Ethnic differences in appointment-keeping and implications for the patient-centered medical home--findings from the diabetes study of Northern California (DISTANCE).

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ABSTRACT:

Objective. To examine ethnic differences in appointment-keeping in a managed care setting.

Data Sources/Study Setting. Kaiser Permanente Diabetes Study of Northern California (DISTANCE), 2005-2007, n = 12,957.

Study Design. Cohort study. Poor appointment-keeping (PAK) was defined as missing > 1/3 of planned, primary care appointments. Poisson regression models were used to estimate ethnic-specific relative risks of PAK (adjusting for demographic, socio-economic, health status, and facility effects).

Data Collection/Extraction Methods. Administrative/electronic health records and survey responses.

Principal Findings. Poor appointment-keeping rates differed >2-fold across ethnicities: Latinos (12 percent), African Americans (10 percent), Filipinos (7 percent), Caucasians (6 percent), and Asians (5 percent), but also varied by medical center. Receiving >50 percent of outpatient care via same-day appointments was associated with a 4-fold greater PAK rate. PAK was associated with 20, 30, and 40 percent increased risk of elevated HbA1c (>7 percent), low-density lipoprotein (>100 mm/dl), and systolic blood pressure (>130 mmHg), respectively.

Conclusions. Latinos and African Americans were at highest risk of missing planned primary care appointments. PAK was associated with a greater reliance on same-day visits and substantively poorer clinical outcomes. These results have important implications for public health and health plan policy, as primary care rapidly expands toward open access to care supported by the patient-centered medical home model.

Key Words. Health disparities, health policy, missed appointments, diabetes, patient-centered medical home, primary care

Primary care plays a central role in disease prevention, detection, care, and monitoring. For patients with chronic conditions like diabetes, primary care providers (PCPs) schedule regular encounters to provide long-term management and monitoring. Frequently missing these diabetes care appointments can extend the time between consultations and screenings, and delay review of treatment effectiveness, identification of adverse drug effects, and needed intensification efforts. Poor clinic attendance by patients with diabetes has been associated with adverse clinical outcomes and poorer risk-factor control (Hammersley, Holland, and Walford 1985; Jacobson, Hauser, and Willett 1997; Griffin 1998; Rhee, Slocum, and Ziemer 2005; Schectman, Schorling, and Voss 2008). We previously reported that patients missing >30 percent of scheduled appointments had substantively poorer glycemic control (HbA1c 0.75 points higher; $p < .0001$) relative to those attending all appointments (Karter, Parker, and Moffet 2004).

A handful of studies have documented ethnic differences in the rates of missed PCP scheduled appointments in bivariate analyses (Griffin 1998). More recently, two multivariate studies have replicated these findings among diabetes patients, with almost double the "no-show" rates among nonwhite compared with white patients (Goldman, Friedin, and Cook 1982; Schectman, Schorling, and Voss 2008). However, there still remains skepticism regarding this association due to lack of adjustment for confounding by education, socioeconomic status, or facility effects. In addition, no study to date has had sufficient power to include Hispanic or Asian patients, thus limiting generalizability to an important segment of the U.S. population.

Ethnic differences in appointment-keeping may play an important explanatory role in poorer health outcomes among minority patients, as well as impact patient-provider relationships, health operations efficiency, costs, and population-level quality of care measures. We examined correlates of frequent missed appointments in primary care among persons with diabetes, paying special attention to ethnic differences in a large, fully insured, and culturally diverse patient population with uniform access to health care. Expanding access to primary care teams (e.g., extending same-day appointment access) and planned visits are cornerstones of the patient-centered medical home (PCMH) (Rittenhouse and Shortell 2009; Bojadzievski and Gabbay 2011). Study findings regarding ethnic differences in appointment-keeping will have policy relevance for both PCMH and health care system efforts to reduce health inequities.

METHODS

Study Population

Kaiser Permanente Northern California (KPNC) is a nonprofit, fully integrated health care delivery system that provides comprehensive medical services to over 3.2 million members. Health plan members resemble the general population except for the extreme tails of the income distribution (Hiatt and Friedman 1982; Krieger 1992; Karter, Ackerson, and Darbinian 2001). This evaluation of appointment-keeping behavior is a substudy of The Diabetes Study of Northern California (DISTANCE) (N = 20,188), a survey follow-up study among an ethnically stratified, random sample of KPNC members with diabetes, designed to assess social disparities in diabetes-related behaviors, processes of care, and health outcomes (Moffet, Adler, and Schillinger 2008). Informed consent was attained from all respondents, and the DISTANCE study protocol was approved by our Institutional Review Board.

We included DISTANCE respondents if they had continuous membership for 12 months following their survey date (2005-2006) and self-reported belonging to one of the five largest ethnic groups (African American, Caucasian, East Asian [includes Chinese, Japanese, Korean, and Vietnamese], Filipino, and Latino) in the health plan. We excluded 3,391 patients from ethnic groups (e.g., Native Americans, Pacific Islanders, South Asians) too small to support statistical analyses, 1,432 patients with gaps in membership >2 months, and an additional 2,408 (16 percent of eligible patients) who had no scheduled primary care appointments during the observation window.

