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Diet quality among US-born and foreign-born non-Hispanic blacks: NHANES 2003–2012 data

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ABSTRACT

Background: Non-Hispanic blacks in the United States are less likely to not meet national dietary recommendations than non-Hispanic whites; however, most studies do not consider nativity of US blacks.

Objectives: With the use of the Alternative Healthy Eating Index–2010 (AHEI-2010) and the Dietary Approach to Stop Hypertension (DASH) scores, this cross-sectional study compared diet quality between US-born ($n = 3,911$) and foreign-born ($n = 408$) non-Hispanic black adults aged 22–79 y, based on pooled nationally representative data (NHANES 2003–2012) as well as by length of US residency.

Design: The association between nativity and diet quality was determined by using multivariable-adjusted linear regression for the continuous total diet quality scores and their components or multinomial (polytomous) logistic regression for categorical tertiles (low, medium, or high) of the total scores and their components.

Results: Foreign-born blacks had significantly higher AHEI-2010 (β: 9.3; 95% CI: 7.5, 11.0) and DASH (β: 3.1; 95% CI: 2.5, 3.8) scores compared with US-born blacks and more favorable intakes for many of the score components. Among foreign-born blacks, diet quality did not significantly differ by length of residency. Foreign-born blacks were more likely to be in the high than in the low tertile for vegetables [excluding starchy vegetables; relative risk ratio (RRR): 1.68; 95% CI: 1.24, 2.29], fruit [excluding and including fruit juice—RRR: 2.42 (95% CI: 1.69, 3.47) and RRR: 2.95 (95% CI: 1.90, 4.59), respectively], percentage of whole grains (RRR: 2.39; 95% CI: 1.64, 3.49), and omega–3 (ω-3) fatty acids (RRR: 2.03; 95% CI: 1.38, 2.97).

Conclusions: Foreign-born blacks have better diet quality than their US-born counterparts. In nutrition research and public health efforts, considering the place of birth among US blacks may improve the accuracy of characterizing dietary intakes and facilitate the development of targeted nutrition interventions to reduce diet-related diseases in the diverse black population in the United States. *Am J Clin Nutr* 2018;107:695–706.

Keywords: diet quality, dietary intake, health disparities, immigrants, foreign-born, blacks/African Americans, place of birth/nativity, length of residency, NHANES, acculturation

INTRODUCTION

In the United States, non-Hispanic blacks (hereafter referred to as "blacks") are generally reported to have poor diet quality and to not meet national dietary recommendations, such as the Dietary Guidelines for Americans (1, 2). Intakes of total vegetables, whole grains, milk, dietary fiber, potassium, and calcium are lower among blacks than whites, whereas intakes of sugar-sweetened beverages and added sugars are higher (1–4). Blacks also have among the highest rates of morbidity and mortality from diet-related diseases such as hypertension, heart disease, and stroke in comparison to other racial/ethnic groups in the United States (5, 6).

A major limitation of the epidemiologic data is the lack of consideration with regard to heterogeneity within the US black population, particularly accounting for nativity. Most of the literature on dietary intake among nonwhite immigrant populations has been reported for Hispanic and Asian groups, with very limited research exploring dietary acculturation among blacks (7–9). Although most blacks were born in the United States and have been in the country for many generations, others are longstanding or recent immigrants from countries throughout Africa and the Caribbean. Combined, Caribbean-born and African-born self-identified black immigrants make up an estimated 8.7% of the US

Research reported in this publication was supported by the National Heart, Lung, and Blood Institute of the NIH under award R01HL115189.

The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Supplemental Figures 1 and 2 and Supplemental Tables 1 and 2 are available from the "Supplementary data" link in the online posting of the article and from the same link in the online table of contents at https://academic.oup.com/ajcn/.

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Abbreviations used: AHEI-2010, Alternative Healthy Eating Index–2010; DASH, Dietary Approaches to Stop Hypertension; IPR, income-to-poverty ratio; MPED/FPED, USDA MyPyramid Equivalents Database/Food Patterns Equivalents Database; RRR, relative risk ratio.

Received August 30, 2017. Accepted for publication January 24, 2018.

First published online May 2, 2018; doi: https://doi.org/10.1093/ajcn/nqy021.

black population (and 1.1% of the total population) (10, 11). The Census Bureau projects that black immigrants will continue to increase in the United States, and by 2060, 16.5% of US blacks (and 2.4% of the total population) are projected to be foreign born (12). Moreover, immigration statistics suggest that the influx of black immigrants represents a diverse array of countries of origin (e.g., Nigeria, Ethiopia, Ghana, Jamaica, Trinidad, and Tobago), which would deepen the heterogeneity of cultures and lifestyle patterns, including food preferences and diet quality (10, 13).

Although there is considerable cultural and ethnic diversity based on nativity in the US black population, existing literature that explores this topic is scarce or outdated (14–16). Haitian Americans have been reported to have a significantly higher diet quality as measured by the Alternative Healthy Eating Index–2010 (AHEI-2010) and the Healthy Eating Index–2005 compared with US-born participants (14). In another study, blacks born in the United States compared with foreign-born Hispanic and non-Hispanic blacks had lower intakes of total energy and all types of fat, as well as higher intakes of fiber, vitamin C, potassium, and other essential nutrients (15). In both studies, the authors emphasized the importance of disaggregating ethnicities and considering nativity when assessing diets.

The aim of the present study was to compare diet quality between foreign-born and US-born blacks by using the AHEI-2010 and Dietary Approaches to Stop Hypertension (DASH) diet scores. We hypothesized that foreign-born blacks would have higher diet quality scores for either index than their US-born counterparts, and that among foreign-born blacks longer lengths of residency would be associated with poorer diet quality scores.

METHODS

Data source, study population, and dietary assessment

This research study used pooled data from the 2003–2012 NHANES, a nationally representative health and nutrition survey of the noninstitutionalized US population (17). NHANES includes demographic, socioeconomic, and health- and diet-related questions and is carried out through complex, stratified, multistage probability sampling. NHANES dietary intake data are based on data from up to two 24-h recalls, in which the foods and beverages consumed during the preceding 24-h period (midnight to midnight) are tabulated to estimate intakes of energy, macronutrients, micronutrients, and food groups (18). In the event that data for two 24-h recalls were available for our analysis, the average was taken (one 24-h recall for US-born, $n = 444$; two 24-h recalls for US-born, $n = 3467$; one 24-h recall for foreign-born, $n = 60$; two 24-h recalls for foreign-born, $n = 348$; see **Supplemental Figure 1**). The recall is collected in the Mobile Examination Center and the second recall is collected by telephone 3–10 d later (18). USDA MyPyramid Equivalents Database/Food Patterns Equivalents Database (MPED/FPED) files, based on NHANES dietary data, were also utilized and accounted for food components (i.e., vegetables, grains, etc.) in mixed dishes. The NHANES protocol was approved by the National Center for Health Statistics Research Ethics Review Board, and all participants provided informed consent. Additional details are available elsewhere (17).

