RACIAL AND ETHNIC DIFFERENCES IN THE EFFECTS OF REGULAR PROVIDERS AND SELF-MANAGEMENT EDUCATION ON DIABETES PREVENTIVE CARE

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Objective: To examine the effects of having regular healthcare providers and diabetes self-management education (DSME) on the receipt of diabetes preventive care among all groups and by race/ethnicity.

Data Source: The 2004 Behavioral Risk Factor Surveillance Survey.

Methods: Logistic regression analyses were performed for the full sample and separately for Blacks, Hispanics, and Whites.

Results: Among all persons, having at least one regular provider and DSME were significantly associated with higher odds of receipt of a glycosylated hemoglobin (HbA1C) test, foot exam, and dilated eye exam in the past year. Results from analyses stratified by race/ethnicity reveal differential effects of having a regular provider and DSME. Among Whites, having at least one regular provider helps assure that diabetes patients receive each of the three recommended preventive services. Among Blacks, having at least one regular provider was significantly associated with receipt of an HbA1C but not other preventive services. Among Hispanics, having a regular provider was significantly associated with receipt of an HbA1C test and dilated eye exam, but not a foot exam. Independent of having a regular provider, DSME appears to be beneficial for Whites and Blacks but not Hispanics. For Whites, DSME was significantly associated with all three types of diabetes preventive care. For Blacks, DSME was significantly associated with the receipt of a foot exam but not an HbA1C test and a dilated eye exam. However, among Hispanics, DSME was not significantly associated with any of the three preventive services.

Conclusion: Access to personal healthcare providers should be promoted among Whites, Blacks, and Hispanics to assure patients with diabetes receive recommended secondary preventive services. Diabetes self-management programs should also be expanded among Whites and Blacks but may need to be modified to benefit Hispanics. (*Ethn Dis*. 2006;16:786–791)

Key Words: Continuity of Patient Care, Diabetes, Disparities

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INTRODUCTION

Improving quality of life for persons with diabetes by preventing or delaying the long-term complications of diabetes is critical. Improvements in diabetes preventive care have shown to be effective in reducing both the incidence and progression of diabetes-related health complications, but many Americans fail to receive recommended diabetes services.[1]

Promoting the continuity of medical care is one potentially fruitful means of increasing access to diabetes preventive care. However, the literature on the impact of continuity of care, which is reflected by having a usual or regular healthcare provider, on the utilization of diabetes preventive services has yielded conflicting results. Mainous et al assessed the relationship between continuity of care and diabetes control by using the Third National Health and Nutrition Examination Survey (NHANES III) data and established no benefit of having a usual provider above having a usual site of care, but having any regular provider or site was associated with better glycemic control among people with diabetes.[2] In another cross-sectional analysis conducted on claims data from a private national health plan for one year, researchers showed that provider continuity was not significantly associated with receipt of a glycosylated hemoglobin test (HbA1C), a lipid profile, or an eye examination.[3] On the other hand, Parchman et al reported that patients who had seen their usual providers within the past year were significantly more likely to have had an eye examination, a foot examination, two blood pressure measurements, and a lipid analysis.[4] Similar findings were also reported by O'Connor et al.[5] Although the potential benefit of greater continuity of care for persons with diabetes is debatable, having a regular provider contributes to a sustained patient-provider relationship[6] and favorable overall health status.[7]

Diabetes self-management education (DSME) is a component of the clinical management of diabetes. The American Diabetes Association (ADA) recommends assessment of self-management skills and knowledge of diabetes at least annually, and continuing diabetes education should also be provided.[8–10] Several quantitative and qualitative reviews have found that diabetes education results in successful behavior changes that influence positive health outcomes.[11,12] Persons who receive DSME may be more aware of the benefits of diabetes preventive care and thus more likely to utilize recommended services.

