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SELF-REPORTED RACIAL/ETHNIC DISCRIMINATION IN HEALTHCARE AND DIABETES OUTCOMES

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Abstract

Background—Self-reported racial discrimination in healthcare has been associated with negative health outcomes, but little is known about its association with diabetes outcomes.

Methods—We utilized data from the Behavioral Risk Factor Surveillance System to investigate associations between self-reported healthcare discrimination and the following diabetes outcomes: 1) quality of care, 2) self-management and 3) complications.

Results—In unadjusted logistic regression models, significant associations were found between self-reported healthcare discrimination and most measures of quality of care (diabetes-related primary care visits [OR: 0.38, 95% CI: 0.21, 0.66], HbA1c testing [OR: 0.42, 95%CI: 0.21, 0.82], and prior eye exam interval [OR: 0.48, 95% CI: 0.24, 0.93]) and health outcomes (foot disorders [OR: 2.32, 95%CI: 1.15, 4.68] and retinopathy [OR: 2.26, 95%CI: 1.24, 4.12]), but not the number of provider foot examinations (p=0.48) or diabetes self-management (self glucose monitoring, p=0.42; self foot examinations, p=0.74; diabetes class participation, p=0.37). The effects of self-reported discrimination were attenuated or eliminated after controlling for sociodemographics, health status, and access to care.

Conclusions—Self-reported racial/ethnic discrimination in healthcare was associated with worse diabetes care and more diabetes complications, but not self-care behaviors, suggesting that factors beyond patients' own behaviors may be the main source of differential outcomes. The

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relationships between self-reported discrimination and diabetes outcomes were eliminated once adjusting for sociodemographics, health status, and access to care. Our findings suggest that other factors (i.e. race, insurance, health status) may play equally or more important roles in determining diabetes health disparities, and that a comprehensive strategy is needed to effectively address health disparities.

Keywords

discrimination; healthcare delivery; diabetes; health disparities; race/ethnicity

INTRODUCTION

Understanding and addressing racial/ethnic health disparities is a national priority (1–3). There is overwhelming evidence that racial/ethnic minorities are more likely to receive lower quality healthcare than Whites in a range of important clinical conditions that are not due to differences in clinical status or insurance, and that these differences translate into higher morbidity and mortality for racial/ethnic minorities (3–8). Although recent data suggest that they are improving (1), diabetes disparities also exist. For example, African-Americans have been less likely than whites to have eye examinations, HbA1c and LDL cholesterol monitoring, and influenza vaccinations (9–12). The reasons for racial disparities in medical care are multi-factorial, and healthcare discrimination may play a role. In a landmark study using standardized patients, Schulman et al. demonstrated that patient race influenced physicians' recommendations for cardiac care, independent of clinical factors, diagnostic tests and the physicians' assessed probability of coronary artery disease (13). Green et al documented the association between implicit physician bias and disparities in treatment recommendations for myocardial infarctions (14).

In addition, self-reported racial/ethnic discrimination in healthcare is associated with important outcomes, such as less preventive healthcare (15–17), prescription medication utilization and medical testing/treatment (18), and patient satisfaction (19). Few studies have investigated the impact of self-reported discrimination on diabetes patients, a subpopulation potentially at increased risk for adverse outcomes from perceived discrimination because of frequent healthcare encounters (17, 20–22). Existing studies have utilized relatively small and/or geographically limited samples. Using data from the California Health Information Study, Trivedi et al. found that diabetes patients reporting healthcare discrimination were less likely to receive HbA1c tests and eye exams (17). Similarly, Ryan et al. reported lower quality diabetes care (e.g. blood pressure monitoring) among those self-reporting healthcare discrimination in a sample of 524 diabetes patients (22). Piette et al. found that self-reported discrimination was associated with lower quality patient/provider communication and worse glycemic control among a sample of patients in Wisconsin and California (21).

