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Differences in Diabetes Self-Care Activities by Race/Ethnicity and Insulin Use

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Abstract

Purpose—The purpose of this study is to examine differences in diabetes self-care activities by race/ethnicity and insulin use.

Methods—Data were from 2011 BRFSS for adults with diabetes. Outcomes included five diabetes self-care activities (blood glucose monitoring, foot checks, non-smoking, physical activity, healthy eating) and level of diabetes self-care (high, moderate, low). Logistic regression models stratified by insulin use were used to estimate the odds of each self-care activity by race/ethnicity.

Results—Only 20% of adults had high levels of diabetes self-care, while 64% had moderate and 16% had low self-care. Racial/ethnic differences were apparent for every self-care activity among non-insulin users, but only for glucose monitoring and foot checks among insulin users. Overall, American Indian/Alaska Natives (AIAN) had higher odds of glucose monitoring, Blacks had higher odds of foot checks, and Hispanics had higher odds of not smoking compared with non-Hispanic Whites. Non-insulin-using AIAN had higher odds of foot checks and non-insulin using Hispanics had higher odds of fruit/vegetable consumption.

Conclusion—Participation in specific diabetes self-care behaviors differs by race/ethnicity and by insulin use. Yet, few adults with diabetes of any race/ethnicity engage in high levels of self-care. Findings suggest that culturally tailored messages about diabetes self-care may be needed, in addition to more effective population promotion of healthy lifestyles and risk reduction behaviors to improve diabetes control and overall health. Diabetes educators can be a catalyst for adopting a population approach to diabetes management, which requires addressing both prevention and management of diabetes for *all* patients.

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Diabetes affects over 25 million adults and costs the US over \$218 billion in medical expenses and lost productivity annually (1). Diabetes increases the risk for health complications such as cardiovascular disease, hypertension, and kidney failure and is the 7th leading cause of death in the US (2). The burden on the healthcare system is substantial. Avoidable emergency room visits or hospital admissions for diabetes complications have been documented (3, 4) and are often attributed to poor primary care management of diabetes (5). The burden of diabetes falls disproportionately on racial/ethnic minorities in the US. Minorities are more likely than whites to be diagnosed with diabetes, and related morbidity and mortality rates vary by complication and by race (6). American Indians/Alaska Natives have more than twice the prevalence of diagnosed diabetes than non-Hispanic whites, while non-Hispanic blacks and Hispanics have rates 70–80% higher than non-Hispanics whites (7). Asian Americans are at a higher risk of developing type 2 diabetes, despite lower average body mass index compared with non-Hispanic whites (8).

Diabetes is a chronic condition that requires regular clinical care to manage and reduce risk of complications (9). While clinical care is critical, it is only a part of daily living for people with diabetes. Self-management is an essential component of effective diabetes care. American Diabetes Association guidelines suggest that all patients with diabetes receive Diabetes Self-Management Education and ongoing Diabetes Self-Management Support (9). This support can lead patients to engage in improved self-care, including self-monitoring blood glucose and adhering to complex medication regimens, appropriate foot care, following prescribed diet and exercise plans, and risk reduction efforts such as smoking cessation (10). However, a universally accepted protocol incorporating these activities for all patients with diabetes does not exist, and the value of SMBG for those with non-insulin treated Type 2 diabetes remains debated (11). Thus, consistent evaluation of successful diabetes self-care behavior can be challenging (12).

Prior studies of race/ethnic differences in diabetes self-care behaviors document disparities for glucose self-monitoring, foot care, physical activity, and dietary intake (13–19). However, these studies examined a limited number of race/ethnicity groups or isolated self-care behaviors, and all were based on data collected prior to 2004. Studies that looked at differences across race/ethnicity groups were typically limited to whites, blacks, and Hispanics, and sometimes an aggregated other category (13, 15–18). Half of these studies examined a single self-care behavior, such as self-monitoring blood glucose (SMBG) (13–15, 18). Four studies used Behavioral Risk Factor Surveillance System (BRFSS) data prior to 2004 (15, 16, 18, 19), two studies used National Health and Nutrition Examination Survey data from 1988–1994 (13, 17), and one used diabetes registry data from a health system collected in the 1990s (14). None of the disparities studies examined insulin use, but other studies have documented differences in self-care behaviors by insulin use (20, 21).