Despite the body of literature about the benefits of regular providers and DSME, no previous study has simultaneously examined their independent associations with the receipt of diabetes-related preventive care. Moreover, no prior study to our knowledge has assessed racial and ethnic differences in the effects of regular providers and DSME. Thus, the purpose of this study was twofold. First, we sought to examine the degree to which regular providers and DSME affect the odds of

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receiving diabetes preventive care in persons with diabetes. Second, we sought to determine if the effects of regular providers and DSME differ between the three major racial and ethnic groups in the United States (non-Hispanic Whites, non-Hispanic Blacks, and Hispanics) in persons with diabetes. Nationally representative data from the 2004 Behavioral Risk Factor Surveillance System (BRFSS) were used to answer these questions.

METHODS

Data Source

We analyzed the 2004 BRFSS, a cross-sectional telephone survey developed by the Centers for Disease Control and Prevention. The 2004 BRFSS used a multi-stage sampling design and random-digit dialing method to obtain a probability sample of the noninstitutionalized adult population (≥18 years of age).[13] Data are weighted to population characteristics (age, race, and sex) to correct for differences in the probability of selection due to nonresponse and noncoverage errors and allow the generalization of findings.[13] The BRFSS data are in the public domain. Hence, this study was exempt from review by the institutional review board.

Study Population

Survey respondents who answered affirmatively to the core question, "Have you ever been told by a doctor that you have diabetes?" were classified as persons with diabetes. Of the 303,822 survey respondents, the sample for our analyses included persons with diabetes (n=25,736). Women who were told they had diabetes only during their pregnancy (n=3039) and those with pre-diabetes or borderline diabetes (3102) were excluded from our study sample. Respondents with refused (n=173), do not know/not sure (n=178), and not asked or missing (n=2) data were coded as missing.

Variables

We studied three self-reported measures of diabetes-specific preventive services that are recommended by the ADA[14]: receipt of an HbA1C test in the past year, receipt of a foot exam in the past year, and receipt of an eye exam in the past year.

HbA1C in the past year was defined as receipt of at least one glycosylated hemoglobin test during the previous 12 months. Foot exam in the past year was defined as receipt of at least one foot examination by a health professional during the previous 12 months. Dilated eye exam in the past year was defined having had a dilated eye exam during the previous 12 months.

These three self-reported measures were chosen because three national health objectives for 2010 specific to diabetes are to increase the proportion of adults with diabetes who have HbA1C measurements at least twice each year to 50%, an annual foot examination to 75%, and an annual dilated eye examination to 75%.[15]

Our main explanatory variables were whether the individual had a personal healthcare provider and diabetes self-management education (DSME). Respondents were asked, "Do you have one person you think of as your personal doctor or healthcare provider?" The response options were 1) yes, only one; 2) more than one; 3) no; 7) do not know/not sure; 9) refused. We created a dichotomous variable indicating whether the individual had one/more than one vs no usual source of care. Four responses were options to the question, "Have you ever taken a course or class in how to manage your diabetes yourself?" 1) yes; 2) no; 7) do not know/not sure; 9) refused. To assess DSME, a dichotomous variable indicating yes vs no was created. Persons with refused, do not know/not sure, or missing data were excluded from the analyses.

Other independent variables included in this study were age (18–44 years, 45–64 years, 65–74 years, ≥75 years), sex, race/ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic; other race, non-Hispanic), education (less than high school, high school diploma or general equivalency diploma, technical training/some college, and a college degree), annual income (<$15,000, $15,000–$24,999, $25,000–$34,999, $35,000–$49,999, and ≥$50,000), employment (employed, out of work, retired, and other), health insurance coverage (insured and uninsured), and self-reported general health status (excellent/good and fair/poor). Duration of diabetes was calculated as current age minus age of diagnosis and categorized as 0–4 years, 5–9 years, 10–19 years, and ≥20 years; oral hypoglycemic agent use and insulin use were also included as markers for disease severity.