The primary analysis was restricted to those who self-identified as non-Hispanic black, were between the ages of 22 and 79 y, were not pregnant at the time of the examination, had all of the data necessary to calculate diet quality scores from ≥1 valid 24-h recall, and had no missing data for variables included in the regression models ($n = 4319$). Given the influence of pregnancy on diet and nutritional and caloric needs, pregnant participants were excluded from the analysis. To account for the average age of college-level educational attainment and the accurate use of this covariate in the statistical modeling, the lower age limit was set at 22 y. Because the age variable in NHANES is top-coded at 80 y, the upper age limit was set at <80 y. The use of all available recall data (one or both days) provided unbiased estimates for population means for our sample. Energy intakes of ≤600 kcal and ≥4800 kcal were excluded from the analysis due to implausibility ($n = 64$ and 52 participants were excluded, respectively).

Diet quality

In this analysis, we used adapted AHEI-2010 and DASH diet scores as a measure of diet quality.

Adapted AHEI-2010

The AHEI-2010 was established as an alternative to the Healthy Eating Index–2010, a score developed to measure compliance with nutrition recommendations based on the 2010 Dietary Guideline for Americans (19, 20). Compared with the Healthy Eating Index–2005, the AHEI-2010 takes a more food-based approach to dietary recommendations instead of a nutrient-based approach. Research suggests an association between higher AHEI-2010 scores with a lower risk of a range of chronic diseases, including cardiovascular diseases and diabetes (21, 22). All component definitions were derived from available data in the USDA MPED/FPED files. On the basis of available valid dietary data, a revised version of the score excluding *trans* fat and using adapted recommendation cutoffs for whole grains. Because of the policy changes enacted and trends in reduced *trans* fat consumption during the duration of the pooled waves of NHANES and the fact that *trans* fat is not collected in NHANES, which might bias the study results, we excluded *trans* fat from the AHEI-2010 score (18, 23). We also adapted the whole-grain cutoffs to reflect the recent dietary guidance from the USDA to consume ≥50% of total grains as whole grains due to constraints of the data set and the availability of reliable data in the USDA MPED/FPED diet files (19, 20). The 10 dietary components of the score include the following: fruit (excluding fruit juice; servings per day); vegetables (excluding white potatoes; servings per day); whole grains (ounce-equivalents per day); sugar-sweetened beverages (servings per day); nut, legume, and vegetable protein (ounce-equivalents per day); red and processed meat (servings per day); long-chain n–3 fats (EPA+DHA; milligrams per day); polyunsaturated fats (PUFAs) (percentage of kilocalories per day); sodium (milligrams per day); and alcohol (drinks per day). USDA definitions were used for whole grains and the nut, legume, and vegetable protein components of the score (21, 22, 24). All AHEI-2010 components were scored from 0 (worst) to 10 (best) on the basis of the established criteria (see **Supplemental Table 1**) and intermediate values were scored proportionally. The individual component scores were summed, with a potential range of 0–100 points and higher scores were indicative of higher diet quality. The AHEI-2010 was not energy adjusted.

Adapted DASH score

The Fung DASH score is a quintile- and food-based dietary score assessing adherence to the DASH diet, which was developed as a dietary approach to prevent and treat hypertension (21, 25). Components of the revised score include vegetables, fruit, whole grains, nuts and legumes, sodium, red and processed meat, and sugar-sweetened beverages (26, 27). The low-fat dairy component in the original score was excluded due to exceptionally low intakes among the study population and the inability to create accurate quintile groupings (28, 29). Points were awarded on the basis of quintiles of intakes, and reverse scoring was used for the sodium, red and processed meat, and sweetened beverages, with a possible range of 0–35 points (see **Supplemental Table 2**).

Main exposure variable and covariates

The main exposure of interest was nativity, represented categorically as US-born compared with foreign-born on the basis of the participants' self-response to the survey question "In what country were you born?" Naturalized citizens, permanent residents, undocumented immigrants, international students, guest workers, and those born in US territories such as Puerto Rico were included in the foreign-born category and anyone born in the United States (50 states or the District of Columbia) were considered US born. Additional information on nativity among immigrants was not publicly available in NHANES, and risk of disclosure presented as a barrier for use of these data. We also examined the potential association of length of residency among foreign-born blacks and diet quality. The 9-category question on length of residency asked by NHANES was recoded into 4 levels, due to sample size constraints, and following other studies on immigration, acculturation, and health (30).

To minimize confounding by other factors, covariates in the analysis included age (years; continuous), sex (male or female), educational attainment [less than high school or general equivalency diploma, high school or general equivalency diploma, associate degree or some college, or college degree or higher], family income-to-poverty ratio (IPR; 0–5, continuous), smoking status (never, former, or current), physical activity (self-reported moderate or vigorous levels of recreational or leisure activity for ≥10 min continuously in the past 30 d; yes or no), and daily energy intake (kilocalories per day; continuous). BMI (kg/m^2) was presented in the descriptive tables continuously and categorically as normal (18.5–24.9), overweight (25–29.9), and obese (≥30.0).

Statistical analysis

Statistical analysis was conducted by using Stata version 13.0 (StataCorp) (31), with the use of sampling weights for the complex survey design so that the results were representative of the noninstitutionalized US population (25, 32). Weighted chi-square and *t* tests were used to determine the significance of any differences in sociodemographic and lifestyle factors between US-born and foreign-born blacks. Descriptive statistics by length of residency category were age-adjusted. Adjusted for all confounding factors described above, percentages meeting the recommended component cutoffs for the AHEI-2010 score were also determined.

Multivariable-adjusted linear regression was used to investigate the association between nativity and diet quality for each respective continuous total score. To assess confounding, we evaluated several regression models. Model 1 included age and sex. Model 2 further included socioeconomic risk factors such as educational level and IPR, and model 3 included the behavioral factors that might influence dietary intakes, such as smoking status and physical activity. Model 4 added daily energy intake. We performed a sensitivity analysis including BMI as a covariate in the models and the results did not vary (data not shown). The same multivariable-adjusted linear regression models were used to examine the association between length of US residency and total diet quality scores among foreign-born blacks. Participants with missing data for any of the confounding variables were excluded from all multivariable linear regression models.

Given the nonnormal distribution and large percentage of "zero" intakes for many of the components (data not shown), we used a multinomial polytomous logistic regression with a 3-level dietary intake measure based on tertiles (low, medium, or high) as the dependent variable for most of the components as well as the total AHEI-2010 and DASH diet scores. Specifically, the multinomial polytomous logistic regression provides a relative risk ratio (RRR) to indicate the ratio of the probability of being in one outcome category over the probability of being in the baseline category. Given the extremely large percentage of "zero" intakes for the alcohol components (78.3% and 72.4%, respectively; see **Supplemental Figure 2**), 3-level dietary intake measures were created to designate no intakes (no-intake group), intakes below the median (of those with intakes), and intakes above the median. The primary predictor of interest was foreign-born compared with US-born and covariates included the same predictors used in the aforementioned full model. In these analyses, the low tertile and no-intake groups were designated as the base comparison categories in the relevant multinomial logistic regression analyses. After adjustment for the other predictors in the model, we obtained adjusted prevalences of the intake tertiles for US-born and foreign-born blacks. We considered a 2-tailed $P < 0.05$ as significant in all analyses.