The goal of this study was to identify race/ethnic differences in diabetes self-care activities. Five specific self-care activities (glucose monitoring, foot checks, smoking, physical activity, diet) and levels of overall diabetes self-care (high, moderate, or low, based on the number of reported self-care activities) were examined by race/ethnicity. Additionally, the odds of each diabetes self-care activity were estimated by race/ethnicity and stratified by current insulin use. The current study adds to the literature by using the most recent

population-based data available on health behaviors, examines five diabetes-related self-care activities individually and combined, compares a larger number of race/ethnicity groups, and evaluates race/ethnic differences in diabetes self-care by current insulin use.

Research Design and Methods

Data source and sample

Data were obtained from the 2011 BRFSS, excluding U.S. territories. BRFSS is a collaborative project between the states and the Centers for Disease Control and Prevention (CDC). It is a state-based system of telephone surveys that collects information on health-related behaviors from randomly selected adults, ages 18 years and older. In 2011, every state and the District of Columbia used a disproportionate dual frame stratified sample and included both a landline sample and a cell phone sample (22). In addition to the core survey, states have the choice to include additional modules targeting specific conditions or topics. In 2011, BRFSS had 34 optional modules, including a module on diabetes.

Analyses were based on adults residing in the 41 states that implemented the diabetes module; 14 states implemented it with the dual frame sample, while 26 states and the District of Columbia implemented it with the landline sample only. The dataset was prepared according to CDC guidance for combining module data and sampling weights from both dual frame surveys and landline-only surveys (23). The target population was adults who reported they had been told they had diabetes, had no indication of missing feet, and self-identified as belonging to one of the race/ethnicity groups (n=38,214 unweighted). Response rates ranged from 66.0% (Nebraska) to 35.5% (Connecticut) with a median response rate of 51.9% for the 41 states (Response Rate 4 using American Association for Public Opinion Research definitions) (24).

Measures

Diabetes self-care activities—Items were identified in BRFSS that corresponded to diabetes self-care activities measured in the Summary of Diabetes Self-Care Activities (SDSCA); Areas assessed include diet, exercise, glucose monitoring, foot care, and smoking (25). Although not asked in the same manner as the SDSCA, BRFSS respondents were asked about these same diabetes self-care activities. Home glucose monitoring and home foot checks were in the diabetes module. Smoking, physical activity, and healthy eating were in the core survey. Frequency of home glucose testing was classified as daily glucose monitoring and less than daily monitoring. Frequency of home foot care was classified as daily foot checks and less than daily foot checks. Smoking was categorized as current smoker or non-smoker. Physical activity of respondents was classified based on the type, duration, and intensity of activity. The BRFSS-computed physical activity variable included five categories: highly active, active, insufficiently active, inactive, or missing. In keeping with CDC recommendations for physical activity (26), highly active and active were combined to create a sufficiently active category (30 or more minutes of moderate exercise a day for 5 or more days or 20 or more minutes of vigorous exercise a day for 3 or more days per week); insufficiently active, inactive, and unknown were combined to create an insufficiently active category. Based on national guidelines that recommend the intake of at

least 5 fruits or vegetables a day, fruit and vegetable intake were categorized as a combined 5 or more servings per day or less than 5 servings per day. Finally, a count of self-care activities was created that represented a sum of the total number of self-care activities, ranging from zero to five, in which each individual reportedly engaged. Level of self-care was classified as high (4–5 activities), moderate (2–3 activities), or low (0–1 activity).

Diabetes care—Use of insulin was classified as currently using insulin or not based on self-report. Finally, a yes/no variable representing whether a respondent reported ever having participated in diabetes self-management education (DSME) also was created for use in analyses

Social and demographic characteristics—Two variables were used to identify a person's race/ethnicity. Anyone who indicated they were of Hispanic origin was classified as Hispanic, regardless of race. For non-Hispanic respondents, self-reported race was used and coded as white; black; Asian/Native Hawaiian or other Pacific Islander (API); and American Indian/Alaskan Native (AIAN). Respondents who selected multiple races, but did not indicate a preferred race/ethnicity or who selected 'other' race were excluded from the analysis due to small sample size.