Data Analysis

We performed bivariate (data not shown) and multiple logistic regression analyses to determine the relationship between having at least one regular doctor/healthcare provider and having taken a class/course of DSME and the three self-reported measures of diabetes preventive care. Three models were used for each of the dependent variables: 1) unadjusted; 2) adjusted for age, sex, and race/ethnicity; and 3) adjusted for age, sex, race/ethnicity, education, employment, income, health coverage, health status, oral hypoglycemic agent use, insulin use, and duration of diabetes. Interactions of race/ethnicity and the

two main explanatory variables, personal doctors and DSME, were included in model 3. Both the interaction terms were found to be statistically not significant and hence were excluded from the final model 3. We further calculated the adjusted odds ratios for the three self-reported measures of diabetes preventive care practices by three racial/ethnic categories (White, non-Hispanic; Black, non-Hispanic; Hispanic). Individuals who had missing data values were excluded from the analyses. Statistical significance was established as P value $<.05$. To account for the complex survey design and weighted sampling probabilities, all analyses were conducted with SUDAAN statistical software (Research Triangle Institute, Research Triangle Park, NC).

RESULTS

Descriptive Statistics

The sample characteristics are displayed in Table 1. More than three quarters of the respondents reported having at least one personal doctor/healthcare provider (92.7%), and approximately half had received DSME (53.7%). The proportion of males and females were approximately equivalent (50.4% vs 49.6%). The sample was predominantly White (65%) and 45–64 years old (44.8%). Approximately one third of the sample had a high school education or general equivalency diploma (32.2%) and was employed (36.4%). Most had healthcare insurance coverage (89%). Slightly more than half of them perceived their general health status to be excellent or good (51.2%).

Findings from Multiple Logistic Regression Analysis; All Races/Ethnicities

In the multiple logistic regression analysis containing all racial/ethnic groups (Table 2), respondents with one or more personal doctor/healthcare

Table 1. Sample characteristics, adults (≥18 years) with diabetes: BRFSS, 2004 (N=25,736)

	n	Percent*
Personal doctor/healthcare provider		
≥1	24,188	92.7
No	1,477	7.3
Diabetes self-management education		
Yes	11,700	53.7
No	10,084	46.3
Insulin use		
Yes	5,787	24.6
No	16,062	75.4
Oral hypoglycemic agent use		
Yes	15,346	69.9
No	6,471	30.1
Duration of diabetes (in years)		
0–4	7,632	38.4
5–9	4,598	21.8
10–19	5,044	23.5
≥20	3,584	16.6
Age (in years)		
18–44	3,010	16.2
45–64	11,329	44.8
65–74	6,649	21.8
≥75	4,605	17.1
Sex		
Male	10,395	50.4
Female	15,341	49.6
Education		
Less than high school	5,146	20.5
High school or GED	8,823	32.2
Tech/some college	6,378	24.9
College degree	5,287	22.4
Annual income, $		
<15,000	5,420	21.7
15,000–24,999	5,503	23.4
25,000–34,999	3,224	14.4
35,000–49,999	3,112	15.2
≥50,000	4,448	25.3
Race/ethnicity		
White, non-Hispanic	18,510	65
Black, non-Hispanic	3,396	14.4
Hispanic	2,078	14.4
Other, non-Hispanic	1,392	6.3
Employment		
Employed	8,368	36.4
Out of work	1,029	5
Retired	10,161	35.6
Other	6,112	23
Healthcare coverage		
Yes	23,196	89
No	2,476	11
General health status		
Excellent/good	12,744	51.2
Fair/poor	12,845	48.8

* Weighted to population characteristics.
n represents the unweighted number of respondents in each cell.
All values rounded up to one decimal place.
BRFSS=Behavioral Risk Factor Surveillance System; GED=general equivalency diploma.

provider were significantly more likely than those without a personal doctor to receive an HbA1C test in the past year, controlling for all the other factors (odds ratio [OR] 3.2, 95% confidence interval [CI] 2.2–4.5). Individuals who had completed DSME had higher odds of receiving an HbA1C than those without DSME (OR 1.8, 95% CI 1.4–2.3). Race/ethnicity was not significantly associated with receipt of an HbA1C test in the past year (data not shown).