Appointment-Keeping Measures

Outpatient primary care appointments (appointments) were identified during the 12 months after the baseline survey from administrative records. These included planned appointments for ongoing diabetes care as well as same-day appointments for acute conditions. We excluded all appointments that were cancelled in advance of the scheduled appointment time and appointments preempted by a hospitalization. We did not include walk-in visits at the urgent care or minor injury clinics; by definition, these visit types are not scheduled in advance and therefore any walk-in visit is a kept appointment. Appointments were classified as "planned" if booked in advance (as opposed to "sameday" appointments), usually with the patient's assigned PCP as part of routine follow-up. A missed appointment occurred when a patient had no primary care office visit within 60 days of the planned appointment date (so as not to penalize patients who managed to reschedule and attend in a timely fashion). The missed appointment rate for each patient was calculated as the percentage of planned appointments during a 12-month period that were missed. Approximately 80 percent of the cohort had no missed appointments, and the maximum number of missed appointments was 4. The distribution for missed appointment rate was not normally distributed.

"Poor" appointment-keeping (PAK) was defined as missing more than one-third of planned appointments (i.e., a missed appointment rate [greater than or equal to] 1 in 3). While there is no consensus regarding how to define inadequate appointment-keeping for diabetes management (Petitti and Grumbach 1993; Griffin 1998), we felt that missing (on average) greater than one-in-three planned appointments should have a clinically relevant impact on continuity of care, one that could impede the timely management of diabetes. Moreover, this simple definition is easily calculated and thus could be implemented in almost any care setting. As a validation, we examined mean prebaseline low-density lipoprotein (LDL) measures stratified by missed appointment rate. We found statistically significant increases in mean LDL with every 10 percent increase in missed appointment rate up to 30 percent, at which point, the 95% confidence interval for mean LDL crossed the clinically recognized target of 100 mg/dl and the increases asymptoted and no longer became statistically significant (i.e., there were overlaps in the 95% confidence intervals from that point forward). Similar results were found in an analysis of prebaseline glycosolated hemoglobin (HbAlc) measures stratified by missed appointment rate (data not shown). Therefore, we felt confident that our cut point of greater than one-third was clinically justifiable.

Primary care appointments can also be scheduled on the day of the intended visit by the patient for acute or urgent care as part of open access policies. This type of visit was classified as "same-day." We measured the total number of booked and attended same-day appointments for each patient during the 12 months after the survey date from administrative records. We also created an indicator variable for patients for whom a majority (>50 percent) of outpatient care was delivered via attended same-day appointments. In addition, we also measured the number of core specialty (cardiology, endocrinology, nephrology, neurology, oncology, surgery, and urology) appointments that were booked and attended during the same 12-month follow-up period.

Clinical Measures

To assess the clinical relevance of PAK, we conducted a secondary analysis of change (pre--post) in risk factor control by modeling postbaseline clinical outcomes as a function of missed appointment rate and prebaseline measures. This included separate assessments of change in hemoglobin Alc (HbAlc), LDL, and systolic blood pressure (sBP), each of which were captured via the KPNC electronic medical record. We collected the last measure prior to survey date as the prebaseline measure, and the last recorded measure available between the survey date and December 31, 2007, as the postbaseline measure.

Covariates

We collected additional data on demographic, socioeconomic, health status, patient-provider relationship, and facility effects. Age, gender, educational attainment, annual income, total assets, age at diabetes onset, duration of diabetes, limited English proficiency (LEP), competing demands to health care, social support and validated measures of health literacy (Chew, Bradley, and Boyko 2004), depressive symptoms (Friedman, Cutter, and Donahue 1988; Spitzer, Kroenke, and Williams 1999; Kroenke, Spitzer, and Williams 2001), and patient trust-in-provider (Anderson and Dedrick 1990; Thorn, Ribisl, and Stewart 1999) were captured via self-report from the DISTANCE survey. We derived a neighborhood-level deprivation index using previously validated methodolgy (Messer, Laraia, and Kaufman 2006) by linking patients' addresses, geocoded at the time of the survey and linked to the 2000 U.S. census data. Administrative records were used to identify patients who had an assigned PCP, the co-payment due for an outpatient office visit, and the KPNC service area (a geographically clustered group of health care facilities, which we refer to as "medical centers" for simplicity) where the patient received most care. Health status was evaluated using a clinically and statistically validated comorbidity index (the DxCG comorbidity index [*http://www.dxcg.com*]).

Statistical Analyses

The DISTANCE study used a stratified random sampling design that oversampled minority patients to provide adequate power for ethnic contrasts. To account for this design effect, we weighted analyses using expansion weights (reciprocal of the nonproportional sampling fractions for each ethnic group) in all multivariable models. While we had no reason to believe that the relationship between ethnicity and PAK would be different among survey responders versus nonresponders, we opted to address survey nonresponse bias in the analysis as well using the Horvitz-Thompson approach (Horvitz and Source 1952). We first fit a model that predicted response to the DISTANCE survey and then created individual weights (reciprocal of the probability of the observed response) that were used in all multivariable models. We included indicators for explanatory variables with missing survey responses, and, so as not to violate assumptions of linearity in the multiplicative models, categorical variables were used instead of their continuous form.