RESULTS

Population characteristics

The study population comprised 4319 non-Hispanic blacks, including 3911 US-born (90.6%) and 408 foreign-born (9.4%) blacks (**Table 1**). Compared with US-born blacks, a higher proportion of foreign-born blacks were men, had attained a higher level of education, were classified as normal or overweight, had never been a smoker, engaged in physical activity, and had lower energy intake. Age-adjusted sociodemographic and health characteristics of foreign-born blacks by length of residency category are also shown in Table 1. In comparison to those who were in the United States for <10 y, more foreign-born blacks who were in the United States for ≥30 y were current smokers (14.8% compared with 5.1%, respectively), had a higher income (IPR ≥4.00: 43.1% compared with 8.3%, respectively), and had a higher percentage with a college degree or higher (39.1% compared with 20.1%, respectively) (Table 1). Foreign-born blacks residing in the United States for ≥30 y reported a higher BMI in comparison to those residing in the United States for <10 y (28.8 compared with 26.7) (Table 1).

TABLE 1
Demographic characteristics and health behaviors among non-Hispanic US- and foreign-born blacks by nativity and US length of residency: pooled NHANES 2003–2012[1]

	Nativity status			Length of residency of foreign-born blacks[2]			
	US-born (n = 3911)	Foreign-born (n = 408)	P	<10 y (n = 108)	10–19 y (n = 97)	20–29 y (n = 87)	≥30 y (n = 106)
Female, %	55.3	47.7	0.049	48.0 ± 0.06	46.7 ± 0.07	51.6 ± 0.04	46.9 ± 0.08
Age, y	45.2 ± 0.4	44.7 ± 0.8	0.51	38.5 ± 1.6	41.8 ± 0.8	48.1 ± 1.3	53.5 ± 1.0
Educational attainment, %							
Less than high school	25.4	17.9	<0.001	28.5 ± 0.06	16.4 ± 0.04	11.5 ± 0.03	13.1 ± 0.03
High school or equivalent	26.1	21.4		31.5 ± 0.09	22.1 ± 0.04	16.7 ± 0.04	13.9 ± 0.04
Some college	33.3	31.3		23.1 ± 0.05	29.8 ± 0.06	42.7 ± 0.06*	37.5 ± 0.05
College degree or higher	15.2	29.4		20.1 ± 0.04	32.0 ± 0.06	30.7 ± 0.05	39.1 ± 0.07*
Income-poverty ratio	2.3 ± 0.06	2.5 ± 0.1	0.13	2.1 ± 0.1	2.3 ± 0.2	3.0 ± 0.2**	3.0 ± 0.2**
<1.85, %	47.8	41.5	0.24	56.8 ± 0.08	46.4 ± 0.06	25.4 ± 0.07**	30.7 ± 0.04*
1.85–3.99, %	31.5	36.5		35.7 ± 0.08	38.1 ± 0.05	43.3 ± 0.09	27.3 ± 0.06)
≥4, %	20.7	22.0		8.3 ± 0.02	15.8 ± 0.05	31.8 ± 0.06**	43.1 ± 0.07**
BMI, kg/m	31.1 ± 0.2	28.1 ± 0.4	<0.001	26.7 ± 0.3	27.9 ± 0.6	29.5 ± 0.8*	28.8 ± 0.8*
Normal weight (18.5–24.9),[3] %	20.5	25.7	<0.001	30.0 ± 0.05	23.5 ± 0.06	22.4 ± 0.04	26.3 ± 0.08
Overweight (25–29.9), %	27.9	43.2		48.4 ± 0.06	44.9 ± 0.07	38.5 ± 0.05	39.3 ± 0.06
Obese (≥30), %	49.8	30.0		20.2 ± 0.04	30.7 ± 0.05	38.3 ± 0.07*	32.0 ± 0.06
Energy intake, kcal/d	2054 ± 17	1847 ± 45	<0.001	1602 ± 81	1928 ± 69*	1966 ± 106*	2038 ± 123*
Smoking status, %							
Never	53.8	76.5	<0.001	82.2 ± 0.05	83.9 ± 0.05	75.1 ± 0.07	63.9 ± 0.07
Former	17.1	15.0		13.0 ± 0.05	8.1 ± 0.03	13.9 ± 0.04	21.7 ± 0.06
Current	29.1	8.5		5.1 ± 0.01	7.6 ± 0.03	11.6 ± 0.05	14.8 ± 0.04*
Moderate or vigorous physical activity,[4] %	46.6	52.9	0.02	45.8 ± 0.06	55.1 ± 0.07	53.0 ± 0.07	57.9 ± 0.06

[1]Values are means or percentages ± SEs. Weighted chi-square and t tests were used to determine the significance of any differences in sociodemographic and lifestyle factors between US-born and foreign-born blacks. For the length-of-residency demographic variables, prevalences of continuous outcomes were age adjusted, with regression and values obtained with the STATA margins command. *$P < 0.05$; **$P < 0.001$. For length of residency, P values are based on the reference category of <10 y.

[2]With the exception of age, values presented by length of residency were age adjusted; significance presented is based on regression models with the reference category for length of residency of <10 y in the United States.

[3]The underweight category was omitted from the table due to the small sample size, but these participants were not omitted from other analyses reported in this article.

[4]Based on self-report of engaging in moderate or vigorous leisure or recreational physical activity for ≥10 min continuously over the past 30 d.

Adapted AHEI-2010

Foreign-born blacks scored higher on the AHEI-2010—total score of 45.8 compared with total score of 35.9 among US-born blacks (**Table 2**).

In terms of the AHEI-2010 components, foreign-born blacks had significantly lower daily intakes of sugar-sweetened beverages, red and processed meat, and sodium and higher intakes of vegetables, fruit, whole grains, and long-chain n–3 fatty acids. **Figure 1** depicts the percentage of adherence to AHEI-2010 cutoffs, with the differences between US-born and foreign-born blacks in descending order of the food component, with the greatest difference presented first. In terms of the percentage fully adhering to AHEI-2010 cutoffs, all of the differences were significant except for sodium and alcohol ($P \leq 0.05$). Despite these differences, the proportion adhering to AHEI-2010 cutoffs for any single component of the score did not exceed 41%. Adjusted mean component scores by length of residency categories among the foreign-born sample differed for red and processed meat and percentage of energy from PUFAs, in which those residing in the United States for ≥20 y showed significantly higher intakes compared with their counterparts residing in the United States for <10 y (Table 2). Conversely, the percentage of whole grains significantly decreased with increased length of residency when comparing those residing in the United States for ≥20 y with their counterparts residing in the United States for <10 y (Table 2).

Adapted Fung DASH score

Foreign-born blacks had significantly favorable intakes and higher scores for vegetables, fruit, whole grains, sugar-sweetened beverages, and red and processed meat (**Table 3**). Among the foreign-born sample, study participants residing in the United States for ≥20 y consumed significantly less whole grains and more red and processed meat compared with those in the United States for <10 y.

