Health Insurance Coverage among Diabetic Adults from Three Major Ethnic Groups in the United States

Linda I. Ekperi, MPH; Shamola Greene, MPH; Ahmed Dehal, MD, MPH; Ana Lòpez-De Fede, PhD; Jian Zhang, MD, DrPH

Objective: The lack of adequate health insurance may result in a downward spiral of the diabetic condition, imposing an increased financial strain on family and the society as a whole. The objective of our study was to assess the insurance type and coverage among diabetic adults from three major ethnic groups.

Design and setting: We used data of two cross-sectional national surveys to estimate insurance coverage among diabetic adults aged 20–64 years, 1988–1994 and 2003–2008.

Results: The prevalence of doctor-diagnosed diabetes has increased by 120%, 178% and 135% respectively among non-Hispanic Whites (NHWs), non-Hispanic Blacks (NHBs), and Mexicans & other Hispanics (M&OHs) from 1988–94 to 2003–08. However, during the same period, the percentages of diabetic adults covered by health insurance declined for all three groups. In the 2003–08 period, 15%, 19% and 40% of NHWs, NHBs and M&OHs, respectively, had no insurance. Diabetic NHBs and NHWs had an equal likelihood to be covered by government-sponsored programs. However, 70% of NHWs, in contrast to 37% of NHBs, were covered by private programs exclusively. Diabetic M&OHs remained at the lowest likelihood to be covered by government-sponsored programs. The diabetic citizen's probability of being insured was more than tripled compared with the non-citizens (OR= 3.40, 95%=1.42–8.14).

Conclusion: Increasing percentages of diabetics had no insurance. Diabetic Whites were more likely to be covered by private programs than diabetic Blacks. Hispanics were the group falling through the cracks between private programs due to low income and government programs because of immigration status. (*Ethn Dis.* 2012;22[4]:486–491)

Key Words: Health Insurance, Race, Ethnicity, Diabetes

From the Jiann-Ping Hsu College of Public Health, Georgia Southern University (LIE, SG, AD, JZ) and the Institute for Families in Society, University of South Carolina (AL).

Address correspondence to Jian Zhang MD, DrPH; Jiann-Ping Hsu College of Public Health, Georgia Southern University; Post Office Box 8015, Statesboro, GA 30460; 912-478-2290; Jianzhang@georgiasouthern.edu

Introduction

Diabetes is one of the leading chronic and disabling conditions, and the presence of diabetes often results in a more complex treatment regimen for a number of other conditions including heart disease, cerebral and peripheral vascular disease, kidney disease and blindness. Overwhelming evidence suggests that the effective management of diabetes can significantly reduce the risks of complications associated with these other diseases. However, access and utilization of these services have been shown to be significantly limited by an individual's insurance status, and the uninsured diabetic individual can be less likely to receive adequate care,[1,2] thereby leading to uncontrolled blood sugar levels, greater risk of hospitalization, and elevated risk of complications and possibly death.[2,3] Moreover, the lack of adequate health insurance may result in a downward spiral of the patient's condition by imposing an increased financial strain on family and the society as a whole.

The literature suggests the presence of a persistent racial disparity in recorded death rates of diabetes. Among African Americans, the aggregate age-adjusted death rate of diabetes from 2003 to 2007 was 53.1 deaths per 100,000 population as compared to a death rate of 20.5 per 100,000 for Whites.[4] In addition to a genetic predisposition for diabetes, differences in the care management of diabetes among certain racial groups may influence overall death rates. Although limited access to health services is related to a number of factors, this barrier is often the result of lack of adequate, appropriate, and affordable health insurance. However, limited information is available pertaining to the racial disparities related to health insurance among diabetic adults.[4] To the best of our knowledge, the last study examining this issue using national representative data was published nearly ten years ago.[5] Since then, dramatic social changes have been taking place, including the epidemiology of diabetes, and the availability, financing, and access to health services. In an attempt to address the gap in knowledge as it relates to the disparity in health insurance among diabetic patients, we analyzed the latest data released from the National Health and Nutrition Examination Survey (NHANES).

