RACIAL/ETHNIC DIFFERENCES IN THE HEALTHCARE EXPERIENCE (COVERAGE, UTILIZATION, AND SATISFACTION) OF US ADULTS WITH DIABETES

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Objective: To examine racial/ethnic differences in healthcare coverage, utilization, and satisfaction, among US adults with diabetes.

Design and Setting: We conducted a cross-sectional analysis among 9443 adults with diabetes who participated in the 1999 Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey of the civilian non-institutionalized US population aged ≥18 yrs.

Main Outcome Measures: We compared healthcare coverage, utilization, and satisfaction across 4 race/ethnicity categories: non-Hispanic Whites (NHW), non-Hispanic Blacks (NHB), Hispanics (HSP), and others, and examined whether these factors were associated with self-rated health status.

Results: By self-report, more NHB (14.8%), HSP (20.7%), and members of other races (21.8%) were uninsured, compared to NHW (6.4%). Similarly, cost was a barrier to visiting a doctor for 23.9% of HSP, 19.5% of NHB, and 13.4% of members of other races; however, only 8.2% of non-Hispanic Whites reported cost as a barrier. More NHW (90.1%) and NHB (90.7) reported having had a check-up in the past year, compared to HSP (84.5%) or others (84.1%). All 3 variables exhibited significant differences by race or ethnicity (all $P<.01$). After adjustment for age, sex, income, education, and insulin use, the association with race/ethnicity persisted for health insurance coverage ($P<.001$), and for cost as a barrier ($P<.003$). Reporting cost as a barrier to visiting a doctor ($P=.013$), and rating one's overall health care as fair or poor ($P=.001$), were associated with poorer health status.

Conclusions: These results suggest that ethnic minorities with diabetes report less healthcare coverage and more cost-related barriers to utilization, compared to non-Hispanic Whites. Persons with fair/poor health status were more likely to report cost barriers and poor satisfaction. Future research should focus on the reasons for such differences and on interventions to improve health care for minority populations. (*Ethn Dis.* 2003;13:47–54)

Key Words: Racial/Ethnic Differences, Diabetes, Healthcare Insurance, Healthcare Coverage, Healthcare Utilization, Healthcare Satisfaction, Health Status, Behavioral Risk Factor Surveillance System, BRFSS, National Data

INTRODUCTION

Outcomes for persons with diabetes may reflect their healthcare experience. The healthcare experience is multi-dimensional and incorporates all aspects of health care, from the acquisition of health insurance, accessing services, and interacting with providers, to evaluating the quality of care received, and engaging in further preventive healthcare behaviors. Aspects of the healthcare experience have been shown to be related to health status in the general population.[1–4] Although individual aspects of the healthcare experience have been evaluated, the healthcare experience is rarely considered as a whole. In fact, much of the research in diabetes care has centered around patient behaviors and compliance with prescribed treatment regimens.[5,6] In addition, the field has seen a recent explosion of literature evaluating clinician behaviors and adherence to clinical practice recommendations.[7–9] In efforts to understand factors that may improve health outcomes for individuals with diabetes, more focus should be placed on the clinician-patient relationship, and on patients' interactions with the healthcare system in general.

It is well known that most ethnic minorities in the United States, as compared to their White counterparts, have a higher incidence and prevalence of diabetes, as well as an increased risk for diabetes-related complications and adverse outcomes.[10–17] Healthy People 2010, a program setting specific national health objectives to achieve by 2010, has included eliminating health disparities as a goal.[18] With this in mind, identifying areas in which individuals are not connecting with the healthcare system will serve to provide a more complete picture of quality of care and, possibly, to explain some of the racial/ethnic differences observed in adverse outcomes.

A growing body of literature has demonstrated poorer access to treatment, as well as sub-optimal treatment patterns for ethnic minorities with chronic diseases, such as cardiovascular and renal disease.[19–23] Few studies, however, have been specifically conducted with persons with diabetes, regarding the association between race/ethnicity and key aspects of the healthcare experience, including cost barriers, utilization, and patient satisfaction. Studies using national data collected in the early 1990s examined healthcare insurance coverage and utilization for racial/ethnic groups.[24–28] However, measures of patient satisfaction have generally been limited to large health maintenance organizations (HMOs).[29–31] Further, the field needs more recent, population-based assessments of factors related to the healthcare experience of persons

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with diabetes, with particular consideration given to race/ethnicity.