Multivariate analysis of DASH and AHEI-2010 scores

Foreign-born blacks had, on average, AHEI-2010 scores that were 9.3 points higher (β: 9.3; 95% CI: 7.5, 11.0) than their US-born counterparts after demographic, socioeconomic, and behavioral factors were controlled for (**Table 4**). Foreign-born blacks scored significantly higher on the DASH diet score in comparison to their US-born counterparts for all models, including the full model (Table 4; β: 3.1; 95% CI: 2.5, 3.8).

TABLE 2
Adjusted mean intakes and component scores of AHEI-2010 diet score by nativity and length of residency among non-Hispanic blacks: pooled NHANES 2003–2012[1]

				Length of residency of foreign-born blacks			
	US-born (n = 3911)	Foreign-born (n = 408)	P	<10 y (n = 108)	10–19 y (n = 97)	20–29 y (n = 87)	≥30 y (n = 106)
Energy intake, kcal/d	2097 ± 18	1871 ± 48	<0.001	1774 ± 75	1891 ± 62	1973 ± 83	2043 ± 108
Total AHEI-2010 score[2]	35.9 ± 0.3	45.8 ± 0.9	<0.001	49.3 ± 1.6	44.4 ± 1.5*	45.9 ± 1.6	45.8 ± 1.8
Vegetables[3]							
Servings/d	0.9 ± 0.02	1.2 ± 0.06	<0.001	1.2 ± 0.1	1.2 ± 0.1	1.1 ± 0.2	1.2 ± 0.2
Mean score	1.8 ± 0.03	2.4 ± 0.1	<0.001	2.4 ± 0.2	2.3 ± 0.2	2.2 ± 0.3	2.5 ± 0.3
Fruit[4]							
Servings/d	0.5 ± 0.02	0.8 ± 0.09	0.001	1.1 ± 0.2	0.8 ± 0.1	0.7 ± 0.1	0.8 ± 0.1
Mean score	1.2 ± 0.04	2.0 ± 0.2	<0.001	2.6 ± 0.5	1.8 ± 0.3	1.7 ± 0.3	2.1 ± 0.4
Whole grains[5]							
% of total grains	10.5 ± 0.4	20.4 ± 2.1	<0.001	26.9 ± 3.5	20.4 ± 2.7	18.0 ± 2.5*	17.8 ± 3.3*
Mean score	2.0 ± 0.06	3.6 ± 0.3	<0.001	4.5 ± 0.5	3.7 ± 0.4	3.4 ± 0.4*	3.3 ± 0.5
Sugar-sweetened beverages[6]							
Servings/d	1.9 ± 0.05	1.2 ± 0.1	<0.001	1.0 ± 0.1	0.8 ± 0.1	1.0 ± 0.2	1.1 ± 0.1
Mean score	2.8 ± 0.1	4.8 ± 0.3	<0.001	5.1 ± 0.6	5.3 ± 0.4	5.4 ± 0.5	4.6 ± 0.5
Red/processed meat							
Servings/d	2.4 ± 0.06	1.6 ± 0.1	<0.001	1.0 ± 0.2	1.5 ± 0.2*	1.6 ± 0.3*	1.5 ± 0.2*
Mean score	2.7 ± 0.1	4.8 ± 0.3	<0.001	6.2 ± 0.5	4.3 ± 0.5*	5.1 ± 0.5	4.4 ± 0.5*
Nut, legume, and vegetable protein[5]							
Ounce-equivalents/d	0.8 ± 0.03	1.2 ± 0.1	0.002	1.1 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	1.7 ± 0.4
Mean score	3.6 ± 0.1	4.4 ± 0.3	0.008	4.0 ± 0.6	4.0 ± 0.5	4.7 ± 0.6	5.6 ± 0.7
Long-chain n–3 PUFAs (EPA+DHA)							
mg/d	126.6 ± 6.7	182.6 ± 16.6	0.001	226.7 ± 44.2	183.9 ± 28.0	125.2 ± 32.8	156.4 ± 29.6
Mean score	3.3 ± 0.1	4.4 ± 0.2	<0.001	4.6 ± 0.5	4.5 ± 0.4	4.0 ± 0.6	3.7 ± 0.3
Total PUFAs							
% kcal/d	7.8 ± 0.07	6.6 ± 0.2	<0.001	6.0 ± 0.2	6.5 ± 0.2*	6.9 ± 0.3*	7.5 ± 0.4*
Mean score	6.8 ± 0.7	5.5 ± 0.2	<0.001	4.7 ± 0.2	5.5 ± 0.2*	6.0 ± 0.3**	6.5 ± 0.3**
Sodium[7]							
mg/d	3339 ± 28	3248 ± 47	0.06	3002 ± 93	3048 ± 117	3130 ± 102	2861 ± 107
Mean score	5.0 ± 0.07	5.2 ± 0.1	0.110	5.6 ± 0.2	5.4 ± 0.3	5.5 ± 0.3	6.2 ± 0.3
Alcohol,[8] drinks/d							
Women	0.3 ± 0.03	0.3 ± 0.05	0.758	0.2 ± 0.1	0.1 ± 0.1	0.1 ± 0.1	0.3 ± 0.1
Men	0.9 ± 0.05	1.0 ± 0.1	0.736	0.4 ± 0.2	0.5 ± 0.2	0.9 ± 0.2	0.8 ± 0.2
Mean score	3.5 ± 0.05	3.7 ± 0.1	0.362	3.5 ± 0.3	3.4 ± 0.3	4.4 ± 0.3	3.8 ± 0.4

[1]Values are means ± SEs, adjusted for age, sex, educational level, income-to-poverty ratio, smoking status, physical activity status, and energy intake. Adjusted means were obtained with the STATA margins command after running the adjusted regression models. *$P < 0.05$; **$P < 0.001$. For length of residency, P values are based on the reference category of <10 y. AHEI-2010, Alternative Healthy Eating Index–2010.
[2]Possible AHEI-2010 score is 0–100 points.
[3]All vegetables, except for white potatoes and juice.
[4]Includes only whole fruit, excluding fruit juice.
[5]Based on the USDA definition.
[6]Includes soda, fruit juice and fruit drinks, presweetened iced teas, sports drinks, and energy drinks.
[7]Sum of all sodium content of all foods.
[8]Includes wine, beer, and distilled spirits.

Intake tertile–adjusted prevalences for US-born and foreign-born blacks

The adjusted percentages of foreign-born blacks in the highest tertile for both the AHEI-2010 and DASH scores were 60.4% and 50.8% compared with 29.6% and 24.8% among US-born blacks, respectively (**Table 5**). Similarly, it appears that more foreign-born blacks were in the highest tertiles for intakes of vegetables, fruit, whole grains, nuts, legumes, and vegetable protein and long-chain fatty acids. Meanwhile, US-born blacks had a higher percentage in the highest-intake tertile for sugar-sweetened beverages, red and processed meat, PUFAs, and sodium.