Other demographic characteristics included sex (female and male) and age group (18–39, 40–64, 65 years or older). Socioeconomic characteristics included educational attainment (less than high school, high school graduate or GED, some college, college graduate), marital status (married or unmarried), employment status (employed, unemployed, retired), family income (<\$20000, \$20000–34999, \$35000–49999, \$50000–74999, \$75000+), and insurance coverage (covered or not). Health status variables included self-reported health (excellent/very good, good, fair/poor) and body mass index (BMI). BMI was calculated as weight in kg divided by height in meters squared and classified as underweight/normal (BMI <25), overweight (BMI 25–30), and obese (BMI 30+). Census region was based on residential location (Northeast, Midwest, South, West).

In order to retain as much sample as possible, missing values for education (<1%), employment (<1%), and income (15%) were imputed using hotdeck imputation, a standard method of substituting empirically derived values from suitably matched cases for cases with missing values.

Analytic Methods

Differences in respondent characteristics, diabetes status measures, and individual self-care activities by race/ethnicity were assessed overall using cross-tabulations with design-based f-tests. To examine race/ethnic differences in self-care activities by insulin status, survey means were employed with post-estimation commands for adjusted Wald Tests for differences across race/ethnic groups within each insulin status group and t-tests for within race group differences by insulin status. Logistic regression is a statistical technique that is often used to examine the association between a dichotomous outcome (e.g., yes/no, occurred/did not occur) and one or more predictor variables. For this study, logistic regression was used to estimate the odds of each self-care activity by race/ethnicity adjusting for all sociodemographic variables shown in Table 1, as well as diabetes type and DSME.

Additionally, a state of residence indicator was used to account for potential geographic differences in survey implementation, disease prevalence, clinical care, or health behavior norms. Adjusted odds ratios are reported and represent how much higher the odds of a given self-care activity are for each race/ethnicity group compared to non-Hispanic Whites after adjusting for all other factors. The final analytic sample includes adults with diabetes in the 41 states that implemented the diabetes module and who had complete data for all key variables (n=36,998, unweighted). All analyses were conducted using survey procedures in Stata SE version 12, which accounted for unequal probability of selection (sampling weights) and the complex sample design (clustering and stratification) of the BRFSS.

Results

Table 1 shows selected characteristics of adults with diabetes by race/ethnicity as well as unweighted sample and weighted population sizes. Overall, 65.5% of the weighted population was white, 14.2% black, 3.0% API, 1.8% AIAN, and 15.5% Hispanic. Significant differences in demographic, socioeconomic, and health characteristics by race/ethnicity were noted for all variables except sex. Indicators of diabetes type or severity also differed by race/ethnicity. AIAN had the highest percentage currently using insulin (40%), while API had the lowest insulin use (24%). Notably, AIAN had the highest percentage reporting having attended DSME (64%), while Hispanics had the lowest reported DSME (47%).

Table 2 displays the distributions of specific diabetes self-care activities and level of self-care by race/ethnicity. Statistically significant race/ethnic differences were detected for each of the diabetes self-care variables. AIAN had the highest reported daily glucose monitoring (77%) and the highest reported daily foot care (73%), while API had the lowest reported at 51% and 42%, respectively. Conversely, API had the highest levels of non-smoking (86%), while AIAN had the lowest (75%). Slightly more than one-third of adults engaged in sufficient physical activity and 15% ate five or more fruits and vegetables daily, and these also differed by race/ethnicity. Overall, only 20% of adults had high levels of diabetes self-care, as indicated by engaging in four or five self-care activities. AIAN had the most with 24%, while fewer than 20% of blacks and API had high levels of self-care. Among insulin users, 25% engaged in at least 4 self-care activities, while only 18% of those not using insulin engaged in high levels of diabetes self-care (data not shown). The majority (64%) engaged in moderate levels of diabetes self-care, indicated by participating in two or three self-care activities.

Table 3 presents the diabetes self-care activities performed by race/ethnicity and insulin status. Overall, there were statistically significant differences in the prevalence of each self-care activity by race/ethnicity among non-insulin users. Conversely, among insulin users, only the prevalence of daily glucose monitoring and foot checks differed by race/ethnicity. Insulin users had a higher percentage of daily glucose monitoring than non-insulin users for every race/ethnic group and higher daily foot checks for all groups except API and AIAN.