Methods

Study Population

NHANES is an ongoing stratified, multistage probability sample of the US non-institutionalized population designed to represent the health and nutritional status of general populations of all ages. A unique feature of NHANES is that the sampling approaches, interviews, and examination methods are standardized across surveys.[6] For this study, outcomes of interest (diabetes and the prevalence and health insurance coverage) from two separate sampling cycles (1988–1994 and 2003–2008) were compared. The study population for this project was limited to adults aged 20–64 years. After excluding respondents who were from races/ethnicities other than three major groups (n=1,592), with missing data on insurance (n=1,592) or

diagnosis of diabetes (n =520), a total of 11,460 participants were still eligible from the 1988–1994 survey. Among these participants, 1,278 were diabetic patients. For the 2003–2008 survey, 527 subjects were excluded based on race, 54 participants were excluded based on missing health insurance data, and 139 participants were excluded due to missing diabetes diagnosis. Therefore, 10,502 participants, among which 854 participants were diabetic, were retained.

Ascertainment of Diabetes and Health Insurance Status

Diabetes and health insurance status were ascertained using the Computer-Assisted Personal Interviewing (CAPI) system. The CAPI system is programmed with built-in consistency checks to reduce data entry errors. Frequency counts were checked, ''skip'' patterns were verified, and the reasonableness of question responses, completeness, and analytic usefulness of the data were reviewed consistently. A diabetic adult was identified if an individual answered ''yes'' to the questions ''Have you ever been told by a doctor that you have diabetes or sugar diabetes?'' or if an individual reported current use of insulin and/or an oral anti-diabetic medication. Women with gestational diabetes were also excluded.

The health insurance module of NHANES inquires about insurance coverage. Specifically, types of insurance and lost insurance coverage were assessed. It was noted that the time frame referenced for recall differed slightly between the two survey cycles. Recall for the 1988–1994 cycle assessed insurance status for the previous month while recall for the 2003–2008 cycle attempted to ascertain current insurance status. Four mutually exclusive categories of insurance status were defined and they included the following: (i) covered by private insurance only; (ii) covered by government-sponsored insurance only, including Medicaid and Champus/VA; (iii) covered by a dual program, namely, both private and government-sponsored insurance; and (iv) not covered by any health insurance.

Definition of Race/Ethnicity

The National Center for Health Statistics (NCHS) standard definition for ethnicity was used for this study.[6] This study was limited to three major groups: Non-Hispanic Whites (NHWs), Non-Hispanic Blacks(NHBs), and Mexican and other Hispanic Americans (M&OHs). This race/ethnicity variable was derived by combining responses to questions on race and Hispanic origin. Subjects indicating more than one race (multiracial) but then selected a primary race were then recoded into those respective categories. Participants indicating the multiracial category but failing to specify a primary race were excluded from the analysis.

Other Major Covariates

Other variables included in the analysis were educational attainment, family income, marital status, and citizenship. A poverty income ratio (PIR) is the ratio of income to the family's appropriate poverty threshold defined by the US Census Bureau and this measure was used to assess family income. Specifically, respondents were asked to select range of income categories. The midpoint of the selected range value was then compared to the appropriate poverty threshold based on size and composition of the family. If a family's total income was less than the appropriate threshold income value, then that family, and every individual in it, is considered poor. Thresholds are updated annually for inflation with the Consumer Price Index.[7] Lastly, citizenship was a dichotomous variable; citizenship status was reported using two codes: i) citizen by birth or naturalization or ii) not a citizen of the United States.

Statistical Methods

The SUDAAN software (SAS-callable version, 10, Research Triangle Park, NC) with appropriate weighting and nesting variables[8] for each survey cycle to account for the oversampling of M&OHs and NHBs was used. The age-adjusted prevalence of diabetes and the percentages of uninsured populations were calculated for each race/ethnicity group by age, adjusting to the standard 2000 non-institutionalized US population.[9] Specific age groups for standardization were 20–29 years old, 20–39 years old, 40–49 years old, and 50–64 years old with respective weights of 0.2232, 0.2587, 0.2624, 0.25559.[9] The Chi-square test (α = 0.05) was used to investigate proportional differences in insurance status by race both within and between each survey cycle.