Models predicting overall and component DASH and AHEI-2010 scores

Foreign-born blacks were more likely to be in the high-scoring tertile than in the low tertile for both the AHEI-2010 (RRR: 5.75; 95% CI: 3.73, 8.86) and DASH (RRR: 7.63; 95% CI: 4.73, 12.31) scores (**Table 6**). For the DASH scores, foreign-born blacks were

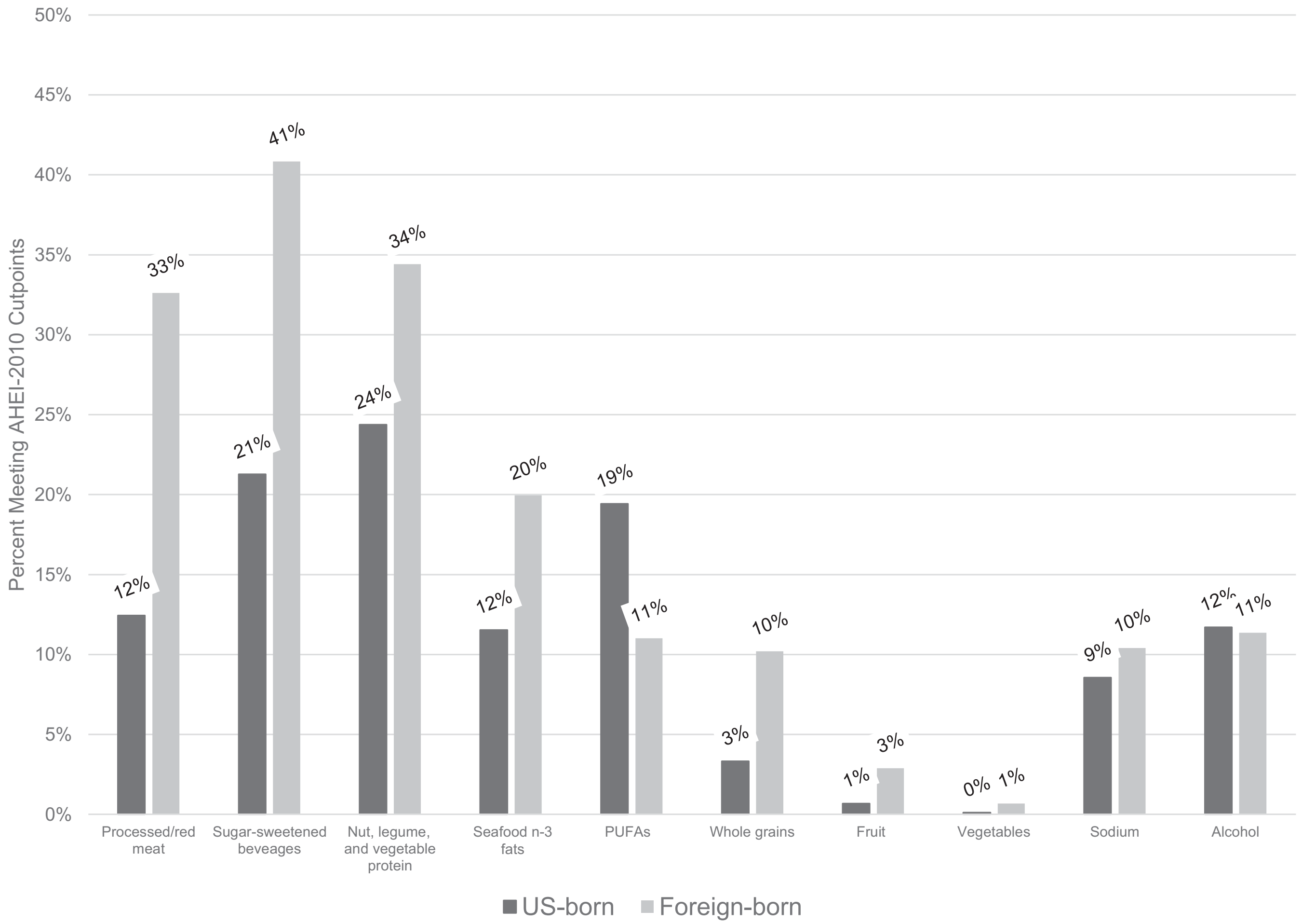

FIGURE 1 Adherence to AHEI-2010 cutoffs for US-born and foreign-born, non-Hispanic blacks. Values were adjusted for age, sex, income-poverty ratio, education, smoking status, physical activity status, and caloric intake. All differences were significant except for sodium and alcohol. AHEI-2010 cutoffs: vegetables, ≥5 servings/d; fruit, ≥4 servings/d; whole grain, ≥50% total grains/d; sugar-sweetened beverages, 0 servings/d; nut, legume, and vegetable protein, ≥1 servings/d; seafood n–3 fatty acids, ≥250 mg/d; PUFAs ≥10%; sodium, lowest decile; alcohol, 0.5–1.5 and 0.5–2.0 drinks/d for women and men, respectively. AHEI-2010, Alternative Healthy Eating Index–2010.

also more likely to be in the medium tertile than in the low tertile (RRR: 2.86; 95% CI: 1.80, 4.53). For the component analyses, foreign-born blacks were more likely to be in the high tertile for vegetables (RRR: 1.68; 95% CI: 1.24, 2.29), fruit categories (excluding fruit juice—RRR: 2.42; 95% CI: 1.69, 3.47; including fruit juice—RRR: 2.95; 95% CI: 1.90, 4.59), percentage of whole grains (RRR: 2.39; 95% CI: 1.64, 3.49), and n–3 fatty acids (RRR: 2.03; 95% CI: 1.38, 2.97). US-born blacks were less likely to be in the high-tertile category than in the low intake for sugar-sweetened beverages (RRR: 0.27; 95% CI: 0.19, 0.40), red and processed meat (RRR: 0.36; 95% CI: 0.24, 0.54), and PUFAs (RRR: 0.36; 95% CI: 0.24, 0.52).

DISCUSSION

Overall, this study suggests that, among blacks in the United States, being foreign born is associated with higher AHEI-2010 and DASH scores and intakes of certain nutrients and types of foods compared with being US born. These findings support what is known as the healthy immigrant hypothesis, which posits that immigrant groups have more favorable health behaviors, risk factors, and family support that are associated with a lower risk of a variety of chronic diseases and poor health outcomes than those of the same race/ethnicity born in the United States (25). Our study findings also modestly support evidence from other ethnic groups that more-recent immigrants are healthier than those residing in the United States for longer periods due to acculturation, possibly resulting in the adoption of less healthy eating and lifestyle behaviors (9, 33). For example, our findings suggest an association between increased length of residency and increased intakes of red and processed meat and polyunsaturated fat and decreased whole-grain intake, findings that could be considered for the development of future interventions for black immigrant groups. Significant changes by length of residency were not found for intakes of vegetables, fruit, sugar-sweetened beverages, and nut, legume, and vegetable protein, however.

