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Diabetes among U.S.- and Foreign-Born Blacks in the United States

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Abstract

Background—Little is known about diabetes status among U.S. blacks by nativity. This study aims to measure differences in diabetes among U.S. blacks by region of birth and examine potential explanations for subgroup differences.

Design—Data from 47,751 blacks aged 25–74 pooled from the 2000–2013 waves of the National Health Interview Survey were analyzed. Logistic regression models predicted self-reported diabetes. The roles of education, income, body mass index (BMI), smoking, and duration of U.S. residence were explored.

Results—Compared to the U.S.-born, foreign-born blacks had significantly lower reported diabetes prevalence (8.94% vs. 11.84%) and diabetes odds (OR 0.75; 95% confidence interval (CI): 0.62, 0.89), adjusting for socio-demographic characteristics. Further inclusion of education, income, household size, and smoking did not appreciably change the OR (OR 0.77; 95% CI: 0.61, 0.86). Including an adjustment for BMI entirely eliminated the foreign-born advantage (OR 0.93; 95% CI: 0.78, 1.11). The foreign born from the Caribbean/Americas had similar diabetes odds compared to the African born. Among the foreign born, an increased duration of U.S. residence was associated with a higher diabetes odds, but these associations did not reach statistical significance ($p > 0.05$).

Conclusion—The healthy immigrant advantage extended to diabetes among U.S. blacks, a finding that is explained by lower levels of overweight/obesity among the foreign born compared to the U.S. born. Nonetheless, more than 71.4% of the foreign born were overweight or obese. Understanding the mechanisms through which exposure to the U.S. environment leads to higher obesity and diabetes risk may aid prevention efforts for the rapidly growing foreign-born black subpopulation.

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Keywords

Diabetes; obesity; African Americans/blacks; immigration

1. Introduction

Studies consistently show that the U.S. foreign born tend to be healthier than their U.S.-born race/ethnic counterparts (Cunningham, Ruben, and Narayan 2008). Understanding this heterogeneity is integral to addressing health disparities as the number of U.S. foreign born continue to grow due to high levels of past and current immigration (U.S. Census Bureau 2010; U.S. Department of Homeland Security 2012). Since the 1960s, large immigrant streams from the Caribbean and Africa have also led to an increasing share of the U.S. black population that is foreign born. By 2010, 9% of U.S. blacks were foreign born, up from 1.9% in 1970 (Population Reference Bureau 2002; U.S. Census Bureau 2011). Prior research suggests that foreign-born blacks have lower mortality, better mental and perinatal health, lower rates of overweight/obesity, and better outcomes for heart and circulatory disease, cancer, infectious disease and injury compared to U.S.-born blacks (Cunningham, Ruben, and Narayan 2008; Dey and Lucas 2006; Antecol and Bedard 2006; Hicks et al. 2003; Lucas, Barr-Anderson, and Kingston 2003; Singh and Hiatt 2006).

As a whole, blacks have one of the highest burdens of diabetes of any race/ethnic group in the U.S. (Centers for Disease Control and Prevention and the National Institutes of Health 2013). An estimated 13% of non-Hispanic blacks have diagnosed diabetes compared to 8% for the U.S. population as whole. Nonetheless, little is known about differentials in diabetes status among blacks by place of birth or explanations for these differences. Research in other race/ethnic groups including Hispanics and Asian/Pacific Islanders have shown that diabetes is a notable exception to the healthy immigrant advantage in that the foreign born appear to have a higher prevalence compared to the U.S. born (Cunningham, Ruben, and Narayan 2008; Oza-Frank et al. 2013). One previous study examining blacks suggested no difference in the crude diabetes prevalence rate or the adjusted odds ratio (OR) for diabetes between foreign- and U.S.-born black adults, controlling for age, sex, and socio-demographic characteristics (Singh and Hiatt 2006). However, this study was based on a small sample of foreign-born blacks and did not assess differences by region of birth or explore explanations for diabetes odds.

Using nationally representative data, we investigated differences in diabetes status among U.S. blacks by nativity and the explanatory roles of education, income, obesity, and smoking behaviors in explaining subgroup differences. Among the foreign born, we also explored the role of region of birth and duration of residence in diabetes odds.