Respondents with regular providers were also significantly more likely than those with no regular provider to receive a foot exam by a health professional in the past year, controlling for all the other factors (OR 1.6, 95% CI 1.2–2.2). Similarly, those who had completed DSME had higher odds of receiving a foot exam than those without DSME (OR 2.0, 95% CI 1.7–2.3). Compared to Whites, Hispanics were significantly less likely whereas Blacks were significantly more likely to receive a foot exam in the past year (data not shown).

Similar findings were also found with respect to the receipt of a dilated eye exam in the past year. Respondents with one or more than one personal doctor/healthcare provider were significantly more likely than those with no regular provider to receive a dilated eye exam, controlling for all the other factors (OR 2.0, 95% CI 1.5–2.8). Individuals who had completed DSME had higher odds of a dilated eye exam than those without DSME (OR 1.5, 95% CI 1.3–1.8). Race/ethnicity was not significantly associated with receipt of a dilated eye exam in the past year (data not shown).

Findings from Multiple Logistic Regression Analysis by Race/Ethnicity

Adjusted ORs from multiple logistic regression analyses stratified by the three major racial/ethnic categories are displayed in Table 3. These analyses revealed that having at least one personal doctor/healthcare provider was significantly associated with higher odds of receipt of dilated eye exam in the past year among Whites (OR 1.8, 95% CI 1.2–2.6) and Hispanics (OR 3.5, 95% CI 1.8–7.0) but not among Blacks. Having taken a diabetes self-management course/classes was significantly associated with higher odds of receipt of dilated eye exam among Whites only (OR 1.6, 95% CI 1.4–1.8).

Additional analyses stratified by race/ethnicity showed that having a personal doctor/healthcare provider was significantly associated with higher odds of receipt of HbA1C testing among Whites, Blacks, and Hispanics, controlling for other factors. Having taken a diabetes self-management course/classes was significantly associated with higher odds of receipt of HbA1C testing only among Whites (OR 2.0, 95% CI 1.5–2.5) but not in Blacks and Hispanics.

Having at least one personal doctor/healthcare provider was significantly associated with higher odds of receipt of foot exam among Whites only, controlling for other factors (OR 1.9, 95% CI 1.3–2.6). Having taken a diabetes self-management course/class was significantly associated with higher odds of receipt of foot exam among Whites (OR 2.1, 95% CI 1.8–2.4) and Blacks (OR 2.1, 95% CI 1.4–3.0) but not Hispanics.

DISCUSSION

Racial and ethnic disparities in health and health care are of particular concern in America today, but a limited amount of research has examined how modifiable healthcare system factors, such as access to regular providers and/or DSME, are associated with the receipt of recommended diabetes preventive care. Prior research has demonstrated that having a personal doctor, nurse, or other healthcare provider promotes continuity of care and enhances health outcomes,[6,7] but little research has examined the effects of a regular source of care on the receipt of diabetes preventive services.[2–5] Diabetes self-management education (DSME) promotes recommended self-care behaviors[11,12] and could also affect individuals' utilization of diabetes preventive services. However, whether DSME is associated with the receipt of diabetes preventive care has not been sufficiently explored.

…our findings from analyses of the national BRFSS sample further support that persons suffering from diabetes are more likely to obtain recommended secondary preventive services if they have a regular healthcare provider and if they have completed DSME.

The purposes of this study were to examine the independent effects of having a regular provider and receiving DSME on diabetes-specific preventive services and to determine if the effects of a regular provider and DSME differed by race/ethnicity. Overall, our findings from analyses of the national BRFSS sample further support that persons suffering from diabetes are more likely to obtain recommended secondary preventive services if they have a regular healthcare provider and if they have completed DSME.