To our knowledge, there has been no large-scale, geographically diverse study of self-reported healthcare discrimination and diabetes outcomes. In addition, there has been no research investigating associations between self-reported healthcare discrimination and diabetes self-care behaviors, which are considered the cornerstone of diabetes management (23). Existing literature suggests that provider mistrust and poor patient/provider communication (which may arise from perceived racial discrimination) are associated with non-adherence to treatment plans (4). Because plans for diabetes self-care are often decided during clinical encounters, the potential exists for healthcare discrimination to affect self-care activities. Patients' health behaviors are thought to be one mechanism through which discrimination affects health, and, as such, an important research area is understanding potential relationships between perceived discrimination and diabetes self-management. We are also unaware of prior research exploring associations between self-reported healthcare discrimination and diabetes complications (e.g. retinopathy, neuropathy). Such an association is plausible given the associations between reported healthcare discrimination and diabetes control (21). Because complications are the greatest source of diabetes-related morbidity (vs. hyperglycemia itself) (25), understanding the impact of self-reported discrimination on diabetes complications has significant implications for diabetes disparities.

In this study, we utilized a national dataset to explore potential associations between self-reported racial/ethnic discrimination in healthcare and three classes of diabetes outcomes: 1) quality of care, 2) self-management behaviors, and 3) complications. We hypothesized that self-reported healthcare discrimination would be associated with worse quality of care, lower self-management behaviors and increased diabetes complications.

METHODS

Data and Participants

We used data from the Behavioral Risk Factor Surveillance System (BRFSS), a state-based U.S. health survey coordinated by the Centers for Disease Control and Prevention (CDC) and conducted through random telephone interviews of community-dwelling adults aged ≥ 18 years. The BRFSS has required (‘core’) and optional survey modules; each state tailors the survey to their needs. The optional ‘Diabetes’ module includes information about treatment regimens, self-care activities, clinical care, and health outcomes. The optional module ‘Reactions to Race’ includes information about racial identity, self-reported healthcare discrimination, and physical/emotional reactions to discrimination.

We used a pooled sample from the 2004–08 BRFSS datasets utilizing diabetes patients living in a state with the optional Diabetes and Reactions to Race modules (Arizona, Colorado, Delaware, Michigan, Mississippi, Ohio, Rhode Island, South Carolina, Virginia and Wisconsin). For states with more than one year of data, we utilized the largest available dataset. BRFSS implemented the disproportionate stratified random sampling (DSS) design to collect data, which are directly weighted for the probability of selection of telephone number, the number of household adults and the number of household telephones (26).

Measures

Discrimination in Healthcare—Our primary predictor variable, self-reported discrimination in healthcare, was measured with the item ‘Within the past 12 months, when seeking healthcare, do you feel your experiences were worse than other races, the same as other races, better than other races, or worse than some but better than others?’ We defined discrimination as ‘worse than other races’ vs. all other responses.

Outcomes—We created three classes of diabetes outcome variables: quality of care, self-management, and complications. The cut-points for the categorical variables were based on clinical care guidelines of the American Diabetes Association (23), quality of care measures of The Healthcare Effectiveness Data and Information Set (HEDIS), and distribution frequencies of response items.

Diabetes quality of care: This was measured by four variables: number of diabetes-related primary care visits in the prior 12 months (2–5 vs. other), number of HbA1c tests in the prior 12 months (1–4 vs. other), number of provider foot examinations within the prior 12 months (≥2 vs. 0–1), and the time since the last dilated eye examination (<1 year vs. ≥ 1 year).

Diabetes self-management: This was measured by three variables: self glucose monitoring (daily vs. ≥ weekly), self foot examinations (daily vs. ≥ weekly), and prior attendance at a diabetes education class (Y/N).

Diabetes complications: This was measured by two variables: diabetic retinopathy (Y/N) and diabetic foot disorders (Y/N).

Covariates—Because diabetes outcomes are affected by sociodemographics, health status and access to care, we adjusted for these factors, as described below. In addition, because self-reported discrimination is associated with psychological variables (e.g. depression) that affect reporting (27, 28), we also adjusted for these factors using a global measure of mental health.

Sociodemographic factors: Race was defined based on the query: 'Which one or more of the following would you say is your race?,' with options categorized as White, Black/African-American, Multi-Racial or Other (which combined Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaskan Native, or 'Other' groups because of the small sample sizes of the non-Black minority groups). Ethnicity was defined based on the query 'Are you Hispanic or Latino?' Race and ethnicity response categories were mutually exclusive (e.g. Whites were non-Hispanic Whites). The Institute of Medicine recommends self-report as the method for identifying patient race/ethnicity; this classification scheme is currently used by the U.S. federal government (29). Education was categorized as high school graduate or less vs. some college or higher. Income was categorized as: <$15,000, $15,000 – $50,000, and > $50,000. With the exception of race, cut-points for the categorical variables were based on distribution frequencies of response items. Age was used as a continuous variable.