Modified Poisson regression with a log-link function and robust error variance was used to directly estimate relative risk (RR) (Zou 2004) of African American, Asian, Filipino, or Latino ethnicity (relative to Caucasians) in models of the binary PAK outcome. The unit of analysis was the patient. Our modeling selection was based on the analysis of a directed acyclic graph (DAG), a visual and rule-based approach to capturing the causal relationships in a conceptual framework (in this case, with regard to the direct causal linkage between ethnicity and PAK; see Appendix S1). We used established rules for DAGs to determine the minimally sufficient covariates needed to estimate the direct effect of ethnicity on PAK (Maldonado and Greenland 2002; Hernan, Hernandez-Diaz, and Robins 2004). We show unadjusted results, estimates from a model that controls for confounding by age and gender, and estimates from a model that also adjusts for mediators of the ethnicity to PAK effect. Adjusting for these mediators blocks indirect causal pathways and isolates the independent and direct effect of ethnicity on PAK. The mediators included education, income, assets, social support, depression, employment, LEP, inadequate functional health literacy, having an assigned PCP, trust-in-provider, medical center, age of diabetes onset, comorbidity risk score (DxCG), and competing demands. We also assessed effect modification by testing for interactions between ethnicity and the following: age, gender, and medical center.

To evaluate the clinical relevance of PAK, we modeled postbaseline clinical outcomes using two sets of cutpoints: (HbAlc > 7 percent, LDL > 100 mg/dl, and sBP > 130 mmHg) and (HbAlc > 9 percent, LDL > 130 mg/dl, and sBP > 140 mmHg), to determine whether PAK was independently associated with poor risk factor control. While the majority (85 percent) of clinical measurements was collected after the 12-month observation window we used to determine appointment-keeping behavior, we ran a sensitivity analysis excluding the small percentage of subjects whose measurements were collected concurrently with the PAK measure and found no difference in the results. We present analyses from the larger cohort below.

A potential shortcoming of our PAK measure is that it fails to include same-day appointments when they occur with a patient's assigned PCP. Our reasoning was same-day appointments are motivated by patients' health concerns, typically to address acute needs, whereas planned primary care visits are requested by providers at optimal intervals to ensure sufficient chronic disease monitoring and prevention, and are a cornerstone of the PCMH model. However, the distinction between same-day and planned primary care blurs because medical centers with open access policies and flexible scheduling systems do try to match patients with their PCPs for same-day appointments, and these visits may, time permitting, include chronic disease monitoring and prevention. To address this concern, we conducted a sensitivity analysis using an alternate definition of PAK as missing more than one-third of all appointments (same-day or planned with the assigned PCP), and we defined same-day appointments as only those with providers other than the PCP. Another limitation is that a single missed appointment for patients who scheduled less than three appointments would be categorized as PAK. However, excluding patients with <3 scheduled appointments conferred no substantive differences in findings.

RESULTS

Sample Characteristics

The study cohort included 12,957 diabetes patients with the following ethnic breakdown: Caucasian (26 percent), African American (22 percent), Latino (22 percent), Filipino (15 percent), and Asian (14 percent) (Table 1). As expected, there were pronounced socioeconomic and clinical differences by ethnicity in this sample. African Americans and Latinos reported lower annual incomes and had a greater percentage of total assets <$10,000 than other groups. Thirty-five percent of Latinos did not receive a high school degree, and over one-third of both Latinos and African Americans lived in deprived neighborhoods. Filipinos and Latinos had the poorest glycemic control, whereas African Americans shouldered the highest burden of dyslipidemia and hypertension. Depressive symptoms were common in all groups; baseline prevalence ranged from a low of 25 percent in Asians to a high of 42 percent in Latinos. The groups with the greatest disease burden (based on percentage of the sample with a DxCg risk score in the upper quartile) were African Americans, Filipinos, and Caucasians.

Characteristics of Patients with PAK

In the 12 months of follow-up, 8 percent (1,031) of patients missed over one-third of their planned appointments (i.e., classified as PAK). PAK was more common in patients who were younger, less educated, had fewer assets, and lived in deprived neighborhoods (Table 1). Twenty-one percent of those with PAK also missed >1/3 of appointments in the year prior to the DISTANCE survey. Having an office visit copay >$30, lack of trust-in-provider, or not having an assigned PCP, were also associated with PAK.

Patients with PAK booked and attended fewer planned appointments than those with good appointment-keeping (GAK) (Table 2), and these differences were statistically significant ($p < .0001$ for both). However, there were no differences in the mean number of same-day appointments that were booked or attended between the two groups. Only 12 percent of patients with PAK attended at least two primary care visits in the 12-month postsurvey compared with 73 percent of patients with GAK. Forty-four percent of PAK patients received a majority of their care at same-day appointments as compared with 12 percent for GAK. Patients with PAK also had lower utilization of specialty care than patients without PAK. The above-mentioned relationships persisted in models that adjusted for demographic, socioeconomic, and clinical and facility effects.

Ethnic Differences in Utilization of Care

In unadjusted analyses, African Americans and Latinos booked and attended more planned appointments than other ethnic groups (Table 2), but these differences became nonsignificant in multivariable models. A similar pattern was seen for same-day appointments; however, higher utilization in African Americans and Latinos remained statistically significant after model adjustment. Nineteen percent of Latino patients received the majority of their care at same-day appointments compared with 15 percent for African Americans and Caucasians, 12 percent for Filipinos, and 8 percent for Asians. African Americans and Caucasians attended the highest mean number of specialty appointments during the follow-up period.