2. Methods

2.1 Data

We pooled data from the 2000–2013 waves of the National Health Interview Survey (NHIS). The NHIS is a cross-sectional household survey that is nationally representative of

the civilian non-institutionalized population of the United States. Analyses were based on public use NHIS data files provided through the University of Minnesota's Integrated Health Interview Series (IHIS) (Minnesota Population Center and State Health Access Data Assistance Center 2012). Our sample was restricted to self-identified blacks, aged 25–74 (N=51,337). Race was determined by participants' response to a question asking about race. We included both Hispanic and non-Hispanic blacks but were unable to stratify by Hispanic status due to the small number of Hispanics (N=1,544). Of the restricted sample, 3,586 (6.9%) were excluded for missing information on one of the covariates used in the analysis except for income. The final analytical sample included 42,379 (87.8%) respondents who were born in the U.S. including its territories, 3,839 (8.6%) respondents born in the Caribbean and central/south America (henceforth referred to as the Americas), and 1,533 respondents (3.5%) born in Africa. Two-hundred and seventy-five blacks who were born outside these regions, including Europe (N=174), and 37 who had unknown region of birth were excluded from the analysis.

2.2 Diabetes Status

Diabetes status was determined by self-report (“[Other than during pregnancy], have you ever been told by a doctor or health professional that you have diabetes?”). The reliability of self-reported diabetes is relatively high for population-based surveys like the NHIS (Saydah et al. 2004). While the specificity of diabetes self-report is high, sensitivity of prevalent self-reported diabetes is lower (Schneider et al. 2012). Thus, prevalence of diabetes was likely underestimated in this study. Moreover, there is a potential for differential misclassification of diabetes status by nativity. To examine this issue, we estimated the sensitivity and specificity of diabetes self-report in the National Health and Nutrition Examination Survey (NHANES 1999/2000 – 2011/2012) among self identified non-Hispanic blacks aged 25–74. A strength of the NHANES is that it contains self-reports of diabetes status, use of insulin and oral glucose medication, and laboratory measurements of glycohemoglobin for a subset of respondents. To our knowledge, there is no other nationally representative dataset with laboratory measurements of blood glucose. A limitation of the NHANES is the small sample size of foreign-born blacks with relevant information (n=145). The NHANES data did not allow us to identify Hispanic blacks; therefore, our analysis was restricted to non-Hispanic blacks. Nonetheless, Hispanics comprised a minority of our NHIS sample (1.4% of U.S.-born and 17.4% of foreign-born). Sensitivity of diabetes self-report in the NHANES was 70.9% for the foreign born and 79.3% for the U.S. born. Specificity was 98.2% for the foreign born and 97.7% for the U.S. born. This suggests that there was likely some misclassification of diabetes status in our study. Because the sensitivity and specificity were high and similar for both the U.S. and foreign born, we do not believe that large or systematic differences in the quality of diabetes reporting by nativity among blacks were likely.

2.3 Other Covariates

We examined the roles of education, income, body mass index (BMI), and cigarette smoking in explaining nativity differentials in diabetes status as these factors are associated with diabetes and have been shown to vary among U.S. black subgroups (Lucas, Barr Anderson, and Kingston 2003, 2005; Kanjilal et al. 2006). Education was coded as: (1) less

than high school; (2) high school diploma, General Education Development (GED), or some college; and (3) college degree or higher. Total combined family income was coded as: (1) \$0–\$34,999; (2) \$35,000–\$74,999; and (3) \$75,000. Because income information was missing for 14.5% of the sample, we used multiple imputation to estimate income based on age, sex, foreign-born status, education, and survey year (Cole, Chi, and Greenland 2006). Household size was included as a continuous variable. Smoking status was categorized as current, former, or never smoker. BMI (kg/m^2) was classified according to current World Health Organization/National Heart, Lung, and Blood Institute guidelines: normal (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), class I obesity (30.0–34.9 kg/m^2), and class II/III obesity ($\geq 35.0 \text{ kg}/\text{m}^2$). To account for potential self-reporting bias of height/weight in the NHIS, we applied correction factors to the self-reported data obtained from an analysis of the NHANES, which contains both self-reported and clinically measured height and weight.

Following previous studies, correction factors were obtained by estimating sex-specific models regressing height (weight) on self-reported height (weight) and its square (Connor Gorber, Shields, and Tremblay 2008). Models were limited to blacks/African Americans. There were no significant differences in the corrections between the U.S. and foreign born and across ages; therefore, the same set of factors were applied to the foreign and the U.S. born and to all ages.