Health status: Self-reported health status was measured by a single item from the Medical Outcomes Study 36-item short form (SF-36) that has been used in diverse populations, and has been validated to predict mortality (30, 31). We collapsed response items into the following categories: excellent/very good, good, fair/poor. Mental health was measured using the query 'Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?'. We used diabetes treatment complexity as a proxy for diabetes severity, and defined it based on a regimen of lifestyle changes alone (nutrition/physical activity), oral hypoglycemic agents without insulin, or a regimen that included insulin (with or without oral agents).

Access to care: Health insurance was measured using the dichotomous variable of uninsured vs. insured ('any kind of healthcare coverage, including prepaid plans such as HMOs, or government plans such as Medicare'). Financial barriers to care were measured based on the query 'Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?' (Y/N).

Geographic region: Because discrimination may be influenced by geography (32), we examined associations with geographic region. States were clustered into the 4 U.S. Census regions: Northeast, Midwest, South and West (33).

Data Analysis

We first conducted descriptive analyses of the study population, and then used Chi-squared tests of proportions to compare demographic characteristics between persons reporting healthcare discrimination and those who did not.

We then examined the bivariate associations between the predictor variables (the primary predictor variable and covariates) and outcome variables, using Chi-squared tests of proportions.

Finally, we conducted unadjusted and adjusted logistic regression analyses that describe associations between self-reported healthcare discrimination and the following outcomes: 1) diabetes quality of care (i.e. number of diabetes-related primary care visits, number of HbA1c tests, number of provider foot examinations and the time since the last dilated eye examination), 2) self-management (i.e. self glucose monitoring, self foot examinations, and diabetes class attendance) and 3) complications (i.e. diabetics-related foot disorders and retinopathy). We independently tested hypotheses for each of the nine outcome variables, rather than combining them into three higher order variables of quality of care, self-management and diabetes complications. Thus, Bonferroni adjustments were not needed (34). We excluded geographic region in the regression models because it was not statistically associated with the outcomes in the bivariate models. We adjusted for the following factors: 1) Sociodemographic factors (race, income, education, age, gender, race*income interaction, and race*education interaction), 2) Health status (self-reported health status, diabetes treatment complexity and mental health status), and 3) Access to care (insurance status and financial barriers to healthcare). We ran models with each group of factors independently *and also* building upon one another as follows: Model 1 (sociodemographic factors alone), Model 2 (sociodemographic factors and health status), and Model 3 (sociodemographic factors, health status, and access to care). We chose race*SES interaction terms because these interactions exist in other related areas (e.g. psychological distress) (35). We also explored a race*discrimination interaction, but it was not statistically significant, and thus we did not include it. The goal of the models was to identify how three key known contributors to diabetes disparities (i.e. sociodemographic factors, health status and healthcare access) modify potential associations between self-reported healthcare discrimination and diabetes outcomes. For diabetes complications, health status was excluded as a covariate to avoid potential predictor/outcome variable conflation. Of note, self glucose monitoring and self foot examinations were also evaluated as continuous variables in linear regression models. The results were similar to the binary/logit models and, consequently, we report only the logit model results. All estimates were weighted and STATA 10.0 was used to account for complex survey design. A criterion of $p<0.05$ was used to determine statistical significance. To confirm our results, we re-ran the unadjusted models using a Bonferroni correction, and our findings were unchanged.

RESULTS

Sample Characteristics

The average age of persons in the study was 59 years, 49% were women, and 50% had a high school degree or less education (Table 1). Fifty-four percent of the sample managed their diabetes with oral medications alone, 30%used insulin and 16% used lifestyle changes (i.e. nutrition and physical activity) alone. Persons who reported racial discrimination in healthcare were more likely to be uninsured, low-income and rate their health as ‘fair’ or ‘poor’ than those who did not report experiencing healthcare discrimination; they were also more likely to be younger, unmarried and belong to a racial/ethnic minority group (Table 1).