Finally, Table 4 presents results of the logistic regression analysis of race/ethnic differences for each self-care activity stratified by current insulin use. Among both insulin and non-

insulin users, AIAN had higher odds of daily glucose monitoring and Hispanics had higher odds of not smoking compared with non-Hispanic Whites. Additionally, Blacks and non-insulin using AIAN had higher odds of daily foot checks, and Hispanics had higher odds of fruit/vegetable consumption compared with non-Hispanic Whites.

Discussion

This study demonstrates significant race/ethnic differences in specific diabetes self-care activities but also shows that adults with diabetes are not engaging in high levels of diabetes self-care activities regardless of race/ethnicity. Diabetes self-care differed by race/ethnicity but not always in the way hypothesized. AIAN and Hispanics have high diabetes-related prevalence and morbidity disparities (16, 27), but our findings indicate they are more (not less) likely to engage in high-levels of diabetes self-care suggesting that something beyond individual behavior may be contributing to poor diabetes outcomes.

Study results show that AIAN have the highest level of diabetes self-care, which seems surprising. However, the AIAN findings are consistent with previous studies using earlier years of BRFSS data, as well as other sources (19, 28). API tend toward lower levels of self-care, which was also consistent with previous studies that found low levels of diabetes self-care among Asian subgroups, particularly Asian Indian and Filipino Americans (8, 29). These findings contribute to the literature by documenting, in one study, race/ethnic differences in diabetes self-care activities that were previously scattered across numerous papers each focusing on a few race groups or a single self-care activity and updating previous findings with the most current data available. Additionally, this study contributes several new insights.

Race/ethnic differences in diabetes self-care differed by current insulin use. Previous studies examined self-care behavior by insulin status and found that those using insulin had higher rates of self-care, such as following a healthier diet and engaging in self-monitoring of blood glucose, than those who did not use insulin (20, 30). Thus, it was anticipated that those using insulin would be more likely to engage in specific self-care activities, such as daily glucose monitoring. Findings confirmed this and additionally found race/ethnic differences for specific self-care behaviors. Minorities at high risk of diabetes-related morbidity and mortality and currently using insulin are engaging in higher levels of diabetes-specific self-monitoring (blood glucose and foot care), with the exception of API. However, adopting healthy lifestyle behaviors (physical activity and health eating), that are important for diabetes control as well as overall health, tends to occur much less frequently. This is of particular concern among the insulin users who are at elevated risk for hyperglycemia, high blood pressure, obesity, and cardiovascular disease.

Limitations

Study findings should be considered in light of limitations. First, the measures of self-care activity chosen from BRFSS approximated the types of self-care measured in validated instruments and monitored in clinical settings. But, they are not collected in the same manner. Prevalence of self-care reported here may not reflect findings reported from validated instruments or clinical data. Second, all diabetes self-care activity was based on

self-reports. In any survey, there is potential for both recall bias, social desirability, and other context effects. BRFSS is a telephone survey, a mode that is subject to increased social desirability and context based effects when compared to other modes of administration (31, 32). While telephone mode is prone to over-reporting, mode is constant across the study population. If the effects are constant across all ethnicities, the impact is only on the accuracy of the estimates, not their relative differences. However, to the extent that social desirability is related to race/ethnicity, at least part of the differences detected could be due to measurement error not true differences (33). Third, measurement of race/ethnicity is limited. While BRFSS does capture self-reported and preferred race for those reporting multiple races, it does not measure detailed Asian, Hispanic, Pacific Islander and tribal subgroups or nativity status. Group-specific heterogeneity is likely masked in the aggregated race/ethnic categories available (34, 35). Moreover, differences in health behaviors related to immigrant status, acculturation, or community integration are not distinguishable due to this lack of information.