Each score used to estimate diet quality contained similar components; however, they differed in how they operationalized some of the components. For example, the AHEI-2010 score excluded fruit juice and the DASH score included it; the AHEI-2010 score cutoff was based on ≥50% of total grains being whole grains, whereas the DASH score whole-grain component was

TABLE 3
Adjusted mean intakes and component scores of the DASH diet score by nativity and length of residence among non-Hispanic blacks: pooled NHANES 2003–2012[1]

				Length of residency of foreign-born blacks			
	US-born ($n = 3911$)	Foreign-born ($n = 408$)	P	<10 y ($n = 108$)	10–19 y ($n = 97$)	20–29 y ($n = 87$)	≥30 y ($n = 106$)
DASH diet score[2]	20.3 ± 0.1	23.4 ± 0.3	<0.001	24.7 ± 0.5	23.6 ± 0.5	23.4 ± 0.5	23.8 ± 0.6
Vegetables[3]							
Servings/d	0.9 ± 0.02	1.2 ± 0.06	<0.001	1.2 ± 0.1	1.2 ± 0.1	1.1 ± 0.2	1.2 ± 0.2
Mean score	2.9 ± 0.03	3.3 ± 0.08	0.001	3.3 ± 0.1	3.3 ± 0.1	3.1 ± 0.2	3.2 ± 0.2
Fruit[4]							
Servings/d	0.9 ± 0.02	1.5 ± 0.1	<0.001	1.9 ± 0.3	1.5 ± 0.2	1.1 ± 0.1	1.2 ± 0.2
Mean score	2.9 ± 0.03	3.5 ± 0.1	<0.001	3.8 ± 0.1	3.7 ± 0.2	3.4 ± 0.2*	3.3 ± 0.3
Whole grains[5]							
Ounce-equivalents	0.6 ± 0.02	1.3 ± 0.1	<0.001	1.6 ± 0.3	1.4 ± 0.3	1.0 ± 0.2*	1.0 ± 0.2*
Mean score	2.7 ± 0.04	3.4 ± 0.1	<0.001	3.8 ± 0.2	3.4 ± 0.2	3.1 ± 0.2*	3.2 ± 0.3
Nut, legume, and vegetable protein[5]							
Ounce-equivalents/d	0.8 ± 0.03	1.2 ± 0.1	0.004	1.0 ± 0.2	1.1 ± 0.2	1.1 ± 0.2	1.8 ± 0.4
Mean score	2.8 ± 0.03	2.9 ± 0.1	0.191	2.7 ± 0.2	2.8 ± 0.2	3.1 ± 0.2	3.4 ± 0.3
Sodium[6]							
mg/d	3337 ± 28	3184 ± 72	0.028	2937 ± 95	3249 ± 132	3142 ± 124	2896 ± 143
Mean score	3.0 ± 0.03	3.1 ± 0.1	0.209	3.2 ± 0.1	3.1 ± 0.1	3.2 ± 0.1	3.5 ± 0.1
Sugar-sweetened beverages[7]							
Servings/d	1.9 ± 0.05	1.2 ± 0.1	<0.001	1.0 ± 0.1	0.9 ± 0.1	1.0 ± 0.2	1.1 ± 0.1
Mean score	3.0 ± 0.03	3.6 ± 0.08	<0.001	3.8 ± 0.2	3.9 ± 0.1	3.8 ± 0.2	3.6 ± 0.1
Red/processed meat							
Servings/d	2.9 ± 0.1	1.6 ± 0.1	<0.001	1.0 ± 0.2	1.5 ± 0.2*	1.6 ± 0.2*	1.5 ± 0.2*
Mean score	2.9 ± 0.04	3.6 ± 0.1	<0.001	4.0 ± 0.1	3.5 ± 0.2*	3.6 ± 0.2	3.6 ± 0.2*

[1]Values are means ± SEs, adjusted for age, sex, educational level, income-to-poverty ratio, smoking status, physical activity status, and energy intake. Adjusted means were obtained with the STATA margins command after running the adjusted regression models. *$P < 0.05$. For length of residency, P values are based on the reference category of <10 y. DASH, Dietary Approaches to Stop Hypertension.
[2]Possible DASH diet score is 0–35 points, and points for component scores are based on quintiles of intakes (range: 0–5).
[3]All vegetables, except for potatoes, juice, and legumes.
[4]All fruit and fruit juice.
[5]Based on the USDA definition.
[6]Sum of all sodium contents of all foods.
[7]Includes soda, fruit juice and fruit drinks, presweetened iced teas, sports drinks, and energy drinks.

based on quintiles of total whole-grain intake. In addition, unlike DASH, the AHEI-2010 score also includes components for seafood n–3 fatty acids and PUFA intake. Of note, foreign-born, non-Hispanic blacks reported having higher intakes of n–3 fatty acids. These results, as well as the higher intakes of other foods associated with lower cardiovascular disease risk, such as fruit, vegetables, and plant-based proteins found in nuts and legumes, have important implications for diet counseling (34). Nutrition professionals working with those of African descent born outside of the United States should encourage adherence to traditional cultural practices and diet to minimize the adverse consequences of acculturation.

These study findings also support existing literature that shows the low diet quality among the US black population, both foreign born and US born combined, as well as the US population overall (1, 2). Of note, although foreign-born blacks scored higher

TABLE 4
Association between nativity (US-born compared with foreign-born) among non-Hispanic blacks and AHEI-2010 and DASH scores: pooled NHANES 2003–2012[1]

	Model 1			Model 2			Model 3			Model 4		
Variables	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI
AHEI-2010[2]	11.1**	0.9	9.4, 12.8	10.2**	0.9	8.4, 12.1	9.9**	0.9	8.1, 11.8	9.3**	0.9	7.5, 11.0
DASH score[3]	4.0**	0.3	3.3, 4.6	3.6**	0.3	2.9, 4.3	3.3**	0.3	2.7, 4.0	3.1**	0.3	2.5, 3.8

[1]$n = 4319$ for all models. Data presented are from multivariable-adjusted linear regression models. Model 1 included age and sex; model 2 further included educational level and income-to-poverty ratio; model 3 further included smoking status and physical activity; and model 4 added daily energy intake. **$P < 0.001$. AHEI-2010, Alternative Healthy Eating Index–2010; DASH, Dietary Approaches to Stop Hypertension.
[2]Potential range for the AHEI-2010 is 0–100 points.
[3]Potential range for the DASH diet score is 0–35 points.

TABLE 5

Intake tertile–adjusted prevalences among US-born and foreign-born non-Hispanic blacks: pooled NHANES 2003–2012[1]