Self-Reported Racial Discrimination in Healthcare and Diabetes Quality of Care Measures

For each quality of care measure (i.e. diabetes-related primary care visits, HbA1c testing, foot examinations and eye examination interval), at least one-fourth of persons reported not receiving appropriate care in that measure (e.g. HbA1c monitoring), and those who reported experiencing discrimination had lower rates of appropriate care in each of the measures except provider foot examinations (Table 2). For example, 57% of persons reporting healthcare discrimination said they had an eye exam within the prior 12 months in comparison to 74% of those who did not report such discrimination (p=0.03). In unadjusted regression models, persons reporting racial discrimination had less than half the odds of having appropriate diabetes-related care in three of the four measured variables--diabetes-related primary care visits (OR: 0.38, 95% CI: 0.21, 0.66), HbA1c testing (OR: 0.42, 95%CI: 0.21, 0.82), and prior eye exam interval (OR: 0.48, 95% CI: 0.24, 0.93) (Table 2).

For diabetes-related primary care visits and HbA1c testing, self-reported healthcare discrimination remained significant in models adjusting for either sociodemographic factors, health status or healthcare access. However, the associations were no longer significant when adjusting for sociodemographic factors and health status together (with or without healthcare access factors) (Table 3). The association between self-reported discrimination and the prior eye examination interval was not significant in any of the models that adjusted for sociodemographic characteristics, health status or healthcare access.

Self-Reported Racial Discrimination in Healthcare and Diabetes Self-Management Measures

Approximately half of the participants reported having attended a diabetes education class, and approximately two-thirds of participants reported monitoring their blood sugars and checking their feet at least once a day (Table 2). Persons who reported discrimination were no less likely to monitor their glucose (p=0.42), examine their feet (p=0.74) or attend a diabetes class (p=0.37) than persons who did not report discrimination (Table 2).

Self-Reported Racial Discrimination in Healthcare and Diabetes Complications

Persons who reported racial discrimination in healthcare were more than twice as likely to report having diabetes-related foot disorders (22% vs. 11%, p=0.02; OR: 2.32, 95%CI: 1.15, 4.68) and retinopathy (36% vs. 20%, p<0.01; OR: 2.26, 95%CI: 1.24, 4.12) (Table 2). The association between self-reported discrimination and diabetes-related foot disorders was not significant in any of the adjusted models (Table 3). Persons reporting healthcare discrimination remained twice as likely to report having diabetic retinopathy after individually adjusting for healthcare access and health status, but not when adjusting for sociodemographic factors alone or adjusting for more than two factors (e.g. sociodemographic factors and health status) simultaneously.

Effect of the Covariates

The covariates race, income, insurance status and treatment complexity (a proxy for diabetes severity) showed the most consistent patterns of association with our outcome variables For example, African-Americans had approximately 40% of the odds of having an appropriate number of diabetes-related primary care visits in comparison to Whites (OR: 0.38, 95% CI: 0.19, 0.75). Persons in the highest income group (>$50,000) were more than three times as likely (OR: 3.34, 95%CI: 1.76, 6.35) to have appropriate HbA1c monitoring as the lowest income group. Patients taking insulin had more than four times the odds of diabetic retinopathy (OR: 4.35, 95% CI: 2.51, 7.50) than those managed with lifestyle changes alone. Significant race/SES interactions were also present.

DISCUSSION

The main finding from this study is that, in unadjusted models, self-reported racial/ethnic discrimination in healthcare was associated with most measures of diabetes quality of care and complications, but not self-management. The effects of discrimination were attenuated or eliminated after controlling for an extensive range of covariates including sociodemographic, health status, and access to care variables. This reduction in the statistical association between self-reported discrimination and outcome variables suggests that much of the explanatory power of self-reported discrimination is accounted for by factors such as race, income and health status. Race in particular may attenuate the statistical association between discrimination and health outcomes, mainly because self-reports of discrimination are so strongly linked to the reporter's race.

Self-reports of discrimination attempt to capture three inter-related phenomena: episodes of discrimination, perception of such events, and reporting of them. The ill health effects from discrimination in society (e.g. at work) are thought to be mediated by the chronic stress and mood disturbances associated with the *perceptions* themselves (and subsequent disruption of autonomic and neuroendocrine systems) (36–39). Yet, the ill health effects from discrimination in healthcare may be largely due to the *occurrence* of discrimination, that is, the differential provision of healthcare services based on race/ethnicity. There is overwhelming evidence that racial/ethnic minorities, as a group, have more limited access to appropriate and comprehensive medical care (3). Differential treatment has been documented in a range of clinical services, including patient/provider communication, preventive care, disease monitoring and treatment, and surgical procedures (3–12; 40, 41). Thus, to the extent that race and socioeconomic status are inter-related proxies for such discrimination, one would expect the effect of self-reported healthcare discrimination to be diminished after adjusting for race and SES. Indeed, we found that associations between self-reported healthcare discrimination and diabetes care were attenuated by sociodemographic factors, primarily race and income.