2.4 Statistical Analysis

We began by estimating sex-specific descriptive characteristics of all covariates by place of birth (U.S., foreign-born Americas, and foreign-born Africans) and compared estimates across the subgroups using design-based Pearson coefficients for categorical covariates and two-sided t tests for continuous covariates. We then estimated a series of logistic models predicting diabetes status. Preliminary results indicated no significant differences in diabetes status between those born in the Americas and those born in Africa, so we combined both groups into a single “foreign born” category to increase statistical power. All models were adjusted for age (measured continuously and centered at age 45), an interaction term for foreign-born status and age, sex, and survey year. Model 1 was the minimally adjusted relationship between diabetes and foreign-born birth status. Model 2 added adjustments for educational attainment, income, and household size to test if differences in diabetes prevalence could be explained by differences in educational attainment or income between foreign-born and U.S.-born blacks. To assess the role of health behaviors in diabetes odds, Model 3 adjusted for BMI category and smoking status. In additional preliminary models, we tested for and found no evidence of an interaction between foreign-born status and either sex or BMI on diabetes odds. We also tested for evidence of interaction between age and BMI and found no evidence of interaction. In addition to reporting ORs, we estimated predicted prevalences of diabetes at age 45, the approximate mean age of the sample, using model 3 and holding all other covariates at their grand mean.

An increasing time spent in the U.S. is often associated with poorer health among immigrants (Antecol and Bedard 2006; Goel et al. 2004; Oza-Frank, Stephenson, and Narayan 2011). In additional models restricted to the foreign born, we examined whether

length of U.S. residence (categorized as <5 years, 5–15 years, and 15+years) was associated with diabetes status and affected differences in diabetes odds between those born in the Americas and the African born.

All models were estimated using STATA v13.1. Estimates were weighted using weights provided in the IHIS to account for complex sampling design of the NHIS. Standard errors account for the complex survey design.

This research relies on secondary analysis of de-identified data and therefore does not constitute human subjects research.

3. Results

3.1 Descriptive Statistics

Table 1 provides descriptive statistics by sex. Of the 47,751 adults included in the sample, 87.7% were U.S. born and 12.1% were foreign born. Among the foreign born, 70.8% were born in the Americas, and 29.1% were born in Africa. Mean age varied slightly by subgroup. The foreign born from Africa were on average younger (40.2 years) than the U.S. born and foreign born from the Americas (45.2 and 45.1 years, respectively).

There were significant differences in educational attainment between U.S.-born and foreign-born blacks as a whole (Pearson χ^2 ; $p < 0.0001$). The foreign born from Africa had the highest educational attainment with 45.0% of the subgroup having at least a college degree. The foreign born from the Americas had the lowest levels of educational attainment with 20.6% having not completed high school. Similarly, 17.6% of U.S.-born blacks did not finish high school. There were differences in income between U.S.-born and foreign-born blacks as a whole. Among the U.S.-born blacks, 55.2% had income less than \$35,000 compared to 47.5% of the foreign-born blacks. The foreign born also had, on average, larger household size compared to the U.S. born (3.2 people vs. 2.7 people).

The foreign born from Africa were more likely to be male (56.8%) than other subgroups. Region of residence in the U.S. varied significantly by nativity (Pearson χ^2 ; $p < 0.0001$). The regional distribution of black subgroups reflected the typical settlement patterns of foreign-born blacks. The majority of U.S.-born blacks resided in the south (60.2%) whereas the majority of foreign-born blacks from the Americas resided in the northeast (52.1%).

Duration of residence in the U.S. varied by foreign-born subgroup. Compared to the foreign born from the Americas, foreign-born blacks from Africa had the shortest duration of residence in the U.S. (18.3% less than 5 years and 48.4% from 5 to 15 years). Conversely, 65.9% of the foreign-born from the Americas had resided in the U.S. for more than 15 years.

Table 2 provides health and behavior characteristics. Diabetes status differed significantly by place of birth (Pearson χ^2 ; $p < 0.0001$). The highest prevalence of diabetes was seen among U.S.-born women (12.0%) and U.S.-born men (11.6%). The lowest prevalence was seen among the foreign born from Africa (6.9%). Smoking status differed significantly by nativity and sex (Pearson χ^2 ; $p < 0.0001$). Overall, there was a very low prevalence of current

(3.9%) or former smoking (4.0%) among foreign-born women. Table 3 provides the results of the logistic models for the U.S. born and the foreign born.