Therefore, we analyzed national data from the Behavioral Risk Factor Surveillance System (BRFSS) to examine racial/ethnic differences in the healthcare experience of US adults with diabetes, as indicated by their healthcare coverage, utilization, and satisfaction. We then examined whether these factors of the healthcare experience were related to self-rated health status.

METHODS

Data Source

We analyzed the 1999 Behavioral Risk Factor Surveillance System. BRFSS methods have been previously reported.[32–34] Briefly, the BRFSS is a state-specific, cross-sectional telephone survey of the civilian, non-institutionalized adult population, aged ≥18 years. Funded by the Centers for Disease Control and Prevention (CDC), the survey is conducted in all 50 states and the District of Columbia. BRFSS uses sampling procedures based on either the disproportionate stratified sampling (DSS), or the Mitofsky-Waksberg method of random digit dialing. Trained interviewers administer a core questionnaire required in all states, as well as several optional modules. State-specific data are aggregated and weighted to yield estimates for the United States population; all data are self-reported.

Study Population

The study group had answered yes to the question: "Have you ever been told by a doctor that you have diabetes?" Those who reported diabetes only during pregnancy were excluded from analysis. Race and ethnicity were determined separately. Participants were asked to report a race (White, Black, Asian/Pacific Islander, American Indian/Alaska Native, Other), and whether or not they were of Spanish or Hispanic origin. We then stratified persons with diabetes into 4 racial/ethnic categories: non-Hispanic Whites (NHW), non-Hispanic Blacks (NHB), Hispanics (HSP), and others. Excluding those who did not report race/ethnicity (N=499), our analysis included 9443 persons: 6899 NHW, 1163 NHB, 976 HSP, and 405 members of other races. Following the application of sample weights, the groups represented 67%, 14%, 15%, and 4%, respectively, of the US population.

Study Variables and Measures

Socio-demographic data (age, sex, education, and annual household income from all sources were taken from the core questionnaire, and, therefore, were available for the entire diabetic population. Some data were missing for the income variable (18% missing). Clinical characteristics, including age at the time of diabetes diagnosis and current insulin use, were abstracted from the optional diabetes module (N=6911), administrated by 38 states in 1999.

Several variables from the core questionnaire and the optional diabetes (38 states, N=6911) and healthcare utilization modules (2 states, N=306) were used to describe 3 domains of the healthcare experience: health insurance coverage, healthcare utilization, and healthcare satisfaction. Health insurance coverage was determined by the respondent's having any form of coverage, and was taken from the core questionnaire. Healthcare utilization was assessed by 3 dimensions: time since last check-up by a doctor; frequency of visits to a health professional, specifically for diabetes (the American Diabetes Association recommends quarterly visits[35]); and cost as a barrier to utilization. The queries on time since last check-up and cost as a barrier came from the core questionnaire, and visits for diabetes came from the optional diabetes module. Respondents' healthcare satisfaction was also assessed using the optional healthcare utilization module, and was considered to have 2 dimensions: self-rating of their overall health care, and the convenience of their healthcare facility. Response categories were excellent, very good, good, fair, or poor, for both dimensions. Respondents rated their general health status as excellent, very good, good, fair, or poor, on the core questionnaire.

Statistical Analysis

Selected socio-demographic and clinical characteristics were stratified by race/ethnicity. Chi-square analysis was used to test for any overall statistically significant differences between the racial/ethnic groups. Similarly, variables related to healthcare insurance coverage, utilization, and satisfaction, were stratified by race/ethnicity, with χ^2 tests again being used to determine statistically significant differences. Logistic regression models were used to determine whether racial/ethnic differences persisted, after adjusting for socio-demographic and clinical characteristics that appeared to differ between the races/ethnicities. For logistic regression analyses, all healthcare experience variables were dichotomized.

Analyses were also conducted to determine whether individual variables of the patients' healthcare experience were each related to health status, adjusting for race/ethnicity, and other socio-demographic and clinical variables. We used χ^2 tests and logistic regression

Table 1. Socio-demographic and clinical characteristics of US persons with diabetes by race/ethnicity