We used polytomous logistic regression models with a four-category polytomous variable of insurance status as the dependent variable to identify the factors associated with insurance coverage. Participants not covered by either private insurance or government-sponsored programs were used as the controls. Specific comparisons were made between the controls and those covered by private insurance coverage only, between the controls and those covered by government-sponsored programs only, and between controls and those covered by both private and government-sponsored programs. Odds ratios (OR) and the corresponding 95% CI were calculated to estimate the associations, and the Wald tests was used to identify significant factors. Technically, it is implausible to combine the data of the two survey cycles because they differ with respect to sampling designs. Moreover, it is practically unnecessary to combine the two since the associations between factors and insurance coverage may differ due to policies changes related to private or public programs, or both. Therefore, logistic regression was only performed

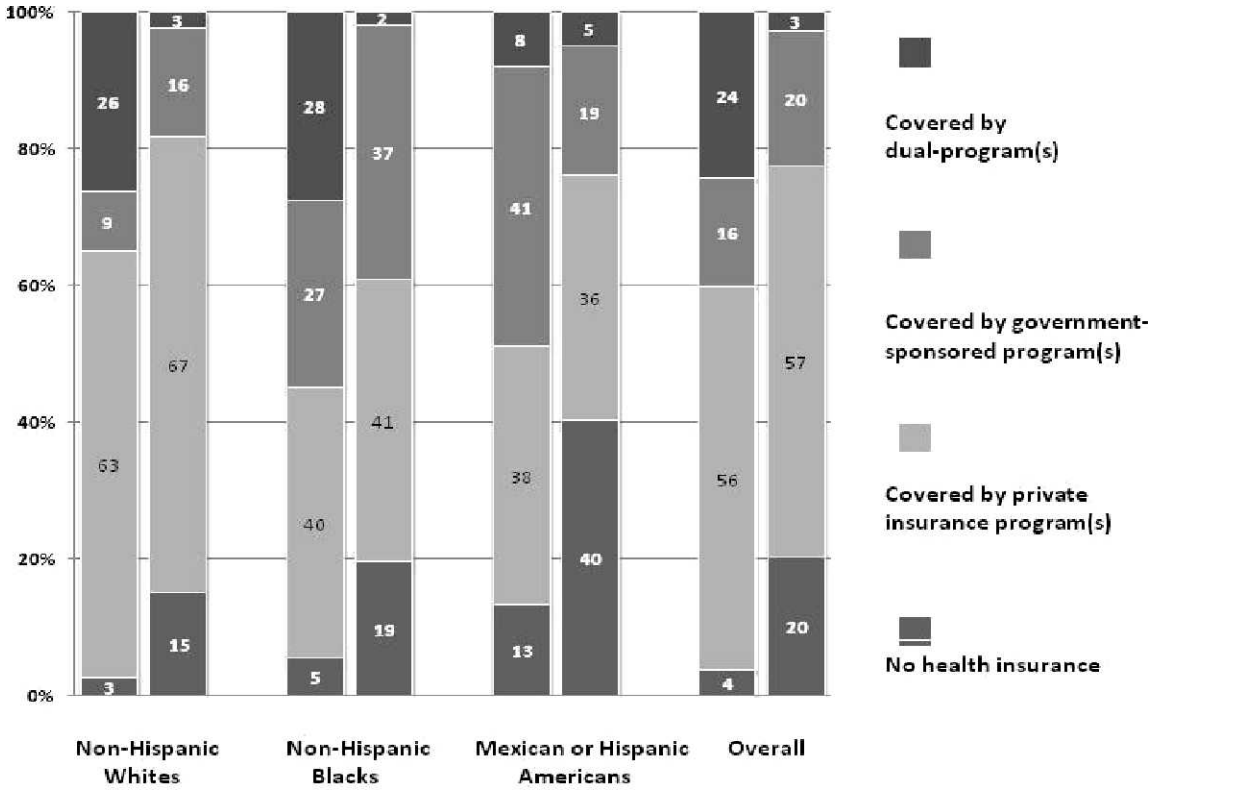

Fig 1. Age-adjusted insurance coverage estimated from NHANES 1988–94 and 2003–08 diabetic adults 20–64 y old, United States[a]

[a] For each panel, the first bar(left) is for the NHANES conducted in 1988–1994, and the second bar (right) is for the survey in 2003–2008 NHANES, The National Health and Nutrition Examination Survey

for the participants of 2003–2008 survey to derive estimates of associations of interest from the latest survey.