Ethnic Differences in PAK

Poor appointment-keeping rates differed more than 2-fold across ethnicities, and were as follows: 12 percent (95% CI: 10.6, 13.5) in Latinos, 10 percent (8.7, 11.0) in African Americans, 7 percent in Filipinos (5.8, 8.4), 6 percent (4.9, 6.6) in Caucasians, and 5 percent (3.5, 5.9) in Asians. Compared with Caucasians, Latinos and African Americans had 80 and 60 percent increased risk, respectively, of PAK in a model adjusting for age and gender (Table 3). No substantive risk differences between Asians or Filipinos and Caucasians were observed. Note that while Caucasians are commonly used as a reference group for ethnic comparisons, they had the intermediate level of PAK, and thus mask the full range of differences, that is, when comparing the highest (Latinos) with the lowest rates (Asians). In the fully adjusted model (model 3), the estimates attenuated; however, the risk for African Americans ($RR = 1.6$, 95% CI: 1.3, 1.9) and Latinos ($RR = 1.5$, 95% CI: 1.2, 1.9) compared with Caucasians was still elevated and statistically significant ($p < .0001$ and $p = .0001$, respectively). In a model adjusting for ethnicity, age, gender, and total number of scheduled outpatient appointments, receiving more than half of outpatient care via same-day appointments was the strongest independent predictor of PAK (RR [95% CI] = 4.0 [3.4, 4.9]; $p < .0001$).

We found a statistically significant interaction between ethnicity and medical center (p = .004), but neither age nor gender was an effect modifier of the ethnicity-PAK relationship. In stratified analyses, PAK rates among Cancasians were similar across medical centers (range: 4-8 percent), but African American and Latino rates varied widely (range: 5-24 and 0-16 percent, respectively) (Table 4). When we compared the ethnic groups with the highest to lowest rates of PAK at each medical center, the unadjusted relative risks ranged from no difference (RR = 1) to a 9-fold increased risk of PAK by ethnicity. With the exception of medical centers 3, 10, and 11, we have adequate representation of all ethnicities in each center (i.e., >50 patients per ethnicity per site) and therefore feel that variation due to small sample size is of minimal concern.

Clinical Consequences of PAK

In a lagged cross-sectional analysis, patients with PAK were at 20, 30, and 40 percent increased risk for poor glycemic, LDL, and sBP control, respectively, in the postbaseline period. Adjusting for prebaseline clinical control, ethnicity, age, gender, and total number of scheduled outpatient appointments, the relative risks (95% CI) for HbAlc > 7 percent, LDL > 100 mg/dl, and sBP > 130 mmHg associated with PAK were as follows: 1.2 (1.1, 1.3), 1.3 (1.1, 1.5), and 1.4 (1.3, 1.5) with p-values of .0002, .0004, and <.0001, respectively. We also ran models with indicators of poor clinical control using higher cut points, as the influence of PAK may differ across disease severity. The relative risks (95% CI) for HbA1c > 9 percent, LDL > 130 mg/dl, and sBP > 140 mmHg were similar in direction and magnitude to the lower cut points (1.3 [1.1, 1.6], 1.4 [1.1, 1.81, and 1.6 [1.3, 1.9] respectively).

Sensitivity Analysis

We conducted a sensitivity analysis using an alternate definition of PAK (missing more than one-third of the total planned appointments and same-day appointments with the assigned PCP) and an alternate definition for same-day appointments (only those with providers other than the PCP). The mean proportion of same-day visits among all attended visits declined markedly using this definition (25-14 percent), which was expected, given that approximately half of the attended same-day appointments are with a patient's PCP. However, our primary study findings remained unchanged: (1) the patterns and magnitude of ethnic differences in PAK persisted, (2) receiving the majority of outpatient care via same-day appointments was still the strongest independent predictor of PAK, and (3) the associations between poor glycemic, LDL, and sBP control and PAK held.

We also conducted sensitivity analyses defining PAK in two different ways: (1) using a lenient cut point (missing any planned appointments), and (2) using a stricter cut point (missing >50 percent planned appointments). Our results were robust to these changes.

DISCUSSION

To our knowledge, this is the first study to evaluate ethnic differences in primary care appointment-keeping in a large, ethnically diverse diabetic patient population with uniform access to health care. Our study is unique in that we had sufficient sample size to disaggregate "minority" ethnicity and examine utilization patterns separately. We observed substantial ethnic differences in PAK, with the highest rates among Latinos and African Americans. These differences were not fully explained by the confounders and mediators included in our models (i.e., demographics, education, socioeconomic status, and patient-provider relationship [trust-in-provider]) previously thought to account for these findings. Medical center was an effect modifier of the ethnicity-PAK association. PAK was associated with a 20-40 percent greater rate of poor control for the major cardiometabolic risk factors (HbA1c, LDL, and BP), underscoring the public health relevance of these findings. Our results suggest that ethnic differences in PAK are not spurious and deserve more attention.

While offered care and total utilization were, for the most part, uniform across ethnic groups in this health care setting after adjustment for demographic, socioeconomic, and clinical risk factors, Latinos and African Americans were at much higher risk of missing planned visits. In as much as planned visits are scheduled with providers to ensure a proactive approach to disease management and prevention of comorbidities, PAK may represent missed opportunities for treatment intensification and preventive care, even for patients with seemingly adequate overall utilization based on visit number. Latinos and African Americans were more likely to have negative perceptions of their PCP communication style (i.e., reporting they were not patient-centered, or relationship-centered) and were more likely to be in ethnic discordant patient-PCP dyads (data not shown). Previous research has shown that satisfaction may be poorer among vulnerable populations (Rothschild 1998), where differences in patients' and providers' social class (i.e., social distance) may reinforce stereotypes, give rise to unintentional discrimination (van Ryn and Burke 2000; Sequist, Fitzmaurice, and Marshall 2008), or in the case of this study, foster differential utilization patterns among ethnicities. Appointment-keeping may also be influenced by patients' attachment styles with regard to the patient-provider relationship, which may differ across ethnic groups (Ciechanowski, Russo, and Katon 2006).