	Non-Hispanic Whites (*N*=6899)	Non-Hispanic Blacks (*N*=1163)	Hispanics (*N*=976)	Others (*N*=405)	*P* Value
Age, y					<.001
18–44	12.8	18.3	24.2	14.3	
45–64	39.8	52.4	45.3	54.7	
≥65	47.4	29.3	30.5	31.0	
Female, %	50.7	57.8	53.8	46.3	.019
Education					
< High school	18.7	33.6	53.6	24.8	
High school	36.0	30.7	23.8	21.9	<.001
Some college/college graduate	45.3	35.7	22.6	53.3	
Income, $					
<20,000	28.4	46.5	57.0	36.6	
20,000–34,999	30.8	26.6	24.7	34.5	<.001
35,000–49,999	16.8	12.5	9.3	14.3	
≥50,000	24.0	14.4	9.0	14.6	
Age of diabetes onset, y					
≥30	89.0	85.4	87.5	88.7	.331
Duration of diabetes, y					
1–4	32.2	33.9	24.6	32.2	
5–9	23.0	20.7	29.4	27.0	.236
≥10	44.8	45.4	46.0	40.8	
Current insulin use, % yes	30.6	39.5	28.3	21.7	.001

Note: all results reported as percentages. *P* values based on χ^2 tests. *N* for race/ethnicity/ethnicity represents largest number of persons who participated in the core questionnaire. Eighteen percent of participants were missing data on income.

models to examine these associations, and to obtain odds ratios and 95% confidence intervals. Analyses were conducted using SUDAAN to account for the complex survey design.[36]

RESULTS

Participant Characteristics

Socio-demographic and clinical characteristics of persons with diabetes in the United States are summarized in Table 1. Non-Hispanic Whites comprised more individuals aged >65 than any other racial/ethnic group. Non-Hispanic Blacks included the most females. Non-Hispanic Blacks and Hispanics were more likely than other groups to have less than a high school education, while non-Hispanic Whites and members of other races were more likely to have some college education, or to be a college graduate. Non-Hispanic Whites were the most likely to be in the top 2 income categories, with 16.8% earning between $35,000 and $49,999, and 24% earning >$50,000. Age at diabetes onset and duration of diabetes did not differ by race/ethnicity. Non-Hispanic Blacks were the most likely, and other races the least likely, to use insulin.

Healthcare Experience and Race/Ethnicity

Healthcare coverage, utilization, satisfaction, and health status of persons with diabetes are presented by race/ethnicity in Table 2. The percentage of uninsured adults was lower among non-Hispanic Whites (6.4%), compared to non-Hispanic Blacks (14.8%), Hispanics (20.7%), and other races (21.8%). In addition, the uninsured percentage was lower among those aged ≥65 years, although differences between the races persisted (non-Hispanic Whites (2.1%), non-Hispanic Blacks (5.9%), Hispanics (10.9%), and others (2.0%), data not shown). More non-Hispanic Blacks, Hispanics, and members of other races had gone without health insurance at some time during the past 12 months, compared to non-Hispanic Whites (data not shown, overall *P*<.001). Cost as a barrier to healthcare utilization was also different between the races/ethnicities. Non-Hispanic Blacks and Hispanics were more likely to need a doctor, but be unable to see one because of costs. Even among those with some type of healthcare coverage, more non-Hispanic Blacks (13.3%) and Hispanics (16.9%) found cost to be a barrier to healthcare utilization, compared to non-Hispanic Whites (6.2%) and other races (6.4%) (data not shown, overall *P*<.001).

With respect to healthcare utilization, most respondents had undergone a check-up within the past year, though Hispanics and members of other races were less likely to have had one. Non-Hispanic Whites and members of other races were less likely than non-Hispanic Blacks and Hispanics to have met the American Diabetes Association standard of 4 yearly visits to a health professional, specifically for diabetes. Differences by race or ethnicity did not reach statistical significance.

Table 2. Healthcare coverage, utilization, satisfaction, and health status in US persons with diabetes by race/ethnicity

	Non-Hispanic Whites	Non-Hispanic Blacks	Hispanics	Others	*P* Value
Healthcare coverage					
Any type of coverage*					<.001
None, %	6.4	14.8	20.7	21.8	
Healthcare utilization					
Cost as a barrier to utilization†					<.001
Yes, %	8.2	19.5	23.9	13.4	
Last check-up, y‡					
Past year	90.1	90.7	84.5	84.1	
Past 2 years	4.5	4.3	3.7	6.9	
Past 5 years	2.1	3.7	2.2	2.9	.008
≥5 years	2.8	1.1	6.0	4.9	
Never	0.5	0.2	3.6	1.2	
Times seen health professional for diabetes in past year§					
<4	42.8	35.1	38.0	42.0	.064
≥4	57.2	64.9	63.0	58.0	
Healthcare satisfaction					
Overall healthcare rating‖					
Excellent	34.3	17.9	68.7	14.4	
Very good	31.4	40.5	13.4	4.9	
Good	24.2	29.1	8.3	53.5	.050
Fair	4.3	3.8	9.6	27.2	
Poor	5.8	8.7	0.0	0.0	
Convenience of healthcare facility rating¶					
Excellent	40.8	31.1	39.7	25.4	
Very good	28.4	34.9	12.9	12.8	
Good	24.7	17.2	31.8	12.9	.529
Fair	5.1	16.2	14.5	41.3	
Poor	1.0	0.6	1.1	7.6	
Health status					
General health#					
Excellent	4.7	4.8	4.6	7.2	
Very good	17.2	11.3	8.9	15.0	
Good	34.3	32.4	25.2	40.8	<.001
Fair	27.1	32.8	35.3	22.1	
Poor	16.7	18.7	26.0	14.9	

