357 (15.1)	590 (16.1)	288 (13.0)	132 (11.4)	2,479 (12.6)	
Farming	12 (0.4)	20 (0.9)	33 (0.7)	13 (0.6)	100 (2.7)	37 (1.7)	17 (1.5)	232 (1.2)	
Production/craft	177 (5.3)	145 (6.3)	381 (8.4)	121 (5.1)	465 (12.7)	195 (8.8)	88 (7.6)	1,572 (8.0)	
Operators/laborers	426 (12.6)	186 (8.1)	395 (8.7)	253 (10.7)	654 (17.9)	281 (12.7)	138 (11.9)	2,333 (11.9)	
Military	31 (0.9)	4 (0.2)	15 (0.3)	24 (1.0)	11 (0.3)	6 (0.3)	3 (0.3)	94 (0.5)	
Homemaker	59 (1.8)	82 (3.6)	125 (2.8)	33 (1.4)	201 (5.5)	53 (2.4)	31 (2.7)	584 (3.0)	
Never worked	11 (0.3)	15 (0.7)	7 (0.2)	14 (0.6)	15 (0.4)	6 (0.3)	8 (0.7)	76 (0.4)	
Don't know	28 (0.8)	26 (1.1)	29 (0.6)	27 (1.1)	49 (1.3)	9 (0.4)	12 (1.0)	180 (0.9)	
Diabetes therapy									Not available
Insulin	967 (28.5)	375 (16.3)	1162 (25.4)	357 (15.0)	760 (20.5)	501 (22.6)	240 (16.1)	4,362 (21.7)	
OHA only	2,070 (60.9)	1,625 (70.6)	2,766 (60.4)	1,793 (75.2)	2,522 (68.1)	1,455 (65.8)	985 (66.1)	13,216 (65.8)	
No medication	360 (10.6)	300 (13.0)	655 (14.3)	235 (9.8)	421 (11.4)	256 (11.6)	265 (17.8)	2,492 (12.4)	
Physical Activity §									Not available
Insufficient	1,997 (58.4)	1,261 (54.5)	2,343 (50.9)	1,407 (58.5)	1,962 (52.8)	1,125 (50.6)	1,078 (71.3)	11,173 (55.3)	
Sufficient	510 (14.9)	406 (17.6)	657 (14.3)	378 (15.7)	549 (14.8)	365 (16.4)	145 (9.6)	3,010 (14.9)	
Highly Active	913 (26.7)	645 (27.9)	1,602 (34.8)	619 (25.8)	1,206 (32.4)	732 (32.9)	288 (19.1)	6,005 (29.8)	
Years since diabetes diagnosis	11.1±(9.0)	10.8±(10.0)	10.4±(9.6)	9.6±(8.0)	10.2±(8.7)	9.8±(8.3)	9.6±(8.7)	10.3±(9.0)	Not available
Body Mass Index (kg/m^2)	32.5±(7.7)	26.6±(4.8)	32.6±(7.5)	27.0±(4.8)	32.0±(6.7)	31.7±(7.2)	28.3±(6.0)	30.8±(7.2)	Not available
Data from electronic records									
Female	1,939 (56.7)	1,019 (44.1)	2,035 (44.2)	1,246 (51.8)	1,886 (50.7)	1,122 (50.5)	593 (39.3)	9,840 (48.7)	9,537 (46.4)
Age (years)									
30-44	274 (8.0)	137 (5.9)	382 (8.3)	168 (7.0)	564 (15.2)	253 (11.4)	189 (12.5)	1,967 (9.7)	2,580 (12.6)
45-59	1,347 (39.4)	934 (40.4)	1,794 (39.0)	1,106 (46.0)	1,639 (44.1)	943 (42.4)	695 (46.0)	8,458 (41.9)	8,755 (42.6)
60+	1,799 (52.6)	1,241 (53.7)	2,426 (52.7)	1,130 (47.0)	1,514 (40.7)	1,026 (46.2)	627 (41.5)	9,763 (48.4)	9,212 (44.8)
Language preference English speaking	3,221 (94.2)	1,376 (59.5)	4,394 (95.5)	1,749 (72.8)	2,217 (59.6)	1,691 (76.1)	1,164 (77.0)	15,812 (78.3)	17,212 (83.8)
Glycosylated A1C (%)	7.5±(1.7)	7.2±(1.2)	7.2±(1.4)	7.5±(1.4)	7.7±(1.7)	7.6±(1.7)	7.5±(1.5)	7.4±(1.6)	7.5±(1.7)
Mean A1C >= 7%	1,655 (54.0)	1,087 (50.1)	1,915 (46.8)	1,352 (60.4)	1,957 (58.6)	1,098 (56.2)	779 (57.9)	9,843 (54.1)	8,343 (51.3)