Our study's findings corroborate smaller previous studies which reported worse diabetes care (e.g. fewer HbA1c tests and eye exams) and intermediary diabetes outcomes (higher HbA1c values) among persons reporting healthcare discrimination (17, 21, 22). Provider foot examinations was the one quality measure where we found no association with self-reported healthcare discrimination, which contrasts the findings of Ryan et al.'s study of diabetes patients (22). Our findings contrast those from a Veterans Affairs (VA) study that found no association between self-reported discrimination and a composite measure of diabetes care (20). The reasons for the differences between our study results and those from the VA are not clear, but may be due to the small sample size in the VA study (n=100), the use of VA medical records (vs. patient self-report) to assess quality of care, or the fact that no differences in diabetes care were found between African-Americans and Whites at the VA. Racial/ethnic minorities who receive comparable clinical care may be less likely to report discrimination within that system. We also found that persons who self-reported healthcare discrimination were more than twice as likely to report having diabetes-related foot disorders or retinopathy, two complications that are precursors to lower extremity amputations and blindness.

Self-reported discrimination was not associated with foot disorders after adjusting for sociodemographic factors, health status or healthcare access; self-reported discrimination was not associated with retinopathy after adjusting for health status. Diabetes complications are multifactorially determined, and healthcare delivery is only one of many causative factors.

We did not find associations between self-reported healthcare discrimination and diabetes self-management behaviors. We hypothesized that discrimination might harm health by compromising patients' health behaviors. Patients might disengage from the health system (e.g. delay utilizing healthcare and not adhere to treatment plans for self-care), alter sleep patterns, and cope maladaptively by smoking (37, 42, 43). However, we found that healthcare discrimination was unrelated to self glucose monitoring, self foot examinations, or participation in diabetes education. This may suggest that health behaviors are not a mechanism through which healthcare discrimination affects diabetes outcomes, or more likely, that healthcare discrimination affects aspects of self-care not measured in this study (e.g. nutrition, physical activity, tobacco use) (43, 44). Regardless, the lack of findings for self-care behaviors suggest that factors other than patient behaviors are the main source of differential outcomes from reported discrimination.

Our study has several limitations. First, the number of eligible states from the BRFSS dataset was limited. However, we do have representation from all four regions of the U.S., including metropolitan areas with high percentages of racial/ethnic minorities (e.g. Detroit). Second, self-reports are subject to reporting bias. However, self-reported diabetes measures have been validated (45, 46), and self-reported diabetes complications in our study were comparable to other national data (47). Although self-report is the most commonly accepted method for assessing discrimination (48), there are inherent biases in this approach; patients may not accurately perceive or report their healthcare experiences. However, the goal of this study was not to measure the *accuracy* of patient perceptions, but rather to investigate potential associations between self-reports of healthcare discrimination and health outcomes. Although it was pilot-tested in 2002, the BRFSS instrument itself, like other self-report measures of discrimination, has not been validated to measure self-reported healthcare discrimination. Third, data were cross-sectional, so directionality cannot be assessed. For example, it is possible that patients who perceive or experience healthcare discrimination develop more complications, *or* that patients with complications perceive or experience more discrimination.

In summary, we found that self-reported racial/ethnic discrimination in healthcare may be associated with worse diabetes care and more diabetes complications, but not compromised patient self-care behaviors. Our findings also suggest that other factors, such as sociodemographics, health status, and healthcare access, may play equally or more important roles in determining diabetes health disparities, and that a comprehensive, multi-faceted strategy is needed to effectively address health disparities in the U.S. Our study highlights the importance of understanding and addressing patient perceptions of racial discrimination in healthcare to reducing diabetes health disparities. More research is warranted to elucidate how healthcare discrimination impacts health, e.g., through biased allocation of healthcare resources, maladaptive patient coping strategies, or physiological reactions to racial stress. Finally, our paper focused on the potential effects of discrimination, and future research should include self-reported preferential treatment as a potential contributor to health disparities.