Note: all results reported as percentages. *P* values based on χ^2 tests.
* *N*=9427.
† *N*=9426.
‡ *N*=9363.
§ *N*=5894.
‖ *N*=306.
¶ *N*=303.
\# *N*=9404.

Racial/ethnic differences for healthcare satisfaction were of borderline significance in crude associations, but the study populations were small. Overall health care was generally rated excellent or very good, and two thirds of Hispanics reported their overall health care to be excellent. No statistically significant differences between the races/ethnicities were found for convenience of one's healthcare facility. Health status differed between the races/ethnicities. Hispanics were more likely than others to report their general health to be poor.

The crude and adjusted odds ratios, and 95% confidence intervals, comparing healthcare coverage, utilization, satisfaction, and health status, are shown in Table 3 by race/ethnicity. Adjusted models accounted for age, sex, education, income, and insulin use. The relationship between race/ethnicity and healthcare coverage persisted after adjustment, with non-Hispanic Blacks, Hispanics, and other races all less likely than non-Hispanic Whites to have some type of health insurance coverage. Similarly, members of races/ethnicities other than non-Hispanic White were more likely to experience cost as a barrier to utilization. Although a relationship

Table 3. Crude and adjusted odds ratios for healthcare coverage, utilization, satisfaction, and health status in US persons with diabetes by race/ethnicity

		Odds Ratio (95% Confidence Interval)			
		Non-Hispanic Whites	**Non-Hispanic Blacks**	**Hispanics**	**Others**
Healthcare coverage					
Any type of coverage Yes vs No	crude	1.00	0.39 (0.29, 0.54)	0.26 (0.18, 0.37)	0.24 (0.14, 0.44)
	adjusted	1.00	0.59 (0.37, 0.92)	0.55 (0.35, 0.87)	0.32 (0.16, 0.64)
Healthcare utilization					
Cost as a barrier to utilization Yes vs No	crude	1.00	2.69 (2.06, 3.51)	3.49 (2.50, 4.87)	1.73 (1.05, 2.84)
	adjusted	1.00	1.64 (1.12, 2.42)	1.83 (1.25, 2.67)	1.28 (0.72, 2.29)
Last check-up Past year vs longer ago than past year/never	crude	1.00	1.07 (0.74, 1.54)	0.60 (0.38, 0.93)	0.58 (0.30, 1.11)
	adjusted	1.00	1.34 (0.82, 2.19)	0.71 (0.45, 1.12)	0.60 (0.27, 1.33)
Times seen health professional for diabetes in last year $\geq$4 vs $<$4	crude	1.00	1.38 (1.07, 1.79)	1.22 (0.90, 1.66)	1.04 (0.62, 1.73)
	adjusted	1.00	1.23 (0.90, 1.67)	1.15 (0.82, 1.60)	1.21 (0.67, 2.16)
Healthcare satisfaction					
Overall healthcare rating (excellent, very good, good) vs (fair, poor)	crude	1.00	0.78 (0.30, 2.05)	1.06 (0.26, 4.37)	0.30 (0.03, 2.59)
	adjusted	1.00	1.28 (0.41, 3.99)	1.95 (0.32, 11.68)	0.49 (0.07, 3.29)
Convenience of healthcare facility rating (excellent, very good, good) vs (fair, poor)	crude	1.00	0.32 (0.09, 1.20)	0.35 (0.09, 1.41)	0.07 (0.01, 0.33)
	adjusted	1.00	0.39 (0.11, 1.42)	0.73 (0.09, 6.02)	—
Health status					
General health (excellent, very good, good) vs (fair, poor)	crude	1.00	0.73 (0.61, 0.89)	0.50 (0.38, 0.64)	1.33 (0.90, 1.97)
	adjusted	1.00	0.94 (0.71, 1.25)	0.65 (0.46, 0.90)	1.36 (0.75, 2.49)

Note: adjusted models accounted for age, sex, education, income, and insulin use.

may have persisted for the other variables (healthcare utilization, satisfaction, and health status), the odds ratios were not statistically significant. In most cases, the strength of the association was attenuated after adjustment.