Low-density lipoproteins (LDL) (mg/dL)	98.5±(30.6)	89.3±(26.9)	94.1±(28.9)	90.3±(27.4)	94.9±(29.0)	97.2±(34.7)	95.4±(31.4)	94.3±(29.8)	99.3±(32.1)
Mean LDL >= 100	1,250 (41.7)	626 (28.9)	1,391 (34.6)	634 (28.6)	1,202 (37.1)	736 (38.1)	482 (36.3)	6,321 (35.3)	6,909 (42.4)
Uncontrolled blood pressure (S>130 OR D>80)	1,966 (61.4)	913 (42.8)	2,264 (54.7)	1,041 (46.5)	1,746 (51.2)	1,089 (54.2)	681 (49.5)	9,700 (52.4)	9,581 (54.3)
Missed appointment rate (per year)	0.17±(0.18)	0.10±(0.14)	0.13±(0.16)	0.13±(0.17)	0.18±(0.19)	0.17±(0.19)	0.18±(0.19)	0.15±(0.17)	0.18±(0.22)
Poor medication adherence ‖	955 (37.1)	461 (25.1)	961 (28.2)	592 (29.3)	1,247 (42.8)	636 (36.4)	424 (35.1)	52,76 (33.6)	5,108 (39.0)
Smoking (current)	348 (10.2)	93 (4.0)	410 (9.0)	147 (6.1)	245 (6.6)	200 (9.1)	105 (7.0)	1548 (7.7)	1829 (9.0)
Practices SMBG	1,573 (46.0)	1,004 (43.4)	2,246 (48.8)	1,115 (46.4)	1,622 (43.6)	1,025 (46.1)	623 (41.2)	9,208 (45.6)	6,532 (31.8)
Outpatient risk score ¶	2.4 (2.1)	1.8 (1.1)	2.1 (1.7)	1.8 (1.0)	1.9 (1.4)	2.2 (1.6)	1.9 (1.4)	2.0 (1.6)	1.8 (1.5)
Inpatient risk score ¶	2.6 (4.2)	1.5 (2.0)	2.2 (3.3)	1.4 (2.1)	1.8 (3.0)	2.2 (3.9)	1.7 (2.9)	2.0 (3.2)	1.8 (3.4)
Neighborhood									
Linguistically isolated #	105 (3.1)	115 (5.0)	55 (1.2)	114 (4.8)	281 (7.6)	113 (5.1)	62 (4.1)	845 (4.2)	1,035 (5.1)
Economically deprived **	827 (24.3)	124 (5.4)	346 (7.6)	148 (6.2)	668 (18.2)	323 (14.7)	167 (11.2)	2,603 (13.0)	2,724 (13.4)
Working class ††	1,440 (42.2)	401 (17.4)	1,168 (25.8)	884 (37.0)	1749 (47.6)	868 (39.4)	464 (31.0)	6,974 (34.9)	7,566 (37.2)

* **Other/unknown** includes Pacific Islanders, Native Americans, South Asian, other unspecified and unknown (did not answer)