	Lower- or no-intake tertile, %			Medium-intake tertile, %			Higher-intake tertile, %		
Variables	Adjusted prevalence[2]	SE	95% CI	Adjusted prevalence[2]	SE	95% CI	Adjusted prevalence[2]	SE	95% CI
AHEI-2010 score									
US-born	35.2	0.01	32.9, 37.6	35.2	0.01	33.4, 36.9	29.6	0.01	27.5, 31.7
Foreign-born	16.1	0.03	10.9, 21.3	23.5	0.03	16.9, 30.1	60.4	0.04	53.2, 67.5
DASH score									
US-born	36.1	0.01	33.7, 38.4	39.1	0.01	37.1, 41.1	24.8	0.01	22.7, 27.0
Foreign-born	13.6	0.02	9.0, 18.2	35.5	0.03	30.2, 40.9	50.8	0.03	44.8, 56.8
Vegetables,[3] servings/d									
US-born	36.1	0.01	33.7, 38.4	39.1	0.01	37.1, 41.1	24.8	0.01	22.7, 27.0
Foreign-born	13.6	0.02	9.0, 18.3	35.5	0.03	30.2, 40.9	50.8	0.03	44.8, 56.8
Fruit (excluding juice),[4] servings/d									
US-born	40.4	0.01	38.0, 42.8	28.6	0.01	26.7, 30.5	31.0	0.01	28.9, 33.0
Foreign-born	28.5	0.03	22.7, 34.3	23.5	0.03	17.0, 30.0	48.0	0.04	40.8, 55.3
Fruit (including juice),[5] servings/d									
US.born	34.8	0.01	32.9, 36.7	33.7	0.01	31.9, 35.5	31.5	0.01	29.7, 33.3
Foreign-born	19.3	0.03	13.7, 24.9	33.2	0.03	26.2, 40.1	47.5	0.04	40.1, 54.9
Whole grains,[6] ounce-equivalents/d									
US-born	40.5	0.01	38.2, 42.8	29.1	0.01	27.4, 30.8	30.4	0.01	28.2, 32.7
Foreign-born	28.9	0.03	22.5, 35.4	18.3	0.02	13.7, 22.6	52.7	0.03	46.0, 59.4
Whole grains,[6] % of total grains/d									
US-born	40.3	0.01	38.0, 42.6	28.9	0.01	27.5, 30.3	30.8	0.01	28.5, 33.1
Foreign-born	28.9	0.03	22.5, 35.4	21.1	0.02	16.1, 26.1	50.0	0.03	43.4, 56.6
Sugar-sweetened beverages,[7] servings/d									
U.S.-born	31.2	0.01	28.9, 33.4	33.8	0.01	31.9, 35.7	35.0	0.01	32.8, 37.2
Foreign-born	53.2	0.03	47.0, 59.4	26.4	0.03	21.1, 31.7	20.4	0.03	14.9, 25.9
Nut, legume, and vegetable protein,[6] ounce-equivalents/d									
US-born	39.1	0.01	36.9, 41.4	28.6	0.01	26.1, 31.2	32.2	0.01	30.2, 34.3
Foreign-born	40.6	0.03	34.8, 46.3	17.0	0.03	11.3, 22.8	42.4	0.03	36.3, 48.5
Red/processed meat, servings/d									
US-born	31.4	0.01	28.7, 34.1	34.1	0.01	32.1, 36.1	34.5	0.01	32.0, 37.0
Foreign-born	51.1	0.03	44.2, 58.0	26.1	0.03	20.1, 32.1	22.8	0.03	17.2, 28.4
Long-chain n–3 fatty acids (EPA+DHA), mg/d									
US-born	34.3	0.01	32.0, 36.6	34.0	0.01	32.0, 36.0	31.6	0.01	29.0, 34.3
Foreign-born	26.3	0.03	21.5, 33.0	26.3	0.02	21.4, 31.2	47.6	0.04	39.9, 55.3
PUFAs, % kcal/d									
US-born	31.8	0.01	29.4, 34.2	33.3	0.01	31.6, 35.1	34.8	0.01	32.5, 37.1
Foreign-born	49.8	0.04	42.7, 56.9	30.1	0.03	23.2, 35.0	20.1	0.02	15.3, 24.9
Sodium,[8] mg/d									
US-born	33.2	0.01	31.0, 35.3	33.1	0.01	31.1, 35.0	33.7	0.01	31.7, 35.8
Foreign-born	32.7	0.02	29.3, 36.1	35.9	0.02	31.3, 40.6	31.3	0.02	27.3, 35.4
Alcohol,[9] drinks/d									
US-born	73.3	0.01	71.4, 75.3	13.2	0.01	11.9, 14.5	13.5	0.01	12.0, 14.9
Foreign-born	70.8	0.03	65.2, 76.3	15.7	0.02	11.5, 19.8	13.5	0.03	8.2, 18.8

[1]Total $n = 4319$ for each model. Scores and intakes were categorized into tertiles. The low tertile was designated as the base comparison category, and for the alcohol analysis the "no intake" group was designated as the base comparison category in the polytomous regression analyses. AHEI-2010, Alternative Healthy Eating Index–2010; DASH, Dietary Approaches to Stop Hypertension.

[2]Adjusted for age, sex, educational level, poverty-to-income ratio, smoking status, physical activity status, and energy intake. Adjusted prevalences of the intake tertiles for US-born and foreign-born blacks were determined after adjustment for the other predictors in polytomous regression models.

[3]All vegetables, except for white potatoes and juice.

[4]Includes only whole fruit, excluding fruit juice.

[5]Includes only whole fruit, including fruit juice.

[6]Based on the USDA definition.

[7]Includes soda, fruit juice and fruit drinks, presweetened iced teas, sports drinks, and energy drinks.

[8]Sum of all sodium contents in food.

[9]Includes wine, beer, and distilled spirits.

TABLE 6
Multinomial logistic regression of food component intakes among US-born and foreign-born non-Hispanic blacks: pooled NHANES 2003–2012[1]

	Medium-intake tertile		Higher-intake tertile	
Variables	RRR	95% CI	RRR	95% CI
AHEI-2010 score				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.61	0.98, 2.66	5.75**	3.73, 8.86**
DASH score				
US-born	1.00	1.00	1.00	1.00
Foreign-born	2.86**	1.80, 4.53**	7.63**	4.73, 12.31**
Vegetables,[2] servings/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.31	0.96, 1.82	1.68**	1.24, 2.29**
Fruit (excluding juice),[3] servings/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.23	0.83, 1.85	2.42**	1.69, 3.47**
Fruit (including juice),[4] servings/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.85**	1.21, 2.83**	2.95**	1.90, 4.59**
Whole grains,[5] ounce-equivalents/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	0.90	0.61, 1.34	2.58**	1.76, 3.76**
Whole grains,[5] % of total grains/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.04	0.69, 1.56	2.39**	1.64, 3.49**
Sugar-sweetened beverages,[6] servings/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	0.42**	0.32, 0.56**	0.27**	0.19, 0.40**
Nut, legume, and vegetable protein,[5] ounce-equivalents/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	0.57**	0.36, 0.91**	1.29	0.97, 1.71
Red/processed meat, servings/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	0.45**	0.32, 0.64**	0.36**	0.24, 0.54**
Long-chain n–3 fatty acids EPA+DHA, mg/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.01	0.75, 1.37	2.03**	1.38, 2.97**
PUFAs, % kcal/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	0.56**	0.40, 0.80**	0.36**	0.24, 0.52**
Sodium,[7] mg/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.08	0.79, 1.49	0.87	0.55, 1.37
Alcohol,[8] drinks/d				
US-born	1.00	1.00	1.00	1.00
Foreign-born	1.24	0.88, 1.75	1.05	0.62, 1.80

[1]Total $n = 4319$ for each model. Data shown are from the multinomial polytomous logistic regression models adjusted for age, sex, education level, income-to-poverty ratio, smoking status, physical activity status, and energy intake. Scores and intakes were categorized into tertiles. The low tertile was designated as the base comparison category, and for the low-fat dairy and alcohol analyses the "no intake" group was designated as the base comparison category in the polytomous regression analyses. The RRR indicates the ratio of the probability of being in one outcome category over the probability of being in the baseline (low tertile or no intake) category. $P < 0.05$, except $^{**}P < 0.001$. AHEI-2010, Alternative Healthy Eating Index-2010; DASH, Dietary Approaches to Stop Hypertension; RRR, relative risk ratio.