Results from analyses stratified by race/ethnicity reveal differential effects of having a regular provider and DSME. Among Whites, having at least one regular provider helps ensure that diabetes patients receive each of the three

Table 2. Odds ratio and 95% CI of diabetes preventive services (*N*=25,736)

		Model 1[a]	Model 2[b]	Model 3[c]
		OR[a] (95% CI)	OR[b] (95% CI)	OR[c] (95% CI)
HbA1C in the past year	Personal doctor/healthcare provider	5.1** (3.7, 7.1)	4.7** (3.4, 6.6)	3.2** (2.2, 4.5)
	Diabetes self-management education	2.2** (1.8, 2.7)	2.1** (1.7, 2.6)	1.8** (1.4, 2.3)
Foot exam by health professional in the past year	Personal doctor/healthcare provider	2.0** (1.5, 2.6)	1.9** (1.5, 2.5)	1.6* (1.2, 2.2)
	Diabetes self-management education	2.3** (2.0, 2.6)	2.2** (2.0, 2.6)	2.0** (1.7, 2.3)
Dilated eye exam in the past year	Personal doctor/healthcare provider	2.9** (2.2, 3.8)	2.6** (2.0, 3.3)	2.0** (1.5, 2.8)
	Diabetes self-management education	1.5** (1.3, 1.7)	1.6** (1.4, 1.9)	1.5** (1.3, 1.8)

OR=odds ratio; CI=confidence interval.
All values rounded up to one decimal place.
* $P<.01$;
** $P<.001$.
[a] Model 1 included personal doctor/healthcare provider, diabetes self-management education and each of the diabetes preventive services as dependent variable.
[b] Model 1 plus age in years (18–44, 45–64, 65–74, ≥75), sex, and race/ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic, others).
[c] Model 1 plus age in years (18–44, 45–64, 65–74, ≥75), sex, race/ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic, others), education (less than high school graduate, high school graduate, tech/some college, college degree), employment (employed, out of work, retired, other), income (<$15,000, $15,000–$24,999, $25,000–$34,999, $35,000–$49,999, ≥$50,000), health coverage (yes, no), health status (excellent/vs good/good, fair-poor), oral hypoglycemic agent use (yes, no), insulin use (yes, no), duration of diabetes in years (0–4, 5–9, 10–19, ≥20).

recommended preventive services. Among Blacks, having at least one regular provider was significantly associated with receipt of an HbA1C test but not other preventive services. Among Hispanics, having a regular provider was significantly associated with receipt of an HbA1C test and dilated eye exam but not a foot exam. In summary, although having a regular provider is not consistently associated with the receipt of all preventive services across the three racial/ethnic categories, it clearly yields some benefits for Whites, Blacks, and Hispanics alike.

Independent of having a regular provider, DSME appears to be beneficial for Whites and Blacks but not Hispanics. For Whites, DSME was significantly associated with all three types of diabetes preventive care. For Blacks, DSME was significantly associated with the receipt of a foot exam but not an HbA1C test or a dilated eye exam. However, among Hispanics, DSME was not significantly associated with any of the three preventive services. Failure to find a positive and significant impact of DSME among Hispanics could be explained by a lack of culturally competent diabetes education classes and/or inadequate communication. Diabetes education may need to be more effectively tailored and targeted toward Hispanics. Diabetes self-management education is determined by using a yes/no question in the BRFSS without eliciting further details such as the language the course was conducted in, the availability of interpreter services, the duration and the content of the course, and the time elapsed since the DSME course. Time elapsed since having taken a diabetes self-management course must be recorded, as the

Table 3. Adjusted odds of diabetes preventive services by race/ethnicity, 2004 BRFSS