There were significant differences in BMI and overweight/obesity by sex and nativity. Overall, mean BMI was higher among women than men (31.0 kg/m² vs. 28.8 kg/m²), and women had significantly higher prevalence of obesity compared to men (50.6% versus 34.9%). The U.S.-born women had the highest mean BMI (31.2 kg/m²) and the highest prevalence of obesity (52.2%), while the lowest prevalence of obesity was seen among the African-born men (15.2%) and the foreign-born men from the Americas (20.9%). There were significant differences in the prevalence of both overweight and obesity between U.S.-born and foreign-born blacks as a whole (Pearson χ^2 ; $p < 0.0001$) as well as by sex between the U.S.-born and foreign-born groups (Pearson χ^2 ; $p < 0.0001$ for both comparisons). Among the foreign born, both men and women had a higher prevalence of overweight than their U.S.-born counterparts; however, both foreign-born men and foreign-born women had significantly lower levels of obesity than their U.S.-born counterparts. Among the obese, all women had similar levels of class I obesity; however, the U.S.-born women had nearly double the prevalence of class II/III obesity compared to the foreign-born women (27.2% vs. 14.8%). The foreign-born men had lower prevalence of all classes of obesity compared to the U.S.-born men.

3.2 Logistic Models

Table 3 provides results from the logistic models predicting diabetes for the US born and the foreign born. In Model 1 which adjusted only for age, sex survey year, and the interaction between age and foreign-born status, foreign-born blacks had significantly lower diabetes odds at age 45 compared to U.S.-born blacks (OR: 0.75; 95% Confidence Interval (CI): 0.62, 0.89). The OR for the foreign*age interaction was significant and greater than 1.00 (OR: 1.01; 95% CI: 1.00, 1.02) indicating that there was a convergence in diabetes odds between the U.S. and the foreign born with increasing age (i.e., the OR approaches 1.00 with increasing age). Age and survey year were also significantly and positively related to diabetes odds—a pattern consistent in all models. Females were equally likely as males to report diabetes (OR: 1.01; 95% CI: 0.94, 1.09). Model 2 added education, income, and household size. There was a clear educational gradient with respect to diabetes status. Compared to less than a high school education, high school/GED/some college attainment was associated with reduced odds of diabetes (OR: 0.85; 95% CI: 0.78, 0.93). The protective effect of education was stronger for college degree holders (OR 0.68; 95% CI: 0.60, 0.78). Nonetheless, adding education to the model did not significantly change the diabetes odds of the foreign born relative to the U.S. born compared to Model 1, suggesting that the reduced odds of diabetes among the foreign born was not explained by their higher educational attainment compared to U.S.-born blacks. There was a similar income gradient with respect to diabetes. Relative to people with income less than \$34,999, people with income greater than \$75,000 had a 30% reduced odds of diabetes (OR 0.70; CI: 0.61–0.81). The protective effect among people with income \$35,000–\$74,999 relative to income less than \$34,999 was 14% (OR 0.86; 95% CI: 0.78, 0.94).

In Model 3, we added BMI category and smoking to assess the role of these behavioral factors on diabetes odds. Adjusting for these factors eliminated the foreign-born advantage (OR: 0.93; 95% CI: 0.78, 1.11). There was a dose-response relationship between BMI category and diabetes odds. Relative to the normal weight category, BMI in the overweight category had a diabetes OR of 1.55 (95% CI: 1.37, 1.76). Diabetes increased to 2.51 (95% CI: 2.20, 2.87) for class I obesity and 4.67 (95% CI: 4.09, 5.34) for class II/III obesity. In Model 3, former smoking was associated with a 30% increase in diabetes relative to never smokers (OR: 1.30; 95% CI: 1.18, 1.44). Current smoking was not associated with diabetes. Additional models indicated that inclusion of BMI, and not smoking, into the model was responsible for explaining the lower diabetes status among the foreign born. Specifically, in a model that included smoking, but not BMI, the OR was 0.77 (95% CI: 0.61, 0.86). Using Model 3, the predicted marginal probability of self-reported diabetes at age 45 among the U.S. born was 8.20% (95% CI: 7.87, 8.54) compared to 7.34% (95% CI: 6.43, 8.24) for the foreign-born, holding all other covariates at their grand mean.