RESULTS

The age-adjusted prevalence of diabetes among the study participants increased by 47% from 3.9% in the 1988–1994 period to 5.7% in the 2003–2008 period. The change in prevalence of diabetes was most dramatic among NHBs, among which, the prevalence nearly doubled from 5.7% to 10.6% in the 10-year period between two surveys. Only a modest increase in the prevalence was noticed for NHWs. In contrast to the increasing trend of diagnosed diabetes, the percentage of diabetic adults covered by insurance fell dramatically for all major race/ethnicity groups (Figure 1). During the 1988–1994 survey, 96% of diabetic adults were covered by some form of insurance. However, the rate of insurance declined to 80% in the 2003–2008 survey, thereby indicating an approximate 17% decline in coverage. The most significant change in coverage is evident for the M&OHs. Between the 1998–1994 survey and the 2003–2008 survey, the coverage declined by approximately 31%. A 14.7% decline in coverage was noted for NHBs (95% vs 81%) while NHWs (97% vs 85%) experienced 12.3% decline in coverage.

It is noted that the decline of coverage among diabetic adults was mainly driven by shrinking government-sponsored programs (Figure 1). Among NHWs, private insurance coverage (63% vs 67%) and government sponsored programs (9% vs 16%) increased slightly. However, the coverage for dual programs among this group declined sharply from 26% in the 1988–1994 survey to 3% in the 2003–2008 survey. A declining trend in coverage of government-sponsored programs was also noted among M&OHs (41% vs 19%), but the reduction in coverage of a dual program was not nearly as significant. NHBs experienced a 37% increase in government-sponsored programs (27% vs 37%) when comparing the 1998–1994 survey cycle to the 2003–2008 survey cycle. However, this group witnessed a nearly 93% decline in the coverage of dual programs over the same period.

Table 1. The percentages of diabetic adults covered by different insurance programs, US adults aged 20–64 years, NHANES, 2003–2008[a]

	N	Covered by Both (*n*=37)	Private Program Only (*n*=384)	Government Program Only (*n*=246)	No Insurance (*n*=187)
Total	854	4.93 (1.00)	55.48 (2.15)	22.19 (1.49)	17.40 (1.41)
Race/ethnicity					
Non-Hispanic White Americans	283	5.40 (1.48)	**62.15 (3.48)**	19.80 (2.07)	12.66 (2.01)
Non-Hispanic Black Americans	296	4.63 (1.19)	47.58 (3.33)	**31.62 (3.04)**	16.17 (2.39)
Mexican or other Hispanics	275	3.60 (2.34)	41.28 (4.10)	18.45 (2.81)	**36.67 (4.99)**
Age group (year)					
20–29	28	1.52 (1.53)	60.13 (11.51)	14.32 (7.26)	24.03 (8.97)
30–39	80	- [b]	58.65 (4.73)	18.67 (3.30)	22.68 (4.27)
40–49	169	2.91 (1.79)	55.76 (4.83)	22.39 (4.50)	18.94 (3.32)
50–64	577	6.87 (1.47)	54.49 (2.97)	23.27 (1.91)	15.38 (1.91)
Sex					
Men	416	4.82 (1.42)	60.58 (2.82)	20.10 (2.14)	14.50 (1.53)
Women	438	5.03 (1.40)	50.72 (3.35)	24.13 (2.35)	**20.11 (2.51)**
Education attainment					
Below high school	318	3.72 (1.20)	**31.13 (3.71)**	35.23 (3.26)	**29.92 (3.65)**
High Sschool/equivalent	195	4.44 (2.18)	**55.52 (3.60)**	23.56 (3.06)	**16.49 (2.64)**
Some y of college	231	6.44 (1.92)	**61.59 (4.00)**	18.86 (2.89)	**13.11 (2.88)**
College graduate and higher	110	4.58 (2.58)	**77.77 (5.02)**	8.49 (3.17)	**9.17 (3.48)**
Family income					
Below poverty line	206	3.89 (1.30)	16.09 (3.67)	53.65 (4.16)	26.37 (4.30)
Middle income(1–1.85)	165	5.06 (1.84)	34.07 (3.77)	31.17 (4.92)	**29.69 (4.59)**
High income(>1.85)	418	5.12 (1.36)	72.94 (2.66)	11.01 (1.87)	10.93 (1.75)
Citizenship					
Citizen	749	5.25 (1.06)	57.53 (2.26)	22.64 (1.61)	14.58 (1.39)
Non-citizen	104	0.86 (0.64)	28.63 (3.99)	16.36 (3.93)	**54.15 (5.64)**