† **"Poverty"** = insufficient funds to purchase food, clothes, other needed items "fairly often" or "very often"

‡ **"Underinsurance"** = history of underinsurance (more than 1 year without health insurance during past 10 years)

§ "**Physical Activity**" measured by International Physical Activity Questionnaire[96]

‖ **"Medication non-adherence"** = >20% continuous medication gaps[97]

¶ **"Outpatient risk score"** and **"Inpatient risk score"** are weighted by patient's health care utilization & severity of disease[98]

"Linguisitically isolated" = >25% of households in census block group are linguistically isolated

** **"Economically deprived"** = >20% of households in census block group are living below poverty line

†† **"Working class"** = >66% of persons in census block group are employed in working class occupation

References

Reference List

1. **Healthy People 2010.** *U S Department of Health and Human Services* 2005, **http://www.healthypeople.gov/:** last accessed Aug 2, 2007.

2. 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.

3. Karter AJ, Ferrara A, Liu JY, Moffet HH, Ackerson LM, Selby JV: **Ethnic disparities in diabetic complications in an insured population.** *JAMA 2002 May 15 ;287 (19):2519 - 27* 2002, **287:** 2519-2527.

4. Chaturvedi N, Jarrett J, Shipley MJ, Fuller JH: **Socioeconomic gradient in morbidity and mortality in people with diabetes: cohort study findings from the Whitehall Study and the WHO Multinational Study of Vascular Disease in Diabetes.** *BMJ* 1998, **316:** 100-105.

5. Booth GL, Hux JE: **Relationship between avoidable hospitalizations for diabetes mellitus and income level.** *Arch Intern Med 2003 Jan 13;163 (1):101 -6* 2003, **163:** 101-106.

6. Smedley BD, Stith AY, Nelson AR. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Institute of Medicine. 2002. Washington, D.C., National Academy Press.

7. Karter AJ, Newman B, Rowell S, Harrison R, Birner CR, St.Pierre DJ *et al.*: **Large-scale collection of family history data and recruitment of informative families for genetic analysis.** *Journal of Registry Management* 1998, **25:** 7-12.

8. Karter AJ, Ferrara A, Darbinian J, Ackerson LM, Selby JV: **Self-monitoring of Blood Glucose: Language and financial barriers in a managed care population with diabetes.** *Diabetes Care* 2000, **23:** 477-483.

9. Karter AJ, Moffet HH, Liu J, Parker MM, Ahmed AT, Ferrara A *et al.*: **Achieving good glycemic control: initiation of new antihyperglycemic therapies in patients with type 2 diabetes from the Kaiser Permanente Northern California Diabetes Registry.** *Am J Manag Care* 2005, **11:** 262-270.

10. Karter AJ, Ackerson LM, Darbinian JA, D'Agostino RB, Ferrara A, Liu J *et al.*: **Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanente Diabetes registry*.** *Am J Med* 2001, **111:** 1-9.

11. Karter AJ, Ferrara A, Liu JY, Moffet HH, Ackerson LM, Selby JV: **Ethnic disparities in diabetic complications in an insured population.** *JAMA 2002 May 15 ;287 (19):2519 -27* 2002, **287:** 2519-2527.

12. Karter AJ, Parker MM, Moffet HH, Ahmed AT, Ferrara A, Liu JY *et al*.: **Missed appointments and poor glycemic control: an opportunity to identify high-risk diabetic patients.** *Med Care 2004 Feb ;42 (2):110 -5* 2004, **42:** 110-115.

13. Selby JV, Karter AJ, Ackerson LM, Ferrara A, Liu J: **Developing a prediction rule from automated clinical databases to identify high-risk patients in a large population with diabetes.** *Diabetes Care 2001 Sep ;24 (9):1547 -55* 2001, **24:** 1547-1555.

14. Kleinbaum DG, Kupper LL, Morgenstern H: *Epidemiologic Research: Principles and Quantitative Methods*. New York: Van Norstrand Reinhold; 1982.