In models restricted to the foreign born (Supplement A), Model 1 indicated no apparent difference in diabetes odds between those born in the Americas and the African born after accounting for age, sex, and survey year. Duration of U.S. residence was also not significantly associated with diabetes odds; however, results indicated that an increased duration was associated with higher diabetes odds (Model 2). The inclusion of duration of U.S. residence in this model also did not appreciably change the OR for those born in the Americas compared to the African born. Model 3 included education, income, and household size. Model 4 added behavioral factors. Addition of these controls did not affect the OR for the foreign-born groups.

4. Discussion

We found that diabetes risk among U.S. blacks was patterned by nativity with the foreign born displaying lower levels of reported diabetes compared to the U.S. born, a differential entirely explained by the lower levels of obesity among foreign-born blacks. We did not detect differences in reported diabetes odds among those born in the Americas and those born in Africa, and our results suggest a larger foreign-born advantage at younger compared to older ages. We also report that while foreign-born blacks had lower levels of obesity compared to U.S.-born blacks, the vast majority of both groups were overweight or obese.

Studies on the health of foreign-born blacks have been hampered by their relatively small sample size in national datasets. To our knowledge, only one study to date has reported on diabetes prevalence among foreign-born and U.S.-born blacks. This study, based on the earlier 1993 and 2003 NHIS waves, indicated no significant difference in either the crude prevalence rate or the adjusted OR for diabetes between foreign-born and U.S.-born blacks, controlling for age, sex, and socio-demographic characteristics (Singh and Hiatt 2006). Another study assessing diabetes prevalence by length of residence among U.S. immigrants found that foreign-born non-Hispanic blacks were significantly more likely to report diabetes compared to foreign-born non-Hispanic whites (OR 1.7; 95% CI: 1.3, 2.3); however, no comparisons were made with native-born blacks (Oza-Frank, Stephenson, and Narayan 2011). In contrast to prior work, our study pooled data across 14 recent NHIS

survey waves to obtain a large sample of foreign blacks making it possible to have adequate statistical power to examine foreign-native born differences and distinguish the foreign born by region of birth.

The higher levels of diabetes among U.S. blacks compared to other U.S. race/ethnic groups has been attributed to a variety of factors including higher levels of overweight/obesity, higher levels of insulin sensitivity for a given adiposity level, and genetic susceptibility (Okosun et al. 2000). Our findings underscore the importance of overweight/obesity in patterning diabetes levels within black subgroups. The relatively lower levels of obesity among foreign-born blacks compared to U.S.-born blacks is consistent with previous studies on these populations (Antecol and Bedard 2006; Singh and Hiatt 2006). The more favorable weight patterns among foreign-born blacks may be a function of lower levels of obesity in Western and Eastern Africa and in many Caribbean countries compared to the United States. Studies have documented that acculturation and increased duration of U.S. residence, and thus exposure to the U.S. food environment and lifestyle, is associated with increasing obesity among the foreign born (Delavari et al. 2013; Singh et al. 2011). Our study provides suggestive evidence that an increasing duration of U.S. residence is also associated with higher diabetes levels among foreign-born blacks, although we had limited statistical power to make definitive conclusions. Whether this increase in diabetes is mediated by higher levels of obesity associated with increased duration or other factors requires further study. Moreover, overweight/obesity levels have increased over time among the black foreign born as they have for other U.S. foreign-born groups (Antecol and Bedard 2006). This pattern suggests that the foreign-born advantage in diabetes among blacks may be reduced or not evident in the future.

In addition to examining the role of behavioral factors, we also assessed the roles of education and income. Education has been linked to diabetes risk through its relationship with behavioral factors (e.g., diet, physical activity) and potentially through other factors (e.g., depression, psychosocial factors, medical care/prevention) (Kanjilal et al. 2006; Smith 2007). The relationship between income and diabetes is complex and might be mediated by obesity, access to care, neighborhood/community-level factors such as built environment, or other factors. Despite significant differences in both education and income between the U.S. and foreign born, neither educational attainment nor income explained the differential in diabetes status. This is consistent with prior studies highlighting that observed socio-economic factors often fail to explain health advantages among the foreign born (Robbins et al. 2000). Researchers have hypothesized that differences in health status between the foreign born and the U.S. born might be explained by cultural buffering—in which cultures outside the U.S. restrain risky health behaviors including drinking and smoking—and promote healthy diets. (Antecol and Bedard 2006; Singh and Siapush 2002; Gordon-Larsen et al. 2003). Data on cultural beliefs about healthy lifestyles were unavailable in this data, but as indicated, observable differences in BMI in this study explained the foreign-U.S. differential entirely suggesting that diet and activity patterns are important explanatory factors.