Note: NHANES, The National Health and Nutrition Examination Survey.
[a] Presented as percentage (standard error).
[b] No diabetic adults within this range were covered by a dual program.

Table 1 presents the characteristics of the diabetic adults covered by different programs using data from the year 2003–2008. M&OHs were more likely to be uninsured (37%) compared to either the NHBs (16%) or the NHWs (13%). In terms of income, it is noteworthy that middle-income diabetic adults were the population with the highest proportion of being uninsured (30%), while diabetic adults below the poverty line were primarily covered by government programs. Diabetic adults in the highest income bracket were more likely to be insured by private programs. More than half (54.15%) of diabetic non-citizens had no insurance while only 14.58% of diabetic citizens were not insured.

After simultaneous adjustment for socioeconomic factors including citizenship (Table 2), diabetic NHBs were less likely to be insured by a private program or a dual program compared with the counterparts of NHWs, although the difference was not statistically significant. NHBs and NHWs had an equal likelihood to be covered by a government-sponsored program (OR=1.01, 95%CI=0.54–1.86). However, diabetic M&OHs were significantly less likely than their NHW counterparts to be covered by government-sponsored program (OR=0.41, 95%CI=0.19–0.89). Citizenship was significantly and strongly associated with insurance status after adjustment for all other correlates. The OR of being insured was 3.40 (95%CI=1.42–8.14) among diabetic citizens compared with diabetic noncitizens. In addition, the OR of being covered by a dual program was as high as 9.16 (95% CI= 1.18–71.35) among diabetic citizens compared with diabetic noncitizens.

DISCUSSION

Using two nationally representative surveys, we observed a growing gap between the dramatically increasing prevalence of doctor-diagnosed diabetes and a significantly decreasing overall insurance coverage among diabetic adults. The observations are consistent with previous reports that, for more than two decades, the prevalence of diabetes had increased significantly,[10] and the percentage of the uninsured diabetics had increased steadily.[11] A substantial body of literature suggests that diabetic patients without health insurance experience reduced levels of the basic health care service, and are responsible for an inordinately high utilization of emergency departments for primary care.[12–14] Unnecessary use of emergency services is responsible for high charge services, which eventually must be swallowed by public funds or absorbed by the hospitals that provided the service.[12,15] Providing health insurance for primary care to change downward trajectories of functional declines is particularly cost-effective to reduce the financial burden to the society caused by diabetes, which requires intensive and continuous care management and regular glucose monitoring and foot and eye exams. This is particularly relevant as the gap between increasing prevalence of diabetes and decreasing coverage widens due to the recent economic downturn.

The second gap observed by our study was in relation to the racial difference in coverage and types of insurance. Overall, the likelihood of being covered by public programs was almost equal between these two major race/ethnicity groups after adjustment for social-economic status. However,

Table 2. Adjusted ORs of being insured by different program. Sample of 854 diabetic adults aged 20 to 64 years, NHANES, 2003–2008[a,b]

	Insured vs Not Insured		Covered by Both Programs vs No Insured		Covered by Private Program vs No Insured		Covered by Government Program vs No Insured	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Race/ethnicity								
Non-Hispanic Whites	1.00[c]		1.00		1.00		1.00	
Non-Hispanic Blacks	0.87	0.50,1.54	0.86	0.32,2.29	0.79	0.41,1.49	1.01	0.54,1.86
Mexican or other Hispanics	0.50	0.23,1.09	0.59	0.08,4.29	0.53	0.22,1.25	**0.41**	**0.19,0.89**
Citizenship								
Non-citizen	1.00		1.00		1.00		1.00	
Citizen	**3.40**	**1.42,8.14**	**9.16**	**1.18,71.35**	**2.76**	**1.02,7.49**	**3.31**	**1.32,8.32**