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Table 1

Sample Demographics and Clinical Characteristics.

	Self-Reported Racial/Ethnic Discrimination in Healthcare* **(n =114)**	**No Self-Reported Racial/Ethnic Discrimination in Healthcare*** **(n =2,124)**	**Total (n = 2,238)**	**P -Value**
Percentage of sample	4.8	95.2	100.0	
Race/Ethnicity **				
Non-Hispanic White	40.0	72.7	71.1	0.0001
African-American	42.5	17.4	18.6	
‘Other’ †	7.9	4.1	4.3	
Multi-Racial	2.8	2.1	2.2	
Hispanic	6.8	3.7	3.9	
Age (mean, yrs)	51.9 yrs	58.3 yrs	59.4 yrs	0.02
Female gender	51.3	49.3	49.4	0.79
Marital status				0.04
Never married	15.2	7.5	7.7	
Married/living as married	47.4	65.0	64.2	
Separated/Divorced/Widowed	40.4	27.5	28.1	
Education				0.11
High school or less	61.5	49.7	50.3	
College or more	38.5	50.3	49.7	
Annual household income				0.03
< $15,000	32.9	14.6	15.6	
$15,000–50,000	53.9	56.3	56.1	
> $50,000	13.3	29.1	28.3	
Region				0.11
North	13.1	9.4	9.5	
South	37.1	26.1	26.6	
East	48.6	61.0	60.4	
West	1.2	3.5	3.4	
Health status				0.0001

	Self-Reported Racial/Ethnic Discrimination in Healthcare*[*] (n =114)	**No Self-Reported Racial/Ethnic Discrimination in Healthcare[*] (n =2,124)**	**Total (n = 2,238)**	**P -Value**
Excellent/Very good	7.8	18.0	17.5	
Good	19.2	37.5	36.7	
Fair/poor	73.1	44.5	45.9	
Health insurance status				0.0002
Insured	79.2	92.5	91.9	
Financial barriers to care				<0.0001
Yes	45.2	14.6	16.0	
Medication regimen				0.005
Lifestyle modification only	23.2	15.6	15.9	
Oral agents without insulin	32.2	55.3	54.2	
Insulin +/− oral agents	44.7	29.1	29.9	

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[*] Based on the question ‘Within the past 12 months, when seeking health care, do you feel your experiences were worse than other races, the same as other races, better than other races, or worse than some but better than others?’ We defined discrimination based on a dichotomous categorization of the responses as ‘worse than other races’ vs. all other responses. All estimates are weighted.

[**] Race and Ethnicity were mutually exclusive (e.g. All Whites were categorized as non-Hispanic Whites).

[†] Includes the self-reported racial groups of Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaskan Native, or ‘Other’. These were combined due to the small sample sizes of the individual racial groups.

Table 2

Bivariate Associations between Self-Reported Racial Discrimination in Healthcare and Diabetes Outcomes

	Percentage of Persons With ‘Appropriate’ Outcomes[*]			**Unadjusted Odds Ratio**	**95% CI**
	Self-Reported Racial/Ethnic Discrimination in Healthcare[**]	**No Self-Reported Racial/Ethnic Discrimination in Healthcare**[**]	**P-value**		
Quality of care					
Diabetes-related primary care visits[†] (2–5 times)	38.3	62.3	<0.001	0.38[‡]	(0.21, 0.66)
HbA1c testing[†] (1–4 times)	59.4	77.7	<0.01	0.42[‡]	(0.21, 0.82)
Foot exams[†] (≥**2** times)	59.7	54.6	0.47	1.23	(0.69, 2.19)
Eye exam interval (<1 yr)	57.3	73.8	0.03	0.48[‡]	(0.24, 0.93)
Self-Management					
Self glucose monitoring (daily vs. weekly or more)	68.6	63.3	0.42	1.26	(0.71, 2.24)
Self foot examination (daily vs. weekly or more)	67.3	64.6	0.74	1.13	(0.56, 2.29)
H/o diabetes education class	50.3	56.9	0.37	0.78	(0.43, 1.38)
Diabetes complications					
Diabetes-related foot disorders	22.0	10.9	0.02	2.32[‡]	(1.15, 4.68)
Diabetes-related retinopathy	36.1	20.0	<0.01	2.26[§]	(1.24, 4.12)