Healthcare Experience and Health Status

To determine whether any of the healthcare experience variables were related to health status, we created various models, adjusting for age, sex, education, income, race/ethnicity, and insulin use. Odds ratios and 95% confidence intervals are shown in Table 4. Those for whom cost was a barrier to utilization were significantly less likely to have reported excellent, very good, or good health status. In addition, respondents who visited a health professional for their diabetes less than four times during the previous year were significantly more likely to report better health status. Further, those who rated their overall health care as fair or poor were significantly more likely to report poorer health status than were those who rated their care as excellent, very good, or good. No other statistically significant associations were found.

CONCLUSIONS

Our results support the following conclusions among adults with diabetes in this nationally representative survey: after adjusting for socio-demographic characteristics and insulin use, ethnic minorities reported less healthcare insurance coverage and more cost-related barriers to utilization, compared to non-Hispanic Whites. We also found that those with poorer health status were more likely to experience cost as a barrier to utilization, and to rate their overall health care as fair or poor.

Table 4. Odds ratios for the healthcare coverage, utilization, and satisfaction in US persons with diabetes and health status (excellent, very good, good) vs (fair, poor)

	Odds Ratio (95% Confidence Interval)
Health coverage	
Any type of coverage	0.96
No vs Yes	(0.67, 1.37)
Healthcare utilization	
Cost as a barrier to utilization	0.68
Yes vs No.	(0.51, 0.92)
Last check-up	1.13
Longer ago than past year/never vs past year	(0.69, 1.86)
Times seen health professional for diabetes in last year	1.40
<4 vs ≥4	(1.14, 1.72)
Healthcare satisfaction	
Overall healthcare rating	0.22
(fair, poor) vs (excellent, very good, good)	(0.09, 0.55)
Convenience of healthcare facility rating	0.74
(fair, poor) vs (excellent, very good, good)	(0.23, 2.42)

Note: all models adjusted for age, sex, education, income, race/ethnicity, and insulin use. Response categories listed first are coded as l and second as 0 in logistic regression models.

Our study has several strengths. First, the Behavioral Risk Factor Surveillance System is a widely respected national data system that aims to be representative of the entire US population. Second, because it was designed to track extensive healthcare behaviors and practices, measures regarding the healthcare experience were very comprehensive. Furthermore, the yearly conduct of the survey allows for a current appraisal of the nation's healthcare experience.

Nonetheless, the study has some limitations which should be noted. First, all data are self-reported, which may raise concerns about accuracy and recall bias. However, it has been documented an excellent level of accuracy for self-report of diabetes.[37–41] Second, because this is a telephone-based survey, the data are not necessarily representative of those without telephones. BRFSS methods indicate an average of 95% for telephone coverage in the United States, although non-coverage ranged from 1.8% in Delaware to 13.3% in New Mexico. Third, because the survey design was complex, the sample size frequently varied. We had more respondents for questions asked as part of the core questionnaire, and fewer for variables asked as an optional module (eg, healthcare satisfaction variables). Therefore, our ability to generalize all of our findings to the entire target population is limited. Fourth, because the data are cross-sectional, we cannot confirm inferences about direction of causality. For example, the finding that more non-Hispanic Blacks and Hispanics visited a professional for their diabetes ≥4 times in the past year could imply that these groups have better healthcare utilization patterns, compared to non-Hispanic Whites. On the other hand, non-Hispanic Blacks and Hispanics could have more severe disease, therefore requiring more health services. The cause of this observed relationship cannot be determined using our data. However, we speculate that the latter is likely correct, based on the observation that those who reported seeing a health professional for their diabetes <4 times in the past year were more likely to report better health status than those seeing a health professional ≥4 times in the past year.