15. **Kaiser Permanente Business Intelligence Report 2006.** *Research and Markets* 2006, **http://www.researchandmarkets.com/reportinfo.asp?report_id=451423 :** last accessed July 9 2007.

16. 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.

17. Karter AJ, Ackerson LM, Darbinian JA, D'Agostino RB, Ferrara A, Liu J *et al*.: **Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanente Diabetes registry*.** *Am J Med* 2001, **111:** 1-9.

18. Hiatt RA, Friedman GD: **Characteristics of patients referred for treatment of end-stage renal disease in a defined population.** *Am J Public Health* 1982, **72:** 829-833.

19. Steiner JF, Koepsell TD, Fihn SD, Inui TS: **A general method of compliance assessment using centralized pharmacy records. Description and validation.** *Med Care* 1988, **26:** 814-823.

20. Clark DO, Von Korff M, Saunders K, Baluch WM, Simon GE: **A chronic disease score with empirically derived weights.** *Med Care* 1995, **33:** 783-795.

21. Dillman DA: *Mail and Internet surveys : the tailored design method*, 2nd edn. New York: John Wiley; 2000.

22. Rudd RE, Comings JP, Hyde JN: **Leave no one behind: improving health and risk communication through attention to literacy.** *J Health Commun* 2003, **8 Suppl 1:** 104-115.

23. Singh-Manoux A, Adler NE, Marmot MG: **Subjective social status: its determinants and its association with measures of ill-health in the Whitehall II study.** *Soc Sci Med* 2003, **56:** 1321-1333.

24. John D.and Catherine T.MacArthur Research Network on Socioeconomic Status and Health: **The MacArthur Scale of Subjective Social Status.** *University of California San Francisco* 1999, **http://www.macses.ucsf.edu/Research/Psychosocial/notebook/subjective.html** : last accessed July 12, 2007.

25. White S, Dillow S: *Key Concepts and Features of the 2003 National Assessment of Adult Literacy (NAALS) (NCES 2006-471)*. Department of Education.Washington, DC: National Center for Education Statistics.; 2005.

26. Ross CE, Wu CL: **Education, age, and the cumulative advantage in health.** *J Health Soc Behav* 1996, **37:** 104-120.

27. Ross CE, Mirowsky J: **Refining the association between education and health: the effects of quantity, credential, and selectivity.** *Demography* 1999, **36:** 445-460.

28. Botman SL, Moore TF, Moriarity CL, Parsons VL: *Design and estimation for the National Health Interview Survey (NHIS), 1995-2004*, 2 edn. National Center for Health Statistics; 2000.

29. Friedman GD, Cutter GR, Donahue RP, Hughes GH, Hulley SB, Jacobs DR, Jr. *et al*.: **CARDIA: study design, recruitment, and some characteristics of the examined subjects.** *J Clin Epidemiol* 1988, **41:** 1105-1116.

30. Ross CE, Wu CL: **The links between education and health.** *American Sociological Review* 1995, **60:** 719-745.

31. Robert S, House JS: **SES differentials in health by age and alternative indicators of SES.** *J Aging Health* 1996, **8:** 359-388.

32. Toobert DJ, Hampson SE, Glasgow RE: **The summary of diabetes self-care activities measure: results from 7 studies and a revised scale.** *Diabetes Care 2000 Jul ;23 (7):943 -50* 2000, **23:** 943-950.

33. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE *et al*.: **International physical activity questionnaire: 12-country reliability and validity.** *Med Sci Sports Exerc* 2003, **35:** 1381-1395.

34. Gordon AJ, Maisto SA, McNeil M, Kraemer KL, Conigliaro RL, Kelley ME *et al*.: **Three questions can detect hazardous drinkers.** *J Fam Pract* 2001, **50:** 313-320.