[2]All vegetables, except for white potatoes and juice.

[3]Includes only whole fruit, excluding fruit juice.

[4]Includes only whole fruit, including fruit juice.

[5]Based on the USDA definition.

[6]Includes soda, fruit juice and fruit drinks, presweetened iced teas, sports drinks, and energy drinks.

[7]Sum of all sodium contents in food.

[8]Includes wine, beer, and distilled spirits.

on both respective diet quality scores and reported higher intakes for food groups encouraged for a healthy diet, their diet quality is still suboptimal. For the AHEI-2010 diet score components, considerably $<$50% of foreign-born blacks met the recommended cutoffs for each component. For example, 43% met the recommendation for sugar-sweetened beverages; 34% for nut, legume, and vegetable protein; 33% for processed and red meat; 20% for seafood-based n–3 fatty acids; and $\leq$10% met the remaining component recommendations. An important consideration, however, is the dietary assessment methodology used, differences in the criteria for recommendation cutoffs, and how food groups are operationalized for these studies. An additional limitation of this study, and worth further exploration, is whether the statistical differences in diet quality have clinical meaning and impacts on biomarkers for chronic disease risk, such as systolic and diastolic blood pressure, blood cholesterol, and blood glucose concentrations, or cumulatively, chronic disease risk. There is evidence from this data set of a corresponding lower prevalence of hypertension among foreign-born blacks (35).

This research highlights the importance of targeted interventions for blacks born in the United States in order to adequately address health disparities. The cultural influences that might underpin these observed differences are important. For example, the historically based African-American "soul food" diet includes fried foods, refined grains, processed meats, and few fruit and vegetables. Foreign-born blacks have different cultural cuisines that vary throughout the African diaspora (28, 29). On the basis of the available flora and fauna in the countries of origin, these cultural diets appear to be those associated with lower chronic disease risk (35). Diet is shaped not only by culture but by environmental and social factors, such as availability and access to healthy affordable foods, time and resource availability, nutrition knowledge and awareness, and socioeconomic status (36). The historically based social experiences that differ between US-born and foreign-born blacks, such as the impact of race-based segregation and systematic discrimination and racism, may also contribute to the observed differences. A noteworthy finding that may be a pertinent driver of these study results is the difference in socioeconomic factors between the 2 groups. Unlike other well-studied immigrant groups such as Hispanics, foreign-born blacks tend to be better educated and have a higher income than their US counterparts, underscoring the potential influence of historically based socioeconomic factors (10, 11). The study also underscores the importance of further consideration of length of residency when studying diet among black immigrants and in the development of dietary interventions for this demographic.

Although this study is novel in that it is the first, to our knowledge, to use a large national data set comparing diet quality by nativity among blacks in the United States, there are limitations. First, because NHANES is a cross-sectional study, we are unable to discern variation in dietary intake over time between these 2 groups because the sample size of foreign-born blacks was too small. Region of birth or specific country of birth is not publicly available in the NHANES data set; therefore, we used the crude proxy of place of birth (US born compared with born outside of the United States) to account for the ethnic heterogeneity among blacks. The exclusion of Hispanic blacks (i.e., from Dominican Republic, Puerto Rico, Cuba, Panama, and Colombia) in our analysis is also a limitation, limiting the generalizability to non-Hispanic blacks only. In addition, region of settlement in the United States is another factor to consider given the influence of environment on food availability and, specifically, culturally appropriate foods. Ethnic enclaves that form in urban environments, creating a demand for culturally specific food retail outlets, may play a role in these observed differences. For example, the largest proportion of Caribbean black immigrants are heavily concentrated in New York and Florida, and although African black immigrants are more geographically dispersed, a large concentration settle in New York, Texas, California, Florida, and Illinois in comparison to other parts of the country (10, 11).

The smaller sample size and adequacy of its power to detect an effect of acculturation in the foreign-born black sample are also of potential concern. The dietary collection methodology used in NHANES also poses a limitation. Although 24-h recall data are used in NHANES to assess diet, there are issues with recall and social-desirability bias and the validity of these data to represent typical diet is of concern, especially considering the seasonality of foods and variations in dietary habits throughout the year (37, 38). The 24-h recall method does not capture habitual intake and data are also prone to underestimation of foods and nutrients that are not consumed daily. Nonetheless, most participants (85%) had two 24-h recalls in our analytical sample, which helped assess more day-to-day variation. We also conducted our models with just day one 24-h recall data and our results did not change (data not shown). Culturally adapted food-frequency questionnaires may therefore be a more appropriate instrument in exploring related research questions in this area. Conclusions about meeting recommendations, however, should be interpreted with caution, because our analysis did not adjust for day of the week when the assessment was done or utilize methods for estimating usual intake (39).

Overall, this study underscores the need for public health and nutrition research to consider the differences in nativity and ethnicity among the non-Hispanic black population in the United States and to explore the underlying cultural, behavioral, and environmental factors contributing to these differences. For example, it is well documented that, relative to more healthful foods, food companies disproportionately market high-calorie foods and behaviors and beverages to ethnic minority populations (40, 41), but to our knowledge, no study has examined whether there are differences in the influence of this marketing on food purchases by country of birth. Potential variation in disease outcomes and disease risk, such as cardiometabolic disorders, within the ethnically diverse US black population is also understudied. Future studies could examine the diets of second- and third-generation immigrants to explore the role of biculturalism among this demographic and examine the region of settlement in the United States as well as food experiences during the formative childhood years and how this might play a role in dietary patterns and the dietary acculturation process among foreign-born blacks. In addition, potential differences in access to healthy foods between the 2 groups could be explored.

This study shows that foreign-born US blacks generally have better dietary patterns than their US-born counterparts. The lack of research in this area as well as the research findings from this novel study collectively reinforce the need to investigate potential heterogeneity in the diet and diet quality, and potentially other underlying contributing factors, within the non-Hispanic black US population on the basis of place of birth. The study also underscores the importance of addressing the social determinants of health among US-born blacks in order to improve diet quality.

The authors' responsibilities were as follows—AGMB: conceived of the study design, developed and analyzed the main research question, and drafted and edited the manuscript; RFH: assisted with the study design and statistical analysis and provided critical input on important intellectual content of the manuscript; JM: assisted with the development of the analysis plan and provided critical input on the development and editing of the manuscript; CDR: contributed to the statistical analysis and provided critical input on the editing of the manuscript; DM: contributed to the statistical analysis and theoretical framing of the manuscript; AHL: assisted with the development of the analysis plan and provided critical input on the development and editing of the manuscript; SCF: assisted with the theoretical framing, guided the data analysis process, and helped to edit the manuscript; and all authors: read and approved the final manuscript. None of the authors had a conflict of interest related to this study.

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