Notes: OR, odds ratio; CI, confidence interval; NHANES, the National Health and Nutrition Examination Survey.
[a] The independent variables in the final logistic models: age, sex, educational, family income, race, marital status), age when first told by a doctor that you had diabetes, the year of diagnosis and citizenship.
[b] The diagnosis was based on self-reported to the question: Doctor told that you have diabetes.
[c] Reference level.

41% of NHBs, as compared to 67% of NHWs, were covered by private programs exclusively during the year 2003–008. Studies have demonstrated that the type of insurance was associated with the quality of care,[3,16–18] and that patients with Medicaid and Medicare disability were at increased risk of death after a diagnosis of cancer when compared with patients insured by private programs.[17] Astonishingly, Zhang and colleagues found no difference in quality of care between uninsured patients and Medicaid recipients among 2,018 diabetic patients from community health centers in 17 states.[3] It is unclear whether the poor service was due to inadequate funding levels or if this trend was attributed to the quality of providers and health care organizations.[18] Even less is known about the effect of public insurance programs on the quality of care for diabetic patients among minority populations. This lack of information may be, in part, related to the quickly increasing diabetic minority population, as well as the frequently revised medical recommendations for diabetic case management.[3,18]

An obvious disparity in health insurance coverage continued to be evident among M&OHs in comparison with either NHWs or NHBs. Income is a barrier to private insurance, while lack of legal documentation of residency may be a barrier to access many government-sponsored programs among M&OHs. The M&OHs are the most rapidly growing ethnic population in the country and, statistics suggest they are almost two times more likely to have diabetes than their NHW counterparts of similar age.[19] It was reported that the diabetes-related complications of retinopathy and end-stage renal disease are two to four times more prevalent in M&OHs as compared to diabetic patients in other ethnic groups.[20] The relatively higher prevalence of complications are likely to be caused by insufficient care management due, in a large part, to the lack of insurance among the M&OHs. Policy options designed to bolster immigrants' health care should be explored, such as restoring their eligibility for Medicaid and providing primary care to prevent occurring of higher costs from being incurred at the advanced stage of diabetes.

Our study has several limitations. The selection bias is a major concern. Participants included the doctor-diagnosed diabetic patients only. A recent study indicated that the proportion of total diabetes that was undiagnosed was approximately 40% in those aged $\geq$20 years.[10] The selection bias may be particularly relevant for accurately estimating the percentages of uninsured diabetic adults since insured patients visit health professionals more frequently than uninsured patients for diagnostic evaluation of diabetes, and therefore, they are more likely to be included in the current analyses.[1] Studies also suggested that physicians tend to incorporate a patients' health insurance status into clinical decision-making, thereby possibly altering their diagnostic evaluations.[21] The coverage of government-sponsored programs had decreased by more than 50% among M&OHs between the two surveys. The increase in the M&OHs who were undocumented, therefore not qualified for government-sponsored programs, may be a likely explanation of the reduced government program coverage among this group.[22] However, due to the lack of citizenship information in the 1988–1994 survey, we were unable to test this hypothesis. The sample size of the current study prevented us from further stratifying the diabetic adults by types of subcategories of insurance programs.

It is almost certain that diabetes will continue to be a significant problem in decades to come. As this problem persists, and expands among ethnic populations, the economic strains on

affordable insurance will be tremendous, both in the public and private sector. Exploring effective alternatives, in terms of clinical effectiveness, cost-effectiveness and moral acceptability, will become a massive challenge for government, academia, the medical community and the insurance industry.

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AUTHOR CONTRIBUTIONS

Analysis and interpretation of data: Ekperi, Greene, Dehal, Zhang

Drafting of the manuscript: Ekperi, Greene, Dehal, Zhang.

Critical revision of the manuscript for important intellectual content: All authors.