Finally, previous research suggests that population health surveys vary in terms of their suitability for health disparities research, particularly for AIAN (36, 37). BRFSS was selected as the data source for this analysis as it is the only population-based dataset that includes each of the diabetes self-care activities of interest and seemingly sufficient sample size for the subgroups of interest. However, the states included in our study are a mix of dual frame and landline-only surveys for the diabetes module with potential differences in coverage and coverage error and 10 states not represented at all; therefore it may not be fully representative of the adult population with diabetes in the US. Relatedly, small numbers of participants for some of the race/ethnic groups evaluated may have resulted in an inability to detect significant differences in some outcomes. This is particularly true for API (n=1184) and AIAN (n=891).

Implications for Practice

Findings from this study suggest that participation in specific diabetes self-care activities differs by race/ethnicity and by insulin status. However, adults with diabetes are engaging, on average, in three or fewer diabetes self-care activities, regardless of race/ethnicity, an unanticipated finding with important clinical and public health implications. Adults with diabetes who currently use insulin have higher levels of diabetes-specific self-monitoring (blood glucose and foot care) than those who do not use insulin. Yet, healthy lifestyle behaviors (physical activity and healthy eating), that are important for diabetes control as well as overall health, tend to occur much less frequently among all adults with diabetes. Diabetes educators can use these findings to target self-care support to patients that are not currently using insulin or for culturally-tailored approaches to specific race/ethnicity groups that are less likely to engage in specific self-care activities. More importantly, this study provides diabetes educators with baseline evidence that all patients with diabetes should be continuously supported to adopt and maintain appropriate self-care including promotion of healthy lifestyle behaviors.

Diabetes is a population health problem and should be addressed at multiple levels including individual, family, clinic, and community (38). Adopting a population approach to diabetes

management means that clinics and health systems must think beyond medical management and acute care of patients with uncontrolled diabetes. It requires addressing both prevention and management of diabetes for *all* patients, which cannot occur in the clinic alone. Diabetes educators can be a catalyst for adopting a population approach to diabetes management in their own clinics or health systems. They can work with their patients to identify personal and contextual barriers to engaging in all of the recommended diabetes self-care activities. As health educators, they can apply principles of public health and health promotion to understand and address the multiple factors that promote and constrain healthy living for their patients. They can also think outside of the clinical box about the broader impact of the community for supporting diabetes care. This in turn may uncover potential opportunities for integrated, multilevel, clinical-community-public health partnerships to address overall prevention and management of diabetes.

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Table 1

Selected characteristics of adults with diabetes by race/ethnicity, 2011 BRFSS.

	White		Black		API		AIAN		Hispanic		Total		p-value
	%		%		%		%		%		%		
Sex													
Female	49.9%		52.3%		42.5%		47.2%		49.4%		49.9%		0.398
Male	50.1%		47.7%		57.5%		52.8%		50.6%		50.1%		
Age group													
18–39 years	6.7%		9.2%		9.7%		7.2%		14.9%		8.4%		<0.001
40–64 years	51.0%		58.5%		61.1%		61.1%		58.1%		53.6%		
65+ years	42.4%		32.3%		29.3%		31.7%		26.9%		38.0%		
Education attainment													
Less than HS	17.8%		26.0%		5.0%		25.7%		46.6%		23.2%		<0.001
HS grad or GED	33.4%		32.9%		22.0%		31.8%		21.9%		31.1%		
Some college	31.0%		28.9%		18.2%		30.7%		24.2%		29.3%		
College grad	17.8%		12.2%		54.8%		11.9%		7.3%		16.4%		
Marital status													
Unmarried	45.2%		65.6%		29.8%		51.3%		51.3%		48.6%		<0.001
Married	54.8%		34.4%		70.2%		48.7%		48.8%		51.4%		
Employment status													
Employed	30.0%		28.1%		47.4%		25.0%		37.5%		31.3%		<0.001
Not employed	30.8%		40.0%		23.3%		43.1%		43.1%		34.0%		
Retired	39.2%		31.9%		29.3%		31.9%		19.4%		34.7%		
Income level													
<\$20,000	29.1%		47.2%		19.8%		44.8%		50.7%		35.0%		<0.001
\$20,000 to <\$35,000	26.1%		26.6%		15.0%		27.2%		24.7%		25.6%		
\$35,000 to <\$50,000	14.9%		9.5%		11.5%		11.2%		10.2%		13.2%		
\$50,000 to <\$75,000	13.9%		8.5%		15.9%		6.6%		7.9%		12.1%		
\$75,000 or greater	16.1%		8.2%		37.9%		10.3%		6.5%		14.1%		
Insurance coverage													
Insured	91.1%		86.8%		92.9%		89.6%		76.0%		88.2%		<0.001