35. Toobert DJ, Hampson SE, Glasgow RE: **The summary of diabetes self-care activities measure: results from 7 studies and a revised scale.** *Diabetes Care 2000 Jul ;23 (7):943 -50* 2000, **23:** 943-950.

36. National Health and Nutrition Examination Survey (NHANES) Questionnaire (2001-2002). Centers for Disease Control and Prevention (CDC).National Center for Health

Statistics (NCHS). 2002. Hyattsville, MD: U.S., Department of Health and Human Services, Centers for Disease Control and Prevention.

37. Behavioral Risk Factor Surveillance System (BRFSS). Centers for Disease Control and Prevention (CDC).National Center for Health Statistics (NCHS). 2003. Hyattsville, MD, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

38. Toobert DJ, Hampson SE, Glasgow RE: **The summary of diabetes self-care activities measure: results from 7 studies and a revised scale.** *Diabetes Care 2000 Jul ;23 (7):943 -50* 2000, **23:** 943-950.

39. Chien-Wen T, Phillips RL, Green LA, Fryer GE, Dovey SM: **What physicians need to know about seniors and limited prescription benefits, and why.** *Am Fam Physician* 2002, **66:** 212.

40. Morisky DE, Green LW, Levine DM: **Concurrent and predictive validity of a self-reported measure of medication adherence.** *Med Care* 1986, **24:** 67-74.

41. Toobert DJ, Hampson SE, Glasgow RE: **The summary of diabetes self-care activities measure: results from 7 studies and a revised scale.** *Diabetes Care 2000 Jul ;23 (7):943 -50* 2000, **23:** 943-950.

42. Barringer TA, Kirk JK, Santaniello AC, Foley KL, Michielutte R: **Effect of a multivitamin and mineral supplement on infection and quality of life. A randomized, double-blind, placebo-controlled trial.** *Ann Intern Med 2003 Mar 4;138 (5):365 -71* 2003, **138:** 365-371.

43. Ross CE, Mirowsky J: **Refining the association between education and health: the effects of quantity, credential, and selectivity.** *Demography* 1999, **36:** 445-460.

44. Peyrot M, Rubin RR: **Structure and correlates of diabetes-specific locus of control.** *Diabetes Care* 1994, **17:** 994-1001.

45. Wagenknecht LE, Mayer EJ, Rewers M, Haffner S, Selby J, Borok GM *et al.*: **The insulin resistance atherosclerosis study (IRAS) objectives, design, and recruitment results.** *Ann Epidemiol* 1995, **5:** 464-472.

46. King DE, Mainous AG, III, Pearson WS: **C-reactive protein, diabetes, and attendance at religious services.** *Diabetes Care* 2002, **25:** 1172-1176.

47. Berkman LF, Syme SL: **Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents.** *Am J Epidemiol* 1979, **109:** 186-204.

48. Ware JE, Kosinski M, Keller SD: *SF-12: How to Score the SF-12 Physical and Mental Health Summary Scales*, Second edition edn. Boston: The Health Institute, New England Medical Center; 1995.

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

50. Cohen S, Kamarck T, Mermelstein R: **A global measure of perceived stress.** *J Health Soc Behav* 1983, **24:** 385-396.

51. Kroenke K, Spitzer RL, Williams JB: **The PHQ-9: validity of a brief depression severity measure.** *J Gen Intern Med 2001 Sep ;16 (9):606 -13* 2001, **16:** 606-613.

52. Spitzer RL, Kroenke K, Williams JB: **Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire.** *JAMA* 1999, **282:** 1737-1744.

53. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

54. Ayas NT, White DP, Al Delaimy WK, Manson JE, Stampfer MJ, Speizer FE *et al*.: **A prospective study of self-reported sleep duration and incident diabetes in women.** *Diabetes Care 2003 Feb ;26 (2):380 -4* 2003, **26:** 380-384.

55. Sickel AE, Moore PJ, Adler NE, Williams DR, Jackson JS: **The differential effects of sleep quality and quantity on the relationship between SES and health.** *Ann N Y Acad Sci* 1999, **896:** 431-434.