Previous research in the area we investigated is limited. Analyses from the Third National Health and Nutrition Examination Survey (NHANES III) showed marked ethnic differences in health insurance coverage,[24] with a greater percentage of non-Hispanic Blacks and Mexican Americans being uninsured, compared to non-Hispanic Whites, and Mexican Americans having the greatest number of uninsured persons (23%).[24] Ethnic minorities were also more likely than non-Hispanic Whites to have government-sponsored insurance. Racial/ethnic differences in healthcare coverage were similar for adults with, and without, diabetes. Another report showed that among adults with type 2 diabetes, Mexican Americans had lower rates of coverage than either Caucasians and African Americans, and fewer African Americans and Mexican Americans self-monitored their blood glucose, or had their cholesterol checked.[26] In addition, compared to Caucasians, African Americans and Mexican Americans had higher HbA_{1c} levels, blood pressure levels, and more clinical proteinuria.

At least 2 studies have evaluated healthcare utilization patterns among older African-American adults.[42,43] Bazargan et al found no association between the presence of diabetes and the frequency of office-based physician visits.[42] The study evaluated predisposing (socio-demographics, locus of control) and enabling (support, insurance, residential stability) characteristics associated with healthcare utilization, but did not focus on persons with diabetes. Butler et al studied elderly hypertensive and diabetic African-Americans, finding that higher education levels and having health insurance were significantly associated with increased utilization, as were difficulty with activities of daily living, the number of co-morbid conditions, use of social services, lower self-esteem, and health locus of control.[43] This work gives us insight into what factors may be responsible for racial differences in the healthcare experience.

The studies described above provide an excellent analysis of the healthcare

> *Our results demonstrated that cost-related barriers to utilization differed significantly by race/ethnicity, and that both cost-related barriers to utilization, and poorer satisfaction with health care, were associated with poorer health status.*

access, utilization, and health status of diabetic US adults. We must note, however, that these studies used data collected from the late 1980s through the early 1990s, or were conducted in select populations. In addition, they did not include other aspects of the healthcare experience, such as cost-related barriers to utilization, and healthcare satisfaction. Furthermore, to our knowledge, little research has been conducted on the comprehensive nature of the healthcare experience, in general, or for individuals with chronic illness.[44] We attempted to add to the literature by examining the healthcare experience, although we admit that our measures of healthcare satisfaction were limited. Our results demonstrated that cost-related barriers to utilization differed significantly by race/ethnicity, and that both cost-related barriers to utilization, and poorer satisfaction with health care, were associated with poorer health status. We have also provided an up-to-date assessment of healthcare coverage and its utilization among US adults with diabetes, as well as reporting their perceived overall health status.

Many of the racial/ethnic differences we found in our unadjusted analysis of the healthcare variables were attenuated, after accounting for socio-demographic and clinical characteristics, suggesting that these differences are likely due to social factors (eg, racism, stress), socioeconomic factors (eg, education, income), and clinical and cultural factors. Similarly, differences between the races/ethnicities in health status may be due to these factors, and to factors related to the healthcare experience, including healthcare coverage, utilization, and satisfaction. Therefore, we hypothesize that observed differences may be due to social constructs surrounding race/ethnicity, rather than to race/ethnicity itself. Previous research has also presented this theory.[26]

Due to missing data for the income variable, we ran the adjusted logistic regression models without accounting for income. The point estimates between the models were similar for most of the variables. The exception was the model for cost as a barrier to utilization and race/ethnicity. Compared to non-Hispanic Whites, the relationship without accounting for income was stronger than the relationship in the fully adjusted model, with odds ratios increasing from 1.64 to 2.19 in non-Hispanic Blacks, from 1.83 to 2.30 in Hispanics, and from 1.28 to 1.47 in other races. Based on these results, we speculate that socioeconomically disadvantaged respondents may have been less likely to report income. Therefore, our overall assessment of increased cost barriers in the other races, compared to non-Hispanic Whites, is probably conservative. We can also speculate that the odds ratios from the model adjusting for income and education were more attenuated from the crude than those from the model only adjusting for education, because income and education together represent a more comprehensive measure of socioeconomic status than does education alone.

Our results imply that there are racial/ethnic differences in the healthcare experience and the health status of adults with diabetes, and that these differences may be reduced or eliminated by attending to potentially modifiable factors. Socioeconomic barriers may be a key determinant, as indicated by both the persistence of racial/ethnic differences in healthcare coverage and cost-related barriers to utilization, even after adjustment, and by the finding that cost-related barriers to care were associated with poorer health status. Future research should focus on reasons why minorities tend to have less healthcare coverage and more cost-related barriers to utilization, and on appropriate interventions to improve health care and health status among these populations. Such research is essential for the identification of modifiable determinants, the first step in eliminating health disparities, one of the goals of Healthy People 2010.

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