We found variability in ethnic-specific PAK rates across medical centers despite the largely uniform standards of care at KPNC. Another study also indicated that site of care was an important determining factor in missed appointment rates in a community clinic setting (Lasser, Mintzer, and Lambert 2005). Site-specific structural features, potentially identifiable and modifiable, may influence ethnic differences in appointment-keeping behavior. A recent review article, which examined the effect of open access scheduling, found that in practice, its implementation was imperfect. In "real world" scenarios, outcomes varied across sites. No-show rates improved only in practices with a high prevalence (> 15 percent) of missed appointments at baseline, and there was some evidence suggesting that patients were more likely to be lost to follow-up in open access systems (Rose, Ross, and Horwitz 2011). Site differences in the availability and type of same-day appointments (e.g., extended evening and weekend hours, PCP or non-PCP) may give rise to unexpected utilization patterns (e.g., considering same-day visit as compensating for needed scheduled appointments) and potentially increase ethnic disparities. In this study, we saw a greater propensity among some ethnic groups, particularly Latinos, to use same-day appointments, and this was strongly predictive of PAK (RR ~ 4) even after adjusting for disease severity.

Perceptions of the importance and purpose of planned versus same-day primary care appointments may differ between health care providers and patients. Some patients may have a preference for using same-day services, as acute problems arise at the expense of preventive, primary care visits. Other patients may not distinguish between planned and same-day visits, and consider them interchangeable. For example, if a patient has recently seen his/her PCP at a same-day visit, s/he may consider the upcoming, planned appointment as optional or unnecessary. Conversely, a patient who misses a planned appointment may subsequently make and attend a same-day appointment with the PCP to compensate for the no-show.

Whichever is the directionality, the quality of care provided may differ between the two visit types, even if the PCP attends both. Planned primary care appointments in diabetes maintain continuity of care by evaluating risk factor control and the need for treatment intensification (Rodondi, Peng, and Karter 2006; Schmittdiel, Uratsu, and Karter 2008), monitoring adherence to and tolerance of new medications, and checking for depressive symptoms as well as complications. Same-day appointments are typically intended for patients with acute illness or injury. Even in cases where the PCP conducts the same-day appointment, health care providers are trained to listen to patient complaints (typically requesting symptom relief) before imposing an agenda. Thus, time constraints may leave little time to focus on the preventive diabetes care agenda that would dominate a visit planned by the PCE As a result, patients who are habitually seen at same-day rather than planned primary care appointments may receive less preventive care or have less continuity with one PCP, thus undermining a personal, ongoing patient-provider relationship that has been shown to improve glycemic control (Dearinger, Wilson, and Griffith 2008).

We also found evidence suggesting that PAK may negatively impact outcomes as it was associated with a 20-40 percent increased risk of inadequate control of HbA1c, LDL, and sBP in models that adjusted for prebaseline clinical control. Continuity of care with a PCP is particularly critical for patients with diabetes. If certain ethnic subgroups are receiving the majority of care through same-day rather than planned primary care visits, it may further the disparities commonly observed in blood pressure, lipid, and glycemic control (Karter, Ferrara, and Liu 2002; Brown, Gregg, and Stevens 2005; Kirk, D'Agostino, and Bell 2006; Chew, Bradley, and Boyko 2008). Even though the evidence is suggestive, caution is needed when inferring from these observational data that poor attendance actually caused a worsening of control. Nonetheless, our data confirm that PAK is clearly useful as a marker of poor clinical control (Karter, Parker, and Moffet 2004; Schectman, Schorling, and Voss 2008).

Our study has numerous strengths, including many potential explanatory variables from a large, ethnically diverse cohort collected via self-report and electronically. However, some limitations should be mentioned. Given that our findings are based on survey responses from a sample of patients with diabetes, selection bias (e.g., survey nonresponse bias) could reduce generalizability. However, we controlled for selection bias by incorporating survey nonresponse weights in the multivariable analysis. In addition, we have no reason to believe that the relationship between ethnicity and PAK would be different among survey responders versus nonresponders. Given the slightly higher rate of missed appointments in survey nonresponders (18 percent) compared with responders (15 percent), it is likely that our estimates are conservative and biased toward the null. We studied a fully insured population, and so interpretation of the findings is limited to this group. However, approximately one-third of Northern California's residents are members of Kaiser Permanente, and so our study results should have wide applicability. Finally, as in all observational research, residual confounding due to unmeasured or poorly measured factors is possible.

Our study suggests that the poorer intermediate health outcomes commonly observed in African Americans and Latinos with diabetes may be attributable to some extent to PAK. PAK was associated with increased utilization of same-day appointments and was also predictive of poor clinical outcomes in a lagged cross-sectional analysis. While this study's objective did not include identifying the reasons for ethnic differences in PAK, we did find that the size of these disparities varied across medical centers. Future research needs to evaluate the tension between facility-level structural features (e.g., providing greater convenience and access via extended hours for same-day appointments) and missing planned primary care appointments; those trade-offs may impact ethnic groups differently and perpetuate disparities in unexpected ways.