[*] Categories were determined based on American Diabetes Association standards **and The Healthcare Effectiveness Data and Information Set (HEDIS) measures** (for quality of care and self-management variables), and on the absence of diabetes-related complications (i.e. foot disorders and retinopathy). **All estimates are weighted.**

[**] Based on the question ‘Within the past 12 months, when seeking health care, do you feel your experiences were worse than other races, the same as other races, better than other races, or worse than some but better than others?’ We defined discrimination based on a dichotomous categorization of the responses as ‘worse than other races’ vs. all other responses.

[†] Based on self-reported care within the prior 12 months.

[‡] $p<0.05$,

[§] $p<0.01$.

Table 3

Multivariate Associations between Self-Reported Racial/Ethnic Discrimination in Healthcare and Diabetes Health Outcomes[*]

	<u>Model 1:</u> Sociodemographic Factors[**]	95% Confidence Interval	<u>Model 2:</u> Sociodemographic Factors and Health Status[***]	95% Confidence Interval
Quality of Care				
Diabetes-related primary care visits[††] (2–5 times)	0.50[‡]	(0.28, 0.91)	0.64	(0.35, 1.16)
HbA1c testing[††] (1–4 times)	0.43[‡]	(0.21, 0.87)	0.53	(0.27, 1.06)
Foot exams[††] (≥2 times)	1.04	(0.59, 1.81)	1.14	(0.61, 2.12)
Eye exam interval (<1 yr)	0.51	(0.25, 1.04)	0.55	(0.26, 1.16)
Self-Management				
Self glucose monitoring (daily vs. weekly or more)	1.18	(0.62, 2.23)	1.19	(0.63, 2.24)
Self foot examinations (daily vs. weekly or more)	1.12	(0.55, 2.25)	1.09	(0.53, 2.28)
H/o diabetes education class	0.67	(0.36, 1.26)	0.71	(0.34, 1.47)
Diabetes complications				
Diabetes-related foot disorders	1.76	(0.73, 4.23)	1.57	(0.64, 3.88)
Diabetes-related retinopathy	1.77	(0.96, 3.25)	1.85	(0.97, 3.50)

	<u>Model 3:</u> Sociodemographic Factors, Health Status and Healthcare Access[†]	95% Confidence Interval
Quality of Care		
Diabetes-related primary care visits[††] (2–5 times)	0.66	(0.36, 1.21)
HbA1c testing[††] (1–4 times)	0.55	(0.27, 1.11)
Foot exams[††] (>1 time)	1.26	(0.67, 2.36)
Eye exam interval (<1 yr)	0.61	(0.27, 1.39)
Self-Management		
Self glucose monitoring (daily vs. weekly or more)	0.76	(0.36, 1.61)
Self foot examinations (daily vs. weekly or more)	1.25	(0.65, 2.39)
H/o diabetes education class	1.07	(0.51, 2.24)
Diabetes complications		
Diabetes-related foot disorders	1.23	(0.49, 3.14)

	<u>Model 3:</u> Sociodemographic Factors, Health Status and Healthcare Access[†]	**95% Confidence Interval**
Diabetes-related retinopathy	1.67	(0.89, 3.14)

[*] Categories were determined based on American Diabetes Association standards and The Healthcare Effectiveness Data and Information Set (HEDIS) measures (for quality of care and self-management variables) and on the absence of diabetes-related complications (i.e. foot disorders and retinopathy). All estimates are weighted.

[**] Includes race, income, education, age, gender, race*income interaction, and race*education interaction.

[***] Includes **covariates from Model 1 as well as** self-reported health status, diabetes treatment complexity and mental health status.

[††] Based on self-reported care within the prior 12 months.

[‡] p<0.05,

[§] p<0.01,

[¥] p<0.001.

[*] Categories were determined based on American Diabetes Association standards (for quality of care and self-management variables) and on the absence of diabetes-related complications (i.e. foot disorders and retinopathy).

[†] Includes **covariates from Model 1 and 2, as well as** insurance status and financial barriers to healthcare.

[††] Based on self-reported care within the prior 12 months.

[‡] p<0.05,

[§] p<0.01,

[¥] p<0.001.