		White (*n*=18,510)	Black (*n*=3,396)	Hispanic (*n*=2,078)
		Adjusted OR[a] (95% CI)	Adjusted OR[a] (95% CI)	Adjusted OR[a] (95% CI)
HbA1C in the past year	Personal doctor/healthcare provider	3.1** (2.2, 4.5)	3.1* (1.5, 6.4)	5.4** (2.3, 12.8)
	Diabetes self-management education	2.0** (1.5, 2.5)	1.6 (.9, 2.7)	1.1 (.5, 2.3)
Foot exam by health professional in the past year	Personal doctor/healthcare provider	1.9** (1.3, 2.6)	1.1 (.6, 2.1)	1.8 (.9, 3.6)
	Diabetes self-management education	2.1** (1.8, 2.4)	2.1** (1.4, 3.0)	1.5 (.9, 2.5)
Dilated eye exam in the past year	Personal doctor/healthcare provider	1.8* (1.2, 2.6)	1.0 (.6, 1.9)	3.5** (1.8, 7.0)
	Diabetes self-management education	1.6** (1.4, 1.8)	1.1 (.8, 1.6)	1.2 (.7, 2.0)

BRFSS=Behavioral Risk Factor Surveillance Survey; OR=odds ratio; CI=confidence interval.
All values rounded up to one decimal place.
* $P<.01$;
** $P<.001$.
[a] Adjusted for age in years (18–44, 45–64, 65–74, ≥75), sex, race/ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic, others), education (<high school graduate, high school graduate, tech/some college, college degree), employment (employed, out of work, retired, other), income (<$15,000, $15,000–$24,999, $25,000–$34,999, $35,000–$49,999, ≥$50,000+) health coverage (yes, no), health status (excellent/vs good/good, fair-poor), oral hypoglycemic agent use, (yes, no), insulin use (yes, no), duration of diabetes in years (0–4, 5–9, 10–19, ≥20).

positive effect of DSME declines over time.[11]

The benefits of having a regular source of care and DSME have implications for diabetes-related health policy. Persons who are members of managed care plans frequently must choose a primary care gatekeeper who serves as a regular provider, but those enrolled in traditional Medicare are neither required nor encouraged to choose a regular clinic, doctor, or other healthcare provider. Policies that encourage the selection of a regular provider, such as lower patient copayments, could contribute to better diabetes care management and, ultimately, reduced medical care costs. Similarly, preventive programs such as diabetes self-management education are historically underfunded by governmental and private health insurance plans. Increased reimbursements for preventive education would undoubtedly foster the expansion of DSME in medical clinics that treat diabetic patients.

The use of the national BRFSS sample is both a strength and weakness of this study. Because the BRFSS is large, comprehensive, and nationally representative, the findings are generalizable to America's three major racial and ethnic groups. As the BRFSS is conducted yearly, the findings can be tracked to determine the degree to which racial and ethnic differences in diabetes preventive care change over time. Limitations include potential for recall bias and related differential misclassification, suboptimal response rates, and the non-inclusion of households without a telephone. However, the use of post-stratification weights is expected to adjust for any bias caused by non-coverage or non-response errors.[13] The final limitation reflects those inherent to any cross-sectional survey – a lack of inference on causality. Overall, we would argue that external validity of the findings far outweighs any of these limitations.

The findings of the present study are especially relevant in the light of disproportionate and increasing trends of diabetes among ethnic minority populations. The fact that diabetes is not curable underscores the critical need for effective primary and secondary preventive efforts to reduce the disease burden. Much of the increasing burden of diabetes and its complications could be prevented with improved delivery of care and better DSME. Our study results support that access to regular providers and diabetes education could increase the utilization of diabetes preventive care. Future research should explore the reasons why DSME does not promote Hispanics' utilization of diabetes preventive services. Moreover, prospective studies that include more detailed information on diabetes status and other components of primary care, such as the level of patient involvement in decisionmaking, are warranted to further elucidate the determinants of quality health care among all racial and ethnic groups.

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Data analysis interpretation: Kurian, Borders
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