These results may have important implications for public health and health plan policy as managed care settings rapidly expand open access to care supported by the PCMH model (Rittenhouse and Shortell 2009). On an individual level, heavier use of same-day appointments was associated with higher likelihood of missing planned appointments. Research is needed to evaluate the impact of health care system-level structural changes including: (1) whether increasing availability of same-day appointments at medical centers via open access could actually increase the rate of missing planned appointments for the care of chronic diseases; (2) whether expanding same-day access increases PAK in planned appointments in a way that is detrimental for health outcomes for chronic disease; and (3) whether these negative impacts (1 and 2) are amplified in medically vulnerable populations. If so, it will be crucial that PCMH develop systems to monitor that quality of care will not be compromised among patients who prefer same-day appointments as a substitution for planned appointments. Given our disparate findings across ethnic groups, we will also need to monitor outcomes separately across populations to ensure that open access is not compromising care for medically vulnerable subgroups. Finally, interventions to address PAK deserve special attention, given the simplicity of identifying patients who have missed appointments, potential clinical consequences of missed appointments overall, and its contribution to health disparities.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix S1: DAG Depicting Causal Relationships between Race/ Ethnicity (Exposure of Interest) and Poor Appointment-Keeping (PAK, Outcome of Interest).

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Table 1: Baseline Characteristics of 12,957 DISTANCE (Diabetes

Study of Northern California) Survey Responders with at Least

One Scheduled Primary Care Appointment, Stratified by Ethnicity

and Poor Appointment-Keeping (PAK)

		Ethnicity
	African American	Asian
Characteristic	(n = 2,860)	(n = 1,866)
Missed >1/3 of PCP visits in prior year *	8	4
Age, mean (SD) *	60.0 [+ or -] 9.8	61.1 [+ or -] 9.7
Women	58	44

Ethnicity *		
African American		
Asian		
Caucasian		
Filipino		
Latino		
Level of education *		
No degree earned	12	14
High school/GED	34	22
Some college	31	21
College grad and	23	43
		above
Annual income		
<$15,000	12	14
$15,000-$49,999	39	28
$50,000-$99,999	35	34
$100,000+	14	24
Assets<$10,000 *	37	16
Neighborhood deprivation index *		
Fourth quartile	39	9
		(most deprived)
Employment *		
Managerial/	29	31
		professional/ technical
Service/farming/	11	11
		precision/operator
Not employed	59	58
Limited English	5	21
		proficiency *
Inadequate functional health literacy	9	16
Office visit copay [greater than or equal to] 30 *	1	2
Does not have a personal physician *	1	4
Trust-in-provider *		
Never or sometimes	11	9
DxCg risk score *		
Fourth quartile (most risk)	32	22
Depressive symptoms		
None	63	75
Any	37	25
Lack of social support	15	21
Competing demands	24	27

to diabetes care		
Age at DM onset, mean (SD) *	48.4 [+ or -] 11.5	50.2 [+ or -] 12.3
Duration of DM (years), mean (SD)	11.2 [+ or -] 9.0	10.7 [+ or -] 10.0
HbAlc [greater the or equal to] 7% *	55	51
LDL [greater the or equal to] 100 (mg/dl) *	41	28
Systolic BP to] 130 mmHg *	57	39
		Ethnicity
	Caucasian	Filipino
Characteristic	(n = 3,380)	(n = 1,970)
Missed >1/3 of PCP visits in prior year *	5	6
Age, mean (SD) *	60.3 [+ or -] 9.9	58.8 [+ or -] 9.1
Women	45	53
Ethnicity *		
African American		
Asian		
Caucasian		
Filipino		
Latino		
Level of education *		
No degree earned	11	4
High school/GED	34	17
Some college	26	22
College grad and	30	57 above
Annual income		
<$15,000	6	10
$15,000-$49,999	35	35
$50,000-$99,999	39	35
$100,000+	20	20
Assets<$10,000 *	21	26
Neighborhood deprivation index *		
Fourth quartile	12	14 (most deprived)
Employment *		
Managerial/	35	34 professional/ technical
Service/farming/	11	13 precision/operator

Not employed	55	53
Limited English	3	7
		proficiency *
Inadequate functional health literacy	6	9
Office visit copay [greater than or equal to] 30 *	3	2
Does not have a personal physician *	1	2
Trust-in-provider *		
Never or sometimes	9	8
DxCg risk score *		
Fourth quartile (most risk)	26	28
Depressive symptoms		
None	63	65
Any	37	35
Lack of social support	19	14
Competing demands to diabetes care	25	32
Age at DM onset, mean (SD) *	49.7 [+ or -] 13.0	48.9 [+ or -] 10.8
Duration of DM (years), mean (SD)	10.4 [+ or -] 9.5	9.6 [+ or -] 8.1
HbAlc [greater the or equal to] 7% *	48	61
LDL [greater the or equal to] 100 (mg/dl) *	34	28
Systolic BP to] 130 mmHg *	51	42