The main strength of this study was the use of large nationally representative samples. Nonetheless, we still lacked adequate statistical power to conclusively examine the role of

duration of residence among the foreign born. Prior studies show that there is significant heterogeneity in health behaviors and health status among foreign-born blacks by region of birth, with those born in Africa usually shown to be more advantaged compared to those born in the Americas (Elo, Mehta, and Huang 2008; 2011). Our findings suggested that the African born have a somewhat lower odds of reporting diabetes compared to those born in the Americas, although this result was not statistically significant, also perhaps due to limited power. Similarly, we were unable to assess the role of Hispanic identity on diabetes odds due to small sample sizes, particularly among the foreign born. Prior research suggests that Hispanic blacks may have worse health compared to non-Hispanics blacks (Oza-Frank Stephenson, and Narayan 2011; Elo, Mehta, and Huang 2011). We relied on self-reported data. Thus, we likely underestimated the true prevalence of diabetes for all groups. A primary goal was to examine differences by nativity, and our analysis of NHANES data suggested that misclassification did not differ greatly by nativity. However, the NHANES contained a small sample of foreign-born blacks and we could not include Hispanic blacks in these data. Therefore, we cannot rule out the possibility that differential misclassification of diabetes status by nativity influenced our NHIS findings. Future research on foreign-born blacks should collect laboratory-based measures of diabetes status to better understand risks in this population with relatively high levels of overweight/obesity.

In sum, we found that the healthy immigrant advantage extended to diabetes among U.S. blacks, an outcome that stands in contrast to findings from other race/ethnic groups. The more favorable levels of overweight and obesity among the foreign born appeared to explain this advantage, underscoring the role of lifestyle factors in diabetes. Nonetheless, more than 71.4% of the foreign born and 78.7% of the U.S. born were overweight or obese, suggesting that prevention efforts need to be targeted to both groups. Moreover, there is an indication that an increased duration of U.S. residence is associated with higher diabetes prevalence among the foreign born. Thus, understanding the mechanisms through which exposure to the U.S. environment leads to the higher obesity and diabetes risk may aid prevention efforts for the rapidly growing foreign-born black subpopulation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Descriptive characteristics by place of birth; self-reported blacks/African Americans, ages 25–74, National Health Interview Survey (NHIS)

Table 1

Characteristics	Men (N=19,098)			Women (N=28,653)		
	U.S.-born (N=16,674)	Foreign-born Americas (N=1,592)	Foreign-born Africa (N=832)	U.S.-born (N=25,705)	Foreign-born Americas (N=2,247)	Foreign-born Africa (N=701)
Mean age	45.13 (44.85, 45.40)	44.88 (44.08, 45.68)	40.35 (39.44, 41.26)	45.41 (45.18, 45.65)	45.43 (44.83, 46.03)	40.18 (39.12, 41.24)
Mean household size	2.69 (2.65, 2.73)	3.26 (3.15, 3.37)	2.97 (2.81, 3.13)	2.82 (2.79, 2.86)	3.30 (3.16, 3.44)	3.65 (3.47, 3.82)
<i>Educational attainment</i>						
Less than high school	17.68 (16.84, 18.56)	21.36 (19.04, 23.88)	4.49 (3.10, 6.47)	17.62 (16.87, 18.40)	20.00 (18.15, 22.08)	15.49 (12.31, 19.30)
High school/some college	64.72 (63.69, 64.74)	57.39 (54.48, 60.25)	40.88 (36.16, 45.78)	63.34 (62.42, 64.25)	60.29 (57.16, 63.34)	51.98 (47.29, 56.64)
College degree or more	17.58 (16.69, 18.50)	21.23 (19.07, 23.57)	54.61 (49.62, 59.51)	19.02 (18.17, 19.91)	19.65 (17.44, 22.07)	32.52 (28.07, 37.30)
<i>Marital Status</i>						
Never married	29.80 (28.85, 30.77)	19.02 (16.98, 21.25)	23.30 (20.09, 26.85)	34.11 (33.30, 34.93)	25.07 (22.85, 27.43)	18.45 (15.32, 22.05)
Married	48.60 (47.52, 49.68)	65.16 (62.60, 67.63)	61.70 (57.90, 67.63)	34.05 (33.14, 34.97)	47.33 (47.33, 50.88)	58.26 (53.43, 62.94)
Divorced/separated/widowed	21.48 (20.71, 22.28)	15.96 (14.08, 18.04)	14.63 (12.27, 17.35)	31.82 (31.11, 32.55)	27.59 (25.46, 29.83)	23.28 (19.62, 27.39)
<i>Total Combined Family Income</i>						
\$0–\$34,999	49.70 (48.43, 50.97)	44.14 (40.39, 47.90)	43.95 (39.37, 48.53)	60.66 (59.64, 61.68)	53.35 (49.82, 56.88)	48.65 (43.49, 53.81)
\$35,000–\$74,999	36.39 (35.31, 37.48)	39.09 (35.58, 42.60)	40.98 (36.22, 45.73)	29.77 (28.93, 30.61)	34.58 (31.22, 37.84)	36.33 (31.46, 41.20)
\$75,000	13.89 (13.06, 14.73)	16.75 (14.21, 19.30)	15.06 (11.31, 18.81)	9.55 (8.94, 10.16)	12.05 (9.99, 14.12)	15.00 (11.07, 18.93)
<i>Duration of Residence in US</i>						