	White	Black	API	AIAN	Hispanic	Total	p-value
	%	%	%	%	%	%	
Uninsured	8.9%	13.2%	7.1%	10.4%	24.0%	11.8%	
Self-reported health							
Very good/Excellent	45.3%	53.2%	42.9%	59.9%	63.9%	49.5%	<0.001
Good	36.5%	31.6%	38.6%	27.9%	26.7%	34.2%	
Fair/Poor	18.3%	15.2%	18.5%	12.2%	9.4%	16.4%	
Body Mass Index							
Underweight/Normal	13.2%	13.0%	29.4%	18.1%	13.5%	13.8%	<0.001
Overweight	29.3%	28.5%	45.6%	21.1%	30.6%	29.8%	
Obese	53.0%	55.0%	22.8%	58.4%	50.4%	52.0%	
Missing	4.6%	3.5%	2.2%	2.4%	5.5%	4.5%	
Census Region							
Northeast	15.6%	10.4%	11.4%	4.8%	9.0%	13.5%	<0.001
Midwest	28.3%	16.8%	9.0%	19.8%	3.9%	22.2%	
South	40.6%	59.4%	15.5%	47.8%	37.5%	42.2%	
West	15.5%	13.4%	64.1%	27.7%	49.7%	22.2%	
SAMPLE SIZE							
Unweighted sample	27,425	5,124	1,184	891	2,374	36,998	
Weighted population	10,778,405	2,328,050	497,658	298,683	2,549,708	16,452,505	

Note: Data from BRFSS 2011 public-use data file, 41 states that implemented diabetes module

Table 2

Diabetes clinical care and self-care activities by race/ethnicity, 2011.

	White	Black	API	AIAN	Hispanic	Total	
	%	%	%	%	%	%	p-value
DIABETES STATUS							
Ever taken DSME							
No DSME	44.1%	41.4%	45.8%	37.3%	54.1%	45.2%	<0.001
DSME	55.9%	58.6%	54.2%	62.7%	45.9%	54.8%	
Now using insulin							
No	69.8%	62.6%	76.5%	62.4%	70.5%	68.9%	0.008
Yes	30.2%	37.4%	23.5%	37.6%	29.5%	31.1%	
SELF-CARE							
Glucose-Monitoring							
< daily	35.1%	30.6%	48.4%	23.0%	40.8%	35.6%	<0.001
Daily	64.9%	69.4%	51.6%	77.0%	59.2%	64.4%	
Foot Checks							
< daily	37.1%	27.9%	58.0%	27.0%	42.4%	37.1%	<0.001
Daily	62.9%	72.1%	42.0%	73.0%	57.6%	62.9%	
Smoking							
Current smoker	17.0%	21.5%	13.7%	25.3%	13.8%	17.2%	0.013
Non-smoker	83.0%	78.5%	86.3%	74.7%	86.2%	82.8%	
Physical Activity							
Insufficient	61.7%	67.4%	49.0%	61.0%	68.9%	63.2%	<0.001
Sufficient	38.3%	32.6%	51.0%	39.0%	31.1%	36.8%	
Healthy Eating							
< 5 F/V per day	86.7%	86.4%	76.6%	85.6%	79.6%	85.2%	<0.001
5 F/V per day	13.3%	13.6%	23.5%	14.4%	20.4%	14.8%	
# Self-care Activities							
0 – 1 activities	14.6%	15.2%	22.7%	10.5%	19.9%	15.7%	0.020
2 – 3 activities	65.5%	65.5%	57.6%	64.4%	58.9%	64.2%	
4 – 5 activities	19.9%	19.3%	19.7%	25.1%	21.2%	20.1%	

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Note: Data from BRFSS 2011 public-use data file

Abbreviations: DSME = Diabetes Self-Management Education; F/V = Fruits/Vegetables; API = Asian, Native Hawaiian, and other Pacific Islanders; AIAN = American Indian/Alaska Natives

Table 3

Diabetes self-care activities by race/ethnicity and insulin status, 2011.