	Ethnicity	PAK
	Latino	Yes
Characteristic	(n = 2,881)	(n = 1,031)
Missed >1/3 of PCP visits in prior year *	10	21
Age, mean (SD) *	57.1 [+ or -] 10.9	54.9 [+ or -] 10.7
Women	52	50
Ethnicity *		
African American		26
Asian		7
Caucasian		21
Filipino		13
Latino		32
Level of education *		
No degree earned	35	17
High school/GED	30	30
Some college	24	28

College grad and	10	25 above
Annual income		
<$15,000	14	10
$15,000-$49,999	47	35
$50,000-$99,999	31	39
$100,000+	9	15
Assets<$10,000 *	47	39
Neighborhood deprivation index *		
Fourth quartile	35	30 (most deprived)
Employment *		
Managerial/	23	33 professional/ technical
Service/farming/	24	20 precision/operator
Not employed	53	47
Limited English	25	15 proficiency *
Inadequate functional health literacy	22	12
Office visit copay [greater than or equal to] 30 *	4	4
Does not have a personal physician *	3	4
Trust-in-provider *		
Never or sometimes	13	14
DxCg risk score *		
Fourth quartile (most risk)	24	23
Depressive symptoms		
None	58	62
Any	42	38
Lack of social support	16	19
Competing demands to diabetes care	34	30
Age at DM onset, mean (SD) *	46.7 [+ or -] 12.0	44.9 [+ or -] 11.9
Duration of DM (years), mean (SD)	10.2 [+ or -] 8.7	9.6 [+ or -] 8.7
HbAlc [greater the or equal to] 7% *	59	60
LDL [greater the or equal to] 100 (mg/dl) *	37	42
Systolic BP	46	53

to] 130 mmHg *

		PAK
	No	All
Characteristic	(n = 11,926)	(n = 12,957)
Missed >1/3 of PCP visits in prior year *	6	7
Age, mean (SD) *	59.8 [+ or -] 9.9	59.4 [+ or -] 10.1
Women	50	50
Ethnicity *		
African American	22	22
Asian	15	14
Caucasian	27	26
Filipino	15	15
Latino	21	22
Level of education *		
No degree earned	16	16
High school/GED	29	29
Some college	25	25
College grad and	30	30
		above
Annual income		
<$15,000	11	11
$15,000-$49,999	38	38
$50,000-$99,999	35	35
$100,000+	17	17
Assets<$10,000 *	29	30
Neighborhood		
deprivation index *		
Fourth quartile	23	23
		(most deprived)
Employment *		
Managerial/	30	30
		professional/
		technical
Service/farming/	14	14
		precision/operator
Not employed	56	56
Limited English	11	11
		proficiency *
Inadequate functional health literacy	12	12
Office visit copay > 30 *	2	3
Does not have a personal physician *	2	2
Trust-in-provider *		
Never or sometimes	10	10
DxCg risk score *		
Fourth quartile (most	27	27

risk)		
Depressive symptoms		
None	64	64
Any	36	36
Lack of social support	17	17
Competing demands to diabetes care	28	28
Age at DM onset, mean (SD) *	49.0 [+ or -] 12.0	48.7 [+ or -] 12.1
Duration of DM (years), mean (SD)	10.5 [+ or -] 9.1	10.5 [+ or -] 9.1
HbAlc [greater the or equal to] 7% *	54	54
LDL [greater the or equal to] 100 (mg/dl) *	34	34
Systolic BP to] 130 mmHg *	48	48

Note. Column percents presented unless otherwise noted. Missing
responses were not included. Chi-squared statistic reported
for categorical variables.
p-Value for Spearman's correlation coefficient reported for
continuous variables. p-Values for all ethnicity contrasts
were <.05.
* p-Value < .05 for PAK contrasts.
BP, blood pressure; DM, diabetes mellitus; LDL, low-density
lipoprotein; PCP, primary care providers.

Table 2: Primary Care Utilization (Unadjusted) during the 12-Month

Postbaseline Stratified by Ethnicity and Poor Appointment-Keeping

(PAK)

		Ethnicity
	African American	Asian
Characteristic	(n = 2,860)	(n = 1,866)
Number of planned appts, booked (Mean [+ or -] SD)	3.6 [+ or -] 3.1	3.0 [+ or -] 2.8
Number of planned appts, attended (Mean [+ or -] SD)	3.4 [+ or -] 3.1	2.9 [+ or -] 2.7
Number of same-day appts, booked (Mean [+ or -] SD)	1.6 [+ or -] 2.1	1.0 [+ or -] 1.6
Number of same-day appts, attended (Mean [+ or -] SD)	1.5 [+ or -] 2.0	0.9 [+ or -] 1.6
Receives majority (>50%) of care at same-day visits (%)	15	8
Number of specialty appts, attended (Mean [+ or -] SD)	1.3 [+ or -] 3.7	1.0 [+ or -] 3.1

Note. appts, appointments.

		Ethnicity
	Caucasian	Filipino
Characteristic	(n = 3,380)	(n = 1,970)
Number of planned appts, booked (Mean [+ or -] SD)	3.0 [+ or -] 3.0	3.0 [+ or -] 2.7
Number of planned appts, attended (Mean [+ or -] SD)	2.9 [+ or -] 2.9	2.8 [+ or -] 2.7
Number of same-day appts, booked (Mean [+ or -] SD)	1.5 [+ or -] 2.3	1.2 [+ or -] 1.6
Number of same-day appts, attended (Mean [+ or -] SD)	1.4 [+ or -] 2.2	1.1 [+ or -] 1.6
Receives majority (>50%) of care at same-day visits (%)	15	12
Number of specialty appts, attended (Mean [+ or -] SD)	1.2 [+ or -] 3.4	0.9 [+ or -] 3.7

Note. appts, appointments.