56. Moore PJ, Adler NE, Williams DR, Jackson JS: **Socioeconomic status and health: the role of sleep.** *Psychosom Med* 2002, **64:** 337-344.

57. Benet-Martinez V, John OP: **Los Cinco Grandes across cultures and ethnic groups: multitrait multimethod analyses of the Big Five in Spanish and English.** *J Pers Soc Psychol* 1998, **75:** 729-750.

58. Srivastava S, John OP, Gosling SD, Potter J: **Development of personality in early and middle adulthood: set like plaster or persistent change?** *J Pers Soc Psychol* 2003, **84:** 1041-1053.

59. Gosling SD, Rentfrow PJ, Swann WB: **A very brief measure of the Big-Five personality domains.** *Journal of Research in Personality* 2003, **37:** 504-528.

60. Schillinger D, Grumbach K, Piette J, Wang F, Osmond D, Daher C *et al*.: **Association of health literacy with diabetes outcomes.** *JAMA 2002 Jul 24 ;288 (4):475 -82* 2002, **288:** 475-482.

61. Schillinger D, Barton LR, Karter AJ, Wang F, Adler N: **Does literacy mediate the relationship between education and health outcomes? A study of a low-income population with diabetes.** *Public Health Rep* 2006, **121:** 245-254.

62. Chew LD, Bradley KA, Boyko EJ: **Brief questions to identify patients with inadequate health literacy.** *Fam Med* 2004, **36:** 588-594.

63. **The American Association of Clinical Endocrinologists Medical Guidelines for the Management of Diabetes Mellitus: The AACE System of Intensive Diabetes Self-Management—2002 Update.** *Endocrine Practice* 2002, **8 (Suppl 1):** 40-82.

64. Fitzgerald JT, Funnell MM, Hess GE, Barr PA, Anderson RM, Hiss RG *et al*.: **The reliability and validity of a brief diabetes knowledge test.** *Diabetes Care* 1998, **21:** 706-710.

65. Piette JD, Heisler M, Wagner TH: **Problems paying out-of-pocket medication costs among older adults with diabetes.** *Diabetes Care* 2004, **27:** 384-391.

66. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

67. **Epidemiology of Diabetes Interventions and Complications (EDIC). Design, implementation, and preliminary results of a long-term follow-up of the Diabetes Control and Complications Trial cohort.** *Diabetes Care* 1999, **22:** 99-111.

68. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

69. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

70. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

71. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

72. Krieger N, Sidney S, Coakley E: **Racial discrimination and skin color in the CARDIA study: implications for public health research. Coronary Artery Risk Development in Young Adults.** *Am J Public Health* 1998, **88:** 1308-1313.

73. Krieger N, Smith K, Naishadham D, Hartman C, Barbeau EM: **Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health.** *Soc Sci Med* 2005, **61:** 1576-1596.

74. CAHPS 2.0 Questionnaires. Crofton, C. AHCPR Pub. No. 97-R079. 10-1-1998. Washington DC, Agency for Health Care Policy and Research.

75. Hays RD, Shaul JA, Williams VS, Lubalin JS, Harris-Kojetin LD, Sweeny SF *et al.*: **Psychometric properties of the CAHPS 1.0 survey measures. Consumer Assessment of Health Plans Study.** *Med Care* 1999, **37:** MS22-MS31.

76. CAHPS 2.0 Questionnaires. Crofton, C. AHCPR Pub. No. 97-R079. 10-1-1998. Washington DC, Agency for Health Care Policy and Research.

77. Anderson LA, Dedrick RF: **Development of the Trust in Physician scale: a measure to assess interpersonal trust in patient-physician relationships.** *Psychol Rep* 1990, **67:** 1091-1100.