	Not Using Insulin		Using Insulin	
	Mean	p-value ¹	Mean	p-value ²
Daily glucose monitoring		0.0021		0.025
White	53.5%		91.0%	< 0.001
Black	57.7%		88.9%	< 0.001
API	42.5%		81.1%	0.001
AIAN	66.3%		94.8%	< 0.001
Hispanic	50.3%		80.5%	< 0.001
Daily foot checks		< 0.001		0.031
White	59.9%		69.7%	< 0.001
Black	68.5%		78.2%	0.005
API	38.2%		54.3%	0.211
AIAN	76.1%		67.8%	0.351
Hispanic	54.1%		65.9%	0.030
Non-smoker		0.015		0.056
White	83.3%		82.3%	0.412
Black	79.8%		76.3%	0.464
API	85.9%		87.6%	0.840
AIAN	70.4%		81.9%	0.090
Hispanic	84.8%		89.4%	0.142
Sufficient physical activity		0.001		0.130
White	39.8%		34.9%	0.001
Black	33.7%		30.9%	0.536
API	52.5%		46.2%	0.633
AIAN	40.3%		36.8%	0.701
Hispanic	33.4%		25.6%	0.104
Daily 5+ fruit/veg		< 0.001		0.719
White	13.0%		14.0%	0.349
Black	14.4%		12.4%	0.385

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	Not Using Insulin		Using Insulin		p-value ¹	p-value ²
	Mean	p-value ¹	Mean	p-value ¹		
API	25.0%		18.5%			0.553
AIAN	16.9%		10.2%			0.193
Hispanic	23.2%		13.9%			0.016
Mean self-care activities		0.214		0.511		
White	2.5		2.9			< 0.001
Black	2.5		2.9			< 0.001
API	2.4		2.9			0.030
AIAN	2.7		2.9			0.149
Hispanic	2.5		2.8			0.018

Note:

¹ Based on adjusted Wald Test for overall differences across race/ethnic groups;

² Based on t-test from post-estimation test of race group specific differences by insulin status.

Table 4

Race/ethnic differences in the odds of each self-care activity stratified by insulin use.

	Daily SMBG			Daily Foot Checks			No Smoking			Sufficiently Active			Daily 5+ Fruit/Veg		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Currently using insulin (n= 11,051)															
Non-Hispanic White	1.0			1.0			1.0			1.0			1.0		
Non-Hispanic Black	0.8	0.5	1.2	1.4	1.0	2.0	1.1	0.7	1.5	0.9	0.7	1.3	1.0	0.7	1.5
Non-Hispanic Asian Pacific Islanders	0.4	0.1	1.4	0.6	0.2	1.7	1.0	0.2	6.8	0.8	0.3	2.5	0.8	0.2	3.5
Non-Hispanic American Indian/Alaska Natives	2.2	1.0	4.8	0.9	0.4	2.0	1.6	0.9	3.0	1.0	0.5	2.3	0.8	0.4	1.6
Hispanic	0.6	0.4	1.0	0.9	0.6	1.4	3.2	1.7	6.3	0.7	0.4	1.0	0.9	0.6	1.5
Not using insulin (n = 25,947)															
Non-Hispanic White	1.0			1.0			1.0			1.0			1.0		
Non-Hispanic Black	1.1	0.9	1.3	1.3	1.0	1.6	1.1	0.9	1.4	0.9	0.7	1.1	1.1	0.9	1.5
Non-Hispanic Asian Pacific Islanders	0.9	0.5	1.6	0.5	0.3	0.9	1.3	0.6	2.8	1.2	0.7	2.1	1.4	0.7	2.6
Non-Hispanic American Indian/Alaska Natives	1.5	1.0	2.2	2.0	1.4	2.8	0.6	0.4	1.0	1.2	0.8	1.8	1.4	0.8	2.5
Hispanic	0.9	0.7	1.2	0.9	0.7	1.2	2.1	1.4	3.2	0.9	0.7	1.2	1.6	1.1	2.2

Note: Adjusted for sex, age, education, marital status, employment, income, insurance coverage, health status, body mass index, diabetes self-management education, and state of residence.