	Ethnicity	PAK
	Latino	Yes
Characteristic	(n = 2,881)	(n = 1,031)
Number of planned appts, booked (Mean [+ or -] SD)	3.3 [+ or -] 2.9	2.1 [+ or -] 1.1
Number of planned appts, attended (Mean [+ or -] SD)	3.0 [+ or -] 2.8	0.9 [+ or -] 0.8
Number of same-day appts, booked (Mean [+ or -] SD)	1.8 [+ or -] 2.7	1.5 [+ or -] 2.2
Number of same-day appts, attended (Mean [+ or -] SD)	1.7 [+ or -] 2.6	1.3 [+ or -] 2.1
Receives majority (>50%) of care at same-day visits (%)	19	44
Number of specialty appts, attended (Mean [+ or -] SD)	1.0 [+ or -] 3.7	0.9 [+ or -] 3.5

Note. appts, appointments.

		PAK
	No	All
Characteristic	(n = 11,926)	(n = 12,957)
Number of planned appts, booked (Mean [+ or -] SD)	3.3 [+ or -] 3.0	3.2 +2.9
Number of planned appts, attended (Mean [+ or -] SD)	3.2 [+ or -] 2.9	3.0 [+ or -] 2.9
Number of same-day appts, booked (Mean [+ or -] SD)	1.5 [+ or -] 2.2	1.5 [+ or -] 2.2
Number of same-day appts, attended (Mean [+ or -] SD)	1.4 [+ or -] 2.1	1.4 [+ or -] 2.1
Receives majority (>50%) of care at same-day visits (%)	12	14

Number of specialty appts, attended (Mean [+ or -] SD)	1.1 [+ or -] 3.5	1.1 [+ or -] 3.5

Note. appts, appointments.

Table 3: Ethnic Differences in Poor Appointment-Keeping Behavior, Risk

Ratios (RR) (95% CI) from Modified Poisson Regression Models

Ethnicity	Model 1 RR (95% CI)	Model 2 RR (95% CI)	Model 3 RR (95% CI)
Caucasian (ref)	1.0	1.0	1.0
African American	1.7 (1.4, 2.1)	1.6 (1.4, 2.0)	1.6 (1.3, 1.9)
Asian	0.8 (0.6, 1.1)	0.8 (0.6, 1.1)	0.7 (0.5,1.0)
Filipino	1.3 (1.0, 1.6)	1.1 (0.9, 1.4)	1.1 (0.8,1.4)
Latino	2.1 (1.8, 2.6)	1.8 (1.5, 2.2)	1.5 (1.2, 1.9)
Ethnicity		Model 1 RR (95% CI)	p-Value from Model3
Caucasian (ref)		1.0	Reference
African American	1.7 (1.4, 2.1)	<.0001	
Asian		0.8 (0.6, 1.1)	.05
Filipino		1.3 (1.0, 1.6)	.73
Latino		2.1 (1.8, 2.6)	.0001

Note. Model 1 includes ethnicity only; Model 2 includes ethnicity, age, and gender; Model 3 includes ethnicity, age, gender, education, income, assets, social support, depression, employment, limited English proficiency, health literacy, having an assigned PCP, trust-in-provider, medical center, age of diabetes onset, DxcG risk score, and competing demands. All models included missing indicators for the explanatory variables and were weighted to account for design effects and survey nonresponse bias.

Table 4: Rates of Poor Appointment-Keeping by Ethnicity and

Medical Center *

				Ethnicity
				African
Medical	American	Asian	Caucasian	Filipino
Center	(n = 2,860)	(n = 1,866)	(n = 3,380)	(n = 1,970)
1	84 (9)	9 (3)	9 (7)	10 (6)
2	17 (9)	2 (l)	31 (7)	11 (6)
3	7 (11)	0 (0)	12 (7)	1 (8)
4	8 (8)	12 (5)	17 (6)	22 (9)
5	54 (10)	15 (7)	67 (8)	20 (12)

6	7 (5)	7 (4)	16 (8)	19 (6)
7	28 (9)	3 (6)	13 (4)	16 (5)
8	24 (13)	7 (4)	9 (4)	17 (6)
9	15 (24)	7 (6)	11 (6)	7 (10)
10	8 (7)	1 (5)	19 (7)	2 (4)
11	4 (13)	0 (0)	9 (6)	0 (0)
12	13 (8)	12 (3)	4 (4)	12 (9)

		Ethnicity
Medical	Latino	All
Center	(n = 2,881)	(n = 12,957)
1	25 (11)	137 (8)
2	18 (9)	79 (7)
3	31 (13)	51 (10)
4	51 (14)	110 (9)
5	51 (13)	207 (9)
6	14 (6)	63 (6)
7	21 (13)	81 (7)
8	25 (8)	82 (7)
9	60 (16)	100 (12)
10	21 (10)	51 (8)
11	0 (0)	13 (6)
12	12 (12)	53 (6)

Note. N and (Column percents) presented.

* Medical center refers to a geographically clustered group
of KPNC health care facilities.

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SPECIAL FEATURE: Table

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