Characteristics	Men (N=19,098)				Women (N=28,653)			
	U.S.-born (N=16,674)	Foreign-born Americas (N=1,592)	Foreign-born Africa (N=832)	U.S.-born (N=25,705)	Foreign-born Americas (N=2,247)	Foreign-born Africa (N=701)		
< 5 years	-	6.31 (4.79, 8.27)	17.62 (14.55, 21.17)	-	6.75 (5.48, 8.29)	19.28 (15.39, 23.88)		
5–15 years	-	28.29 (25.13, 31.69)	48.47 (44.33, 52.64)	-	26.74 (23.74, 29.98)	48.63 (44.02, 52.72)		
> 15 years	-	65.39 (62.26, 68.39)	33.90 (29.98, 38.04)	-	66.49 (63.37, 69.48)	32.35 (28.26, 36.72)		

Notes: Proportions unless otherwise noted. 95% Confidence intervals shown in parentheses. Estimates reflect sample weighting except for sample sizes.

Source: National Health Interview Survey, adult sample files, 2000–2013.

Health and behavior characteristics by place of birth; self-reported blacks/African Americans, ages 25–74, National Health Interview Survey (NHIS)

Table 2

Characteristics	Men (N=19,098)			Women (N=28,653)		
	U.S.-born (N=16,674)	Foreign-born Americas (N=1,592)	Foreign-born Africa (N=832)	U.S.-born (N=25,705)	Foreign-born Americas (N=2,247)	Foreign-born Africa (N=701)
Self-reported diabetes	11.63 (11.02, 12.26)	9.27 (7.68, 11.16)	6.90 (5.11, 9.27)	12.01 (11.54, 12.50)	10.64 (8.81, 12.79)	5.59 (3.65, 8.47)
Mean BMI (kg/m ²)	29.12 (29.00, 29.24)	27.16 (26.89, 27.42)	26.39 (26.03, 26.76)	31.25 (31.14, 31.37)	29.04 (28.72, 29.36)	28.89 (28.25, 29.53)
Overweight (25–29.9 kg/m ²)	38.63 (37.64, 39.63)	49.32 (46.64, 52.00)	48.27 (44.24, 52.32)	28.65 (27.99, 29.31)	36.29 (34.00, 38.64)	36.82 (32.22, 41.67)
Obese Class I (30–34.9 kg/m ²)	22.25 (21.45, 23.06)	16.09 (13.96, 18.48)	11.60 (9.23, 14.48)	25.04 (24.41, 25.67)	23.79 (21.77, 25.94)	22.87 (18.71, 27.63)
Obese Class II/III (≥ 35 kg/m ²)	15.14 (14.45, 15.87)	4.85 (3.81, 6.16)	3.69 (2.24, 6.01)	27.21 (26.50, 27.87)	15.26 (13.23, 17.53)	13.53 (10.04, 17.99)
Smoking						
Never Smoker	52.35 (51.32, 53.39)	73.39 (70.88, 75.75)	73.76 (69.55, 77.58)	65.23 (64.37, 66.09)	90.21 (88.70, 91.54)	95.65 (92.80, 97.36)
Current Smoker	28.63 (27.70, 29.57)	12.71 (10.78, 14.94)	11.75 (9.53, 14.41)	21.25 (20.51, 22.02)	4.75 (3.84, 5.86)	1.63 (0.70, 3.72)
Former Smoker	19.00 (18.24, 19.79)	13.88 (12.11, 15.87)	14.47 (11.74, 17.71)	13.36 (12.82, 13.92)	4.71 (3.84, 5.78)	2.18 (1.19, 3.96)