78. Thom DH, Ribisl KM, Stewart AL, Luke DA: **Further validation and reliability testing of the Trust in Physician Scale. The Stanford Trust Study Physicians.** *Med Care* 1999, **37:** 510-517.

79. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

80. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

81. Robins JM: **Association, causation, and marginal structural models.** *Synthese* 1999, **121:** 151-179.

82. Hernan MA, Hernandez-Diaz S, Robins JM: **A structural approach to selection bias.** *Epidemiology* 2004, **15:** 615-625.

83. Bodnar LM, Davidian M, Siega-Riz AM, Tsiatis AA: **Marginal structural models for analyzing causal effects of time-dependent treatments: an application in perinatal epidemiology.** *Am J Epidemiol* 2004, **159:** 926-934.

84. Bryan JF, Yu Z, van der Laan M: **Analysis of longitudinal marginal structural models.** *U C Berkeley Division of Biolstatistics Working Paper Series* 2002, **Paper 120:** 1-29.

85. Neugebauer R, van der Laan M: **Why prefer double robust estimators in causal inference?** *Journal of Statistical Planning and Inference* 2005, **129:** 405-426.

86. Wang Y, Petersen ML, Bangsberg D, van der Laan M: **Diagnosing bias in the inverse probability of treatment weighted estimator resulting from violation of experimental treatment assignment.** *U C Berkeley Division of Biolstatistics Working Paper Series* 2006, **Paper 211:** 1-25.

87. Steiner JF, Koepsell TD, Fihn SD, Inui TS: **A general method of compliance assessment using centralized pharmacy records. Description and validation.** *Med Care* 1988, **26:** 814-823.

88. Clark DO, Von Korff M, Saunders K, Baluch WM, Simon GE: **A chronic disease score with empirically derived weights.** *Med Care* 1995, **33:** 783-795.

89. **The Translating Research Into Action for Diabetes (TRIAD) Study: A multicenter study of diabetes in managed care.** *Diabetes Care 2002 Feb ;25 (2):386 -389* 2002, **25:** 386-389.

90. Porter S, Jackson K, Trosclaire A, Pederson LL, Office on Smoking and Health NCfCDPaHPC: **Prevalence of Current Cigarette Smoking Among Adults and Changes in Prevalence of Current and Some Day Smoking --- United States, 1996--2001.** *MMWR* 2003, **52:** 303-307.

91. Melton LJ3, Dyck PJ, Karnes JL, O'Brien PC, Service FJ: **Non-response bias in studies of diabetic complications: the Rochester Diabetic Neuropathy Study.** *J Clin Epidemiol* 1993, **46:** 341-348.

92. Rothman KJ, Greenland S: *Modern Epidemiology*, first edn. Philadelphia: Lippincott-Raven; 1998.

93. Van Loon AJ, Tijhuis M, Picavet HS, Surtees PG, Ormel J: **Survey Non-response in the Netherlands. Effects on Prevalence Estimates and Associations.** *Ann Epidemiol 2003 Feb ;13(2):105 -10* 2003, **13:** 105-110.

94. Smith GD, Hart C, Blane D, Gillis C, Hawthorne V: **Lifetime socioeconomic position and mortality: prospective observational study.** *BMJ* 1997, **314:** 547-552.

95. Lynch JW, Kaplan GA, Shema SJ: **Cumulative impact of sustained economic hardship on physical, cognitive, psychological, and social functioning.** *N Engl J Med* 1997, **337:** 1889-1895.

96. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE *et al.*: **International physical activity questionnaire: 12-country reliability and validity.** *Med Sci Sports Exerc* 2003, **35:** 1381-1395.

97. Steiner JF, Koepsell TD, Fihn SD, Inui TS: **A general method of compliance assessment using centralized pharmacy records. Description and validation.** *Med Care* 1988, **26:** 814-823.

98. Clark DO, Von Korff M, Saunders K, Baluch WM, Simon GE: **A chronic disease score with empirically derived weights.** *Med Care* 1995, **33:** 783-795.