Notes: Proportions unless otherwise noted. 95% Confidence intervals shown in parentheses. Estimates reflect sample weighting except for sample sizes.

Source: National Health Interview Survey, adult sample files, 2000–2013.

Table 3

Odds Ratios (95% CI) Predicting Diabetes for Black U.S.-born and Foreign-born U.S. Residents Ages 25–74, and Predicted Prevalence of Diabetes at Age 45 from Logistic Regression Models, National Health Interview Survey (NHIS)

<i>Characteristics</i>	Model 1	Model 2	Model 3	Predicted Prevalence at Age 45 for Model 3
<i>Nativity</i>				
U.S. born	-	-	-	8.20 (7.87–8.54)
Foreign-born	0.75 (0.62–0.89)	0.72 (0.61–0.86)	0.93 (0.78–1.11)	7.34 (6.43–8.24)
<i>Sex</i>				
Male	-	-	-	9.10 (8.64–9.57)
Female	1.01 (0.94–1.09)	0.99 (0.92–1.07)	0.80 (0.74–0.87)	7.50 (7.14–7.86)
Age (one year increments)	1.07 (1.06–1.07)	1.06 (1.06–1.07)	1.06 (1.06–1.07)	-
Foreign*Age interaction	1.01 (1.00, 1.02)	1.01 (1.00–1.02)	1.00 (0.99–1.01)	-
Survey year (one year increments)	1.02 (1.01–1.02)	1.03 (1.02–1.03)	1.02 (1.01–1.03)	-
<i>Educational attainment</i>				
Less than high school		-	-	9.10 (8.50–9.70)
High school/GED/some college		0.85 (0.78–0.93)	0.84 (0.77–0.92)	7.98 (7.63–8.34)
College degree or higher		0.68 (0.60–0.78)	0.73 (0.63–0.84)	7.39 (6.75–8.04)
<i>Total Combined Family Income</i>				
\$0–\$34,999		-	-	8.87 (8.47–9.27)
\$35,000–\$74,999		0.86 (0.78–0.94)	0.84 (0.76–0.93)	7.31 (6.85–7.77)
\$75,000		0.70 (0.61–0.81)	0.68 (0.58–0.79)	6.06 (5.33–6.78)
<i>BMI (kg/m²) category</i>				
Normal (18.5–24.9 kg/m ²)			-	4.10 (3.73–4.48)
Overweight (25.0–29.9 kg/m ²)			1.55 (1.37–1.76)	6.58 (6.18–6.98)
Class I obesity (30.0–34.9 kg/m ²)			2.51	10.24

<i>Characteristics</i>	Model 1	Model 2	Model 3	Predicted Prevalence at Age 45 for Model 3
			(2.20–2.87)	(9.64–10.83)
Class II/III obesity (≥ 35.0 kg/m ²)			4.67	16.53
			(4.09, 5.34)	(15.71–17.36)
<i>Smoking Status</i>				
Never			-	7.73
				(7.37–8.09)
Former			1.30	10.02
			(1.18–1.44)	(9.34–10.71)
Current			1.00	7.92
			(0.91–1.11)	(7.41–8.44)

Notes: Reference category is U.S.-born. Sample sizes are 42,379 for U.S.-born and 5,372 for foreign-born. Data are weighted.

Model 1: Minimally adjusted relationship between diabetes and foreign-born birth status (adjusted for age, sex, survey year and foreign*age interaction).

Model 2: Model 1 + educational attainment + total combined family income + household size

Model 3: Fully adjusted model (Model 2 + smoking + BMI category). Predicted prevalence and conditional marginal probabilities are for age 45, holding all other covariates at their grand mean, using Model 3.

Source: National Health Interview Survey adult sample files